Gender Agreement in Russian: A Study of Young Heritage Speakers in Spain

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For my grandmothers, Tamara and Adelaida

Моим бабушкам, Тамаре и Аделаиде

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Abstract

Previous research has demonstrated the difficulty of the grammatical gender category for L2 learners and bilingual speakers. The main goal of this study is to investigate the gender agreement by 30 young L1 heritage speakers of Russian (aged 7-11) who's other dominant languages (L2s) are Spanish and Catalan. To address this issue, production and comprehension experiments were carried out revolving around the knowledge of gender of inanimate nouns in different agreement constructions. Overall, this research reveals that the heritage speakers' knowledge of gender agreement depends on a conglomerate of various factors. Namely, for the masculine gender value, the "default" strategy is applied. In the case of the feminine gender, heritage speakers are sensitive to formal gender marking. The knowledge of the neuter gender seems to be negatively interfered with by crosslinguistic transfer from L2. Also, results reveal that heritage speakers can attain a native-like level of gender knowledge and the amount of exposure to Russian benefits gender agreement production and comprehension. The study sheds light on grammatical gender agreement in heritage languages and contributes to further understanding of grammatical properties of languages in general.

Resumen

De acuerdo con los estudios previos, la adquisición del género gramatical puede representar un reto para los hablantes de una segunda lengua y hablantes bilingües. El objetivo principal de este trabajo es investigar la concordancia de género en 30 hablantes de herencia de ruso L1 (7-11 años) que tienen el español y el catalán (L2s) como lenguas dominantes. Para abordar esta cuestión, se han diseñado dos experimentos (producción y comprensión) mediante los cuales se pretende arrojar luz sobre el conocimiento del género de los nombres inanimados en diferentes construcciones de concordancia. En general, este estudio muestra evidencia de que el conocimiento de la concordancia de género gramatical depende de varios factores. Para el masculino se aplica una estrategia "por defecto". En el caso del femenino, los hablantes son sensibles a las marcas formales y la transparencia morfofonológica de los sufijos de genero de los sustantivos. El conocimiento del género neutro parece resultar afectado negativamente por la influencia lingüística de las L2s. Los resultados también revelan que los niños hablantes de herencia pueden alcanzar un nivel de conocimiento de género gramatical similar a los nativos y que una mayor cantidad de exposición al ruso beneficia la producción y comprensión de la concordancia de género. El presente trabajo de investigación contribuye al mejor conocimiento de la concordancia de género en los hablantes de herencia en particular, y en las lenguas en general.

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INTRODUCTION[1]

The goal of this study is to investigate grammatical gender through agreement constructions in heritage language, bridging the notion of grammatical gender as a morphosyntactic feature and an understudied field of heritage languages. It is generally assumed that gender is 'the most puzzling of the grammatical categories' (Corbett, 1991, p.1) and not only because of the great variety of this feature crosslinguistically, but also due to its great complexity for second language (L2) learners, bilinguals and even for children's first language (L1) acquisition. In turn, the rather newly appeared field of heritage linguistics has quickly gained popularity, becoming a mediating spot between L1 and L2 research, which has permitted to gain a piece of new knowledge on the language acquisition process across varying linguistic situations. Particularly, in this study, I explored how the interplay of several factors influences the gender system and its agreement properties in Russian children living in the bilingual environment of Catalonia and, thus, being speakers of three languages (Russian, Spanish, and Catalan). Below, an overview of heritage speakers and their unique characteristics, as well as relevant theoretical generalizations about grammatical gender agreement in Russian, are addressed.

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It is generally recognized that heritage speakers are bilinguals who usually come from immigrant backgrounds and/or belong to the ethnic minority group. Even though bilingual speakers have been a popular research topic since the 1920s (for a review Cummins and Hornberger, 2010), heritage languages are still a growing field in linguistic science (Benmamoun, Montrul, and Polinsky, 2013; Scontras, Fuchs, Polinsky, 2015). But who are those that we call heritage speakers?

As Polinsky (2015, p. 164) has mentioned, 'heritage speakers are bilingual speakers of an ethnic or immigrant minority language whose L1 does not typically reach native-like proficiency, due to a shift (whether abrupt or gradual) to L2, the socially-dominant language, by the child learner.' To make a clear understanding of the sentences cited above, a detailed explanation of all the issues related to heritage languages should be provided. Firstly, it is important to distinguish between the L1 and L2 of heritage speakers. Under the L1 and L2, usually, the temporal order is considered in which these languages are acquired. When two languages (L1s) are acquired at the same time beginning from birth or before the age of three (Meisel, 2009; Montrul, 2008), simultaneous bilingualism occurs (e.g., those with only one parent who speaks the heritage language while another parent speaks other languages). Moreover, age three is somewhat of a defining point where children who have an established L1, and subsequently go through the process of another language acquisition after the age of three, sequential or successive bilingualism occurs (e.g., those

heritage speakers who grow up in the country of origin and later immigrate to the new country with their parents). Note, that there are also in-between cases: children who grow up with parents who speak exclusively the heritage language at home, but outside the home, they are exposed to the majority language. Secondly, from the socio-political point of view, languages can be classified into majority and minority languages. The majority language is the standard, it is considered prestige and generally the language spoken by the ethnolinguistic dominant group of a community, whereas, the minority language is a language spoken by immigrants under limited contexts, and is considered to be of relatively less prestige and lesser or no official status within the same community (for a detailed discussion on these concepts and terms, see Montrul, 2008).

In the context of the aspects discussed above, it is vital to point out that in the case of heritage speakers in this study, L1 (Russian) represents the minority and secondary language, while the L2s (Spanish and Catalan) are considered the majority and primary ones. The heritage speakers are exposed to L1 mainly in the home environment in their childhood, however, due to migration or the beginning of the schooling, the shift to L2 occurs. From this moment on the exposure to L2 is overwhelming: it is a dominant language of schooling and communication in the society. As a result, heritage speakers are usually more proficient in L2 than in L1 (Benmamoun et al., 2013). As previous research has revealed, one of the important characteristics of heritage speakers is that their

L1 proficiency can significantly vary: some of them have limited productive abilities and (or) even no literacy skills; meanwhile, others possess a native-like mastery of written and spoken modalities (Montrul, 2005, 2010; Valdés, 2000, 2005). Various studies on heritage languages have demonstrated that the proficiency level is crucial for heritage language knowledge and the maintenance of language target features (Albirini, 2014; Montrul, 2004; Montrul, de la Fuente, Davidson, Foote, 2014; Polinsky, 2000, 2006, 2008, among others). Henceforth, the term *proficiency* will be used in referring to the overall linguistic competence in heritage Russian. Since the proficiency of heritage languages can vary tremendously, assessing it is not a simple task (Benmamoun et al., 2013; Montrul, 2005, 2010, 2016; Polinsky, 2015). In this study, heritage proficiency is measured in terms of assessing lexical and grammatical errors in oral narratives. This is motivated by the fact that oral narratives are generally considered to be an objective and ecological measurement of linguistic skills of the heritage speakers with a varied range of language abilities. For instance, oral narratives provide rich information about the linguistic development of children and allow for the evaluation of productive language abilities in monolingual and bilingual learning contexts (Gutiérrez-Clellen, 2004; Pavlenko, 2007, 2008; Pearson, 2002).

The reasons for the above-mentioned variability in proficiency among heritage speakers is considered to be a result of differential input conditions, including such aspects as exposure to the L1 (Gathercole and Thomas, 2005; Rodina and Westergaard, 2017;

Sorace, 2005; Unsworth, 2014, 2016a), to L2 (Anderson, 2001; Caldwell-Harris, Staroselsky, Smashnaya, and Vasilyeva, 2012; Carreira and Kagan, 2011, Jia and Aaronson, 2003; Montrul, 2016; Unsworth, 2013), language use in a home environment (De Houwer, 2007; Gathercole and Thomas, 2009; Lu and Koda, 2011; Paradis, Nicoladis, Crago, and Genesee, 2010; Mitrofanova, Rodina, Urek and Westergaard, 2018), socioeconomic status of the heritage speakers' families, among others (Gathercole and Thomas, 2005; Jia, 2008).

One of the most important factors, as observed in the literature, which affects heritage language proficiency, is exposure to heritage language (Gathercole and Thomas, 2005; Sorace, 2005; Unsworth, 2014). This factor includes two aspects: the quantity (or amount) and the quality of exposure. First, the amount of exposure can vary depending on factors such as what languages are spoken at home (L1 and/or L2), the frequency they are being used and the overall amount of L1 exposure (at home and outside the home). Another aspect is the quality of exposure that can be reduced to certain contexts of acquiring the L1 (naturalistic or formal), variety (e.g., peninsular Spanish vs. Puerto Rican Spanish), and register (written or oral). All these aspects are crucial for normal L1 language development of heritage speakers (Montrul, 2008, 2016).

Age of onset to bilingualism (or age of onset to L2) also has been claimed in playing a critical role in heritage language development. Various studies have demonstrated that the later a child comes into

contact with L2 the better his/her L1 competencies will be (Montrul, 2008, 2016; Polinsky and Kagan, 2007). On the contrary, when the shift to L2 occurs early in childhood, L1 skills can be dramatically affected, which would result in incomplete L1 acquisition in the case of young heritage speakers (Anderson, 2001) or L1 attrition in adult heritage speakers (Polinsky, 2008). Summarizing, in our study, we focus on the role of the following background factors that have been claimed to influence grammar knowledge of the heritage speakers, namely, language proficiency, amount of L1 exposure (including both exposure at home and outside the home) and age of onset to L2.

Despite different linguistic, social, cultural and educational characteristics, heritage speakers of different languages face similar problems in the following domains: syntax (e.g., loss of null subject pronouns in null-subject heritage languages, Albirini, Benmamoun, and Saadah, 2011, for Arabic; Montrul, 2004, for Spanish); lexicon (e.g., noun-verb distinction, Polinsky, 2005, for Russian; Lee, 2012, for Korean); semantics (e.g., the negation in Russian, Polinsky, 2006; Montrul, 2004 , for Spanish), and morphosyntax (e.g., errors in gender agreement in Spanish, Montrul et al., 2014, Polinsky, 2008, for Russian). Such findings demonstrate that discovering similar problems in heritage language can probably tell us something new about ‘human language potential in general’ (Polinsky and Kagan, 2007, p. 4). Therefore, the current study attempts to complement the existing body of research by exploring the language abilities of Russian heritage speakers in the bilingual

community of Spain, whose description leads us into the following paragraph.

Within the context of globalization, the migration processes are in a charge of heritage language dissemination all over the world and Spain is not an exception (for a detailed discussion on heritage Russian in the world see Mustajoki, Protassova, Yelenevskaya, 2019). According to Population Figures of National Statistics Institute of Spain (2018), in the second semester of 2018, the total amount of Russian-born people residing in Spain in 2018 was 73.651. Note that this number does not include people from former Soviet Union republics (Ukraine, Belarus, Moldova, Estonia, Latvia, Lithuania, and others). Most of them are native or bilingual Russian-speaking people. The recent growth of the Russian-speaking population has provoked an increasing demand for Russian language classes where the second-generation Russian immigrants (mainly children from 3 years old) can learn the Russian language and get familiar with Russian culture. The children of immigrants who were born in Spain or migrated with their parents comprise the participant group in the present study. The linguistic skills of these participants are still not explored enough in the previous research. The sociolinguistic environment they live in is particularly interesting and novel: the context of Catalonia, a bilingual community where Catalan and Spanish are both present in social and educational contexts. The participants of the study are multilingual children who speak Russian (L1 heritage language), Spanish and Catalan (L2s, dominant languages of communication

and schooling in a bilingual environment of Barcelona). Thus, in the study, we aimed to investigate heritage Russian focusing, particularly on gender knowledge (through agreement) that the participants possess in their Russian (heritage) grammar.

The study of gender allows us to observe grammatical gender knowledge from different perspectives: at the morpholexical level, gender breaks up nouns into classes and each language has its particularities; at the syntactic level, gender intervenes in a core grammatical property such as agreement. Therefore, gender constitutes a building block of language grammars and, thus, it is viewed as a fruitful and multifaceted grammatical feature to research in the heritage grammars' field. For instance, a large bulk of studies devoted to grammatical gender assignment and agreement in second-language acquisition (e.g., Franceschina, 2005; Hawkins and Franceschina, 2004; Montrul, Foote, and Perpinán, 2008; White, Valenzuela, Kozlowska-Macgregor, and Leung, 2004). The interest in this area is motivated by the fact that grammatical gender has been reported to be a complicated language property to master for L2 learners. The speakers of different L2s continue to make errors even at advanced stages of proficiency when they are compared with L1 speakers (Alarcón, 2011; Franceschina, 2005; Montrul et al., 2008). In contrast, bilingual and heritage speakers demonstrated better results compared to L2 learners of different proficiency levels (Alarcón, 2011; Montrul et al., 2008, 2014) but when compared with monolingual speakers their results differ from study to study (Montrul and Potowski, 2007; Montrul et al., 2014)

and the reason for this is far from clear. That fact makes the investigation of gender value in heritage speakers' population particularly interesting.

Gender is a complex feature that separates nouns into classes (Corbett, 2013). In Russian, there are three grammatical genders (masculine, feminine and neuter) whereas Catalan and Spanish have two genders (masculine and feminine), so, this divergence in comparison with Russian constitutes a challenge for the heritage children in this study. Normally, the gender of nouns can be determined based on real-world properties, such as sex or animacy, of a noun's referent, e.g., *mal'čik* 'boy' is masculine. However, inanimate nouns are assigned a gender value arbitrarily, based on a combination of semantic, morphological and phonological rules (or a combination of them), e.g., *kraska* 'paint' is feminine. The latter nouns are the object of this study since we focus on grammatical, not semantic, gender.

Several experimental studies seem to support the view that gender acquisition is a long-lasting learning process and that speakers were reported to rely on morphophonological cues in the identification of the patterns that would characterize the nouns in each gender class (Karmiloff-Smith, 1979, Kupisch, Akpinar, and Stöhr, 2013, for French; Alarcón, 2011, Pérez-Pereira, 1991, for Spanish). Previous research on gender in Russian has documented that this grammatical feature is a rather challenging domain not only for adult L2 Russian learners (Taraban and Kempe, 1999) but also for

L1 acquisition among Russian monolingual children (Ceytlin, 2000, 2005, 2009) because of its complex morphology, low degree of transparency and phonological salience of noun forms. According to grammatical (formal) gender assignment in Russian, the morphophonological properties of nouns determine their gender. We will refer to the nouns as transparent (Bates, Devescovi, Hernandez, and Pizzamiglio, 1996; Mitrofanova et al., 2018; Rodina and Westergaard, 2017) if the morphophonological cues clearly show gender. In turn, opaque nouns are also marked for gender, but gender cannot be reliably predicted from the noun form (for further details, see Chapter 1). The data from the previous studies demonstrated that heritage speakers mainly exhibit difficulties with gender agreement with opaque nouns (Mitrofanova et al., 2018; Montrul, 2010, 2013, 2016; Montrul et al., 2014; Polinsky, 2008; Schwartz et al., 2014). When the inflection endings of nouns are ambiguous, gender can be recuperated from the agreement markers of the agreeing elements with the target noun.

At this point, it is important to distinguish between two notions: gender assignment and gender agreement. Under gender assignment, we understand a process by which a speaker decides what gender value (e.g., masculine) a noun belongs to. Gender assignment forms the part of the linguistic competence of native speakers and a gender value of a particular word is stored in their mental lexicon. On the other hand, gender agreement is a process by which the co-occurring elements with a noun are concurrently inflected in gender. The agreement is essential for gender because the gender value of a noun can be reliably determined by the shape

of associated words (Hockett, 1958, p. 231). While gender assignment rules scrutinized in the current thesis will be presented in Chapter 1 for Russian, Spanish and Catalan, the focus of this study is not on how speakers determine the gender, per se, of a noun but how they use and comprehend gender agreement on other elements. In the current study, gender agreement both in nominal and sentential domains will be attested. For instance, in Russian, gender is visible in (but not limited to) the nominal domain on attributive adjectives, e.g., *krasnyj.M stul.M* 'red chair'. In the sentential domain, the gender can be determined by the shape of a predicative adjective, e.g., *stul.M krasnyj.M* 'chair (is) red'. The class of associated words that can reveal the gender of a noun in Russian also includes verbs in the past tense, e.g., *stul.M upal.M* 'chair fell'. Gender agreement on the mentioned elements are the focus of this study. More detailed information on gender agreement in Russian, Spanish and Catalan will be discussed in Chapter 1.

Transparent or opaque morphophonological gender cues of inanimate nouns is not the only factor that is relevant for the command of gender in heritage languages. Gender realization can vary crosslinguistically. That fact can favor (in cases of similar gender values) or hinder (in cases of different gender representations in grammar) proper heritage language acquisition and processing. The crosslinguistic influence (both positive and negative) of the grammar properties of the L2 on the acquisition of gender agreement in Russian was documented in Russian-German bilinguals (Lemmerth and Hopp, 2017; Schwartz et al., 2014), in

Russian-Norwegian (Rodina and Westergaard, 2017), Russian-Hebrew (Meir, Walters, and Armon-Lotem, 2017; Schwartz et al., 2014) and in Russian heritage speakers with L2 English (Polinsky, 2008). In sum, based on the evidence from naturalistic, as well as experimental studies, morphophonological gender cues and crosslinguistic L2 influence may affect gender acquisition and gender agreement knowledge in heritage languages.

Recently, there has been a growing interest in Russian heritage language with the research conducted in the USA (Polinsky, 2005, 2006, 2008), Israel (Schwarz, 2012; Schwartz et al., 2014), Germany (Dieser, 2007; Lemmerth and Hopp, 2017), Finland (Protassova, 2007) and Norway (Rodina and Westergaard, 2017). But still, Russian is supposed to be 'a grey area' in theoretical linguistics (Polinsky, 2007): there is a lack of an experimental approach and many of the studies are outdated and based on naturalistic data. Moreover, the syntax of Slavic languages (including the gender in Russian) has not been studied nearly as extensively from the psycholinguistic perspective as the syntax of English or Spanish (for example). Additionally, as far as I know, there is no data on Russian heritage speakers living in the bilingual Catalonia community in Spain. The combination of three languages of different groups (Slavic and Romance) makes the investigation of gender novel and rather intriguing. In light of the information presented above, the following general research questions arise:

(1) What knowledge of grammatical gender agreement in Russian do young heritage speakers from Spain have?

(2) What factors (both linguistic, belonging to the language system, and individual, belonging to the child's profile) underlie the command of grammatical gender agreement production and comprehension in heritage Russian?

When answering these questions, it is not necessarily the case that the results will be similar in production and comprehension (for a detailed discussion see Polinsky, 2018). Thus, we examined the gender knowledge in two well-investigated domains within psycholinguistic research, namely, controlled elicited spoken production and auditory comprehension as well as processing. A significant feature of both experiments (production and comprehension) is that they were conducted with the same participants (the Russian heritage and monolingual speakers) and using the same materials (to the extent that a design of the experiments allowed). Therefore, in direct comparison, results from two types of experiments should lead to a better understanding of gender in heritage Russian. Furthermore, results concerning the command of gender may be specific to the syntactic domain in which the gender agreement is realized. Thus, the agreement both at the nominal and sentential levels on attributive and predicative adjectives and also verbs was analyzed.

Summarizing, the present study improves on previous ones in a number of ways. First, several language-internal factors as well as child-external and child-internal factors that might contribute to gender agreement knowledge were analyzed. Within language-internal factors, properties of the nouns (gender and

morphophonological cues of inanimate nouns) and different gender agreement constructions (with adjectives and/or verbs), as well as agreement domain (nominal or sentential), were addressed. The child-internal factors pertain to Russian language proficiency and possible crosslinguistic influence from L2 Spanish and Catalan. The child-external factors that are expected to influence the command of Russian gender agreement include such key background variables as amount of exposure to Russian and age of onset to L2. The study of this set of factors can contribute to the field of heritage languages and, more specifically, to the development of appropriate strategies for different learning contexts, and to orient teaching practices regarding the features that require the most attention. Secondly, the study uses a controlled elicitation procedure instead of a (semi-) naturalistic production task, so that an equal number of opportunities for using each type of gender condition was created. A common feature of previous research is that most studies analyzed spontaneous data. While ecologically valid, this procedure has the disadvantage in that children may choose less complex or more familiar words, and a different number of opportunities may be created for each type of a gender value. For this reason, the current study used controlled tasks in production, but also in comprehension, with an equal number of opportunities for each gender value.

Going forward, the relevant theoretical concepts and factors that were taken into account in this study will be discussed in detail in

the following chapters. Below an outline of the following chapters is provided.

Chapter 1 introduces the reader with a theoretical background on the properties of grammatical gender. Specifically, the chapter provides an overview of gender assignment rules and agreement constructions crosslinguistically, which are relevant to the study. This chapter also gives a notion to 'default' gender, which will be relevant to later chapters. Additionally, the review of the studies on gender acquisition in the field of monolingual, bilingual, second language and heritage linguistics is presented.

Chapter 2 outlines specific research questions and predictions concerning each factor studied in the current work.

Chapter 3 presents the general methodology used in the current study. This chapter describes the participants, method, and design of two experiments (production and comprehension). It also includes the description of the background measures, which consist of a proficiency assessment measurement, a Receptive vocabulary test, and a Colour-naming test.

Chapter 4 presents the detailed methodology and results for each of the four tasks in offline production. The results of the production experiment indicate that heritage speakers' knowledge of gender agreement is variable and factor-dependent. At the end of this chapter, we provide a discussion of the findings within production.

Chapter 5 introduces the methodology and results of three tasks in comprehension. Here again, results indicate that gender knowledge of heritage speakers is not categorical and depends on various factors. At the end of this chapter, a discussion of the findings for comprehension tasks is provided.

Chapter 6 summarizes the results of the study and provides a comprehensive analysis of the patterns of gender agreement knowledge of both production and comprehension experiments.
Each chapter starts with a brief introduction and finishes with a summary.

1. GRAMMATICAL GENDER

1.1 On gender

Gender is a language-specific feature that is an attribute of the language competence of speakers. According to a recent typological sample, grammatical gender distinctions occur in 40% of the world's languages (Corbett, 2013). Language systems differ in terms of whether or not (and how) gender is distinguished in the grammars. Some language systems, such as Turkish and Finnish, are genderless. Indo-European languages (e.g., Spanish, Catalan, French, and Italian) distinguish two genders (masculine and feminine) regarding animate nouns (that is, human beings) as well as inanimate nouns. On the other hand, the grammar systems of the Slavic languages (for example, Russian, Czech, Slovak and Polish) typically include the three major genders (feminine, masculine and neuter), with both animate and inanimate nouns being classified for gender. In contrast to Russian, Spanish, and Catalan (the relevant languages in the current study), English does not classify inanimate nouns according to different genders. Gender is, however, visible in personal pronouns that distinguish between male or female referents, according to their referential sex or gender identity (for example, my friend – she, and your friend –he). As follows from the overview above, the properties of gender systems differ from language to language and the rules of gender assignment are not universal and allow various exceptions (for an overview, see Corbett, 1991; Franceschina, 2005).

The structure of this chapter is as follows. The concept of gender in Russian, and Spanish and Catalan, is introduced below. Then I explain how gender is manifested in agreement in Russian, Spanish, and Catalan and describe the agreement constructions attested in this study. I then outline some relevant background information about gender and gender agreement acquisition from monolingual, bilingual, L2 and heritage contexts.

1.1.1 Gender in Russian

Based on Corbett's work (1991), two gender assignment systems are possible in Russian: semantic and morphological. Semantic rules can be applied for sex-differentiable nouns (or animate nouns). With regard to the semantic concept, all nouns that stand for male beings are masculine; all nouns that refer to female beings are feminine. Also, in Russian, gender can be marked morphologically, Typically, inanimate nouns ending in -a are feminine, nouns ending in a consonant are masculine or feminine, and nouns ending in -o/-e are neuter.[2] Importantly, the gender assignment system is complex

[2] Note, that a focus of this study is the gender of regular declinable inanimate nouns. Indeclinable nouns, acronyms, borrowings, hybrids, nouns of common gender, and pluralia tantum nouns are not included in this study.

and can consist of different combinations of semantic and morphological rules that sometimes overlap.[3]

Russian has three gender values: masculine, feminine, and neuter. Gender is morphologically expressed on the noun in the nominative singular form in a final suffix, which can also have a zero form.[4] According to Corbett (1991), in Russian each of the three genders is divided into two subclasses: animate (humans and animals) and inanimate (all others), as examples 1a-1f show:

(1) a. masculine-animate: *djadja* 'uncle', *lev* 'lion'
    b. masculine-inanimate: *stol* 'table', *čaj* 'tea'
    c. feminine-animate: *tetja* 'aunt', *l´vica* 'lioness'
    d. feminine-inanimate: *kniga* 'book', *tetrad´* 'notebook'
    e. neuter-animate: *životnoe* 'animal'
    f. neuter-inanimate: *lico* 'face', *more* 'sea'

Based on its morphological gender, each noun (animate or inanimate) belongs to a declensional class which is reflected in the case inflection endings in the singular and plural. The traditional approach recognizes six cases in Russian (nominative, accusative,

[3] The theoretical foundations on which this chapter is built are taken from Corbett (1991, pp. 34-43), Comrie, Stone, and Polinsky (1996, pp. 104-117), Zaliznjak (1967) and further bibliography there.

[4] The gender distinction is visible only on singular nouns, as there are no gender distinctions in the plural. Apart from the nominative case, Russian has five other noun cases: accusative, dative, genitive, instrumental, and locative. In the current research, I restricted myself to singular nouns in the nominative case, which is the citation form. The examples are also presented in the nominative singular.

dative, genitive, instrumental, and locative) which are grouped into four main declensional types (Table 1.1).

	Type of declension			
Case	I masculine *house*	II feminine *water*	III feminine *salt*	IV neuter *milk*
Nominative	*dom-Ø*	*vod-a*	*sol´-Ø*	*molok-o*
Accusative	*dom-Ø*	*vod-u*	*sol´-Ø*	*molok-o*
Dative	*dom-a*	*vod-e*	*sol-i*	*molok-u*
Genitive	*dom-u*	*vod-y*	*sol-i*	*molok-a*
Instrumental	*dom-om*	*vod-oj*	*sol´-ju*	*molok-om*
Locative	*dom-e*	*vod-e*	*sol-i*	*molok-e*

Table 1.1: Main declension types in Russian in the singular (inanimate nouns)

Based on the declension type, the following paradigm is used to assign gender to nouns:

(2) Morphological rules of gender assignment in Russian based on the declension type:

a. nouns of declension type I are masculine;

b. nouns of declension types II and III are feminine; and

c. nouns of declension type IV are neuter.

Thus, the gender of nouns can be predicted from information about the declension class in many cases. Knowing the gender of the noun also means the declension class can be defined. However, many nouns do not adhere to the scheme described above. Consider, for instance, the nouns *djadja* 'uncle' or *papa* 'father', which are masculine but belong to declensional type II. Or the noun *vrač*

'doctor', which belongs to declension type I but can denote a male and a female (in the evidence of agreement). Moreover, various marginal types of nouns like *put´* 'way' or *vremja* 'time' are sometimes assigned to the fourth declension type and sometimes seen as exceptions (as they have the inflection markers of different declension classes). Also, Corbett and Fraser (2000) introduced a fifth declensional class, V, which covers indeclinable nouns like *pal'to* 'coat'.[5] Thus, assignment of gender based on declension class is often a controversial issue.

From an acquisition perspective, for gender assignment in Russian both semantic and formal criteria are crucial. Animate nouns are normally assigned a gender based on semantic rules. According to the semantic rules, gender can be predicted as follows (3a-3c):

(3) Semantic gender assignment rules in Russian:

a. nouns denoting males are masculine: *otec* 'father', *brat* 'brother', *petuh* 'rooster';
b. nouns denoting females are feminine: *mat´* 'mother', *sestra* 'sister', *kurica* 'hen';
c. only a few animate nouns are neuter and these are generic: *životnoe* 'animal', *čudovišе* 'beast'.

For inanimate nouns in the nominative singular form, when gender cannot be determined by semantics, it can be predicted based on

[5] For a more detailed discussion of the declensions types in Russian, see Corbett (1982), and Corbett and Fraser (2000).

noun shape. The typical morphological rules of gender assignment are as follows (4a-4c):

(4) Morphological gender assignment rules for inanimate nouns:[6]

a. nouns ending in a hard consonant are masculine (ending marked with ∅): *stol∅* 'table', *nos∅* 'nose';

b. nouns ending in -a, -ja are feminine: *kniga* 'book', *zemlja* 'land';

c. nouns ending in -o, -e are neuter: *vedro* 'bucket', *more* 'sea'.

The morphological cues (inflectional endings) of the nouns can be phonologically reliable for gender assignment (e.g., 4a and 4b). Such nouns will be referred to as transparent (Bates et al., 1996). However, some nouns do not adhere to the scheme above: these nouns will be referred to as opaque (Kempe, Brooks, Mironova, and Fedorova, 2003). The examples of morphophonologically opaque inanimate nouns include, for instance, nouns ending in a palatalized consonant (orthographically spelled as 'ь' - Russian soft sign and here transliterated by the ´ sign) as *den´* 'day' for the masculine gender and *ten´* 'shadow' for the feminine. Such nouns comprise about 10% of noun types in Russian (Zasorina, 1977 cited in Kempe et al., 2003). Moreover, in the unstressed position, the vowels in the ending of feminine (-a) and neuter nouns (-o) are phonologically reduced. Such nouns may also provoke difficulties in gender acquisition because of their phonological ambiguity. For example,

[6] These gender assignment rules are applicable to the majority of nouns in the Russian lexicon.

the suffixes in the nouns *jabloko* ['jabl^kə] ‘apple’ for neuter and *sumka* ['sumkə] ‘bag’ for feminine sound identical, confusing the learners. The morphological gender assignment rules for opaque nouns for this study are as follows (5a-5c):

(5) Morphological gender assignment rules for opaque nouns:

a. nouns that end in a consonant and have zero endings can be either masculine, *den´* ‘day’, or feminine *ten´* ‘shadow’;

b. nouns ending in an unstressed vowel can be either feminine *sumk[ə]* ‘bag’ or neuter *jablok[ə]* ‘apple’.

Interestingly, the opaque nouns make gender prediction difficult even for adult native speakers (Rakmaninova and Surdaltseva, 1997). In Section 1.3 of this chapter, the data on the acquisition of transparent and opaque nouns will be reviewed in detail.

Concerning the quantitative proportion of nouns in Russian, nouns with masculine gender make up 46% of the nominal lexicon, feminine 41%, and neuter nouns 13% (Ahutina et al., 2001). Similar data concerning the frequency of the gender of Russian nouns are provided by Slioussar and Samoilova (2015): they say that approximately 47% of nouns in Russian are masculine, 34% are feminine, and 18% are neuter.

In sum, the gender of Russian nouns is defined on the basis of two factors: semantic (nouns denoting male or female beings) and morphological (declensional class and (or) formal marking of

nouns). As pointed out by Corbett (1991, p.34), morphological rules of gender assignment are applied when semantic rules fail, which is the case of inanimate nouns, which are the main focus of this dissertation. Importantly, the stimuli in this dissertation were designed in such a way as to only include inanimate nouns in the nominative case. Furthermore, as was mentioned, some morphological rules of gender assignment to inanimate nouns in Russian are less transparent than others and pose greater challenges to learners. In Section 1.3 below, an overview of the research on the difficulties in the acquisition of gender morphology by different populations is provided. Below, I present a brief overview of the relevant features of grammatical gender in Spanish and Catalan – the two languages (in addition to Russian) spoken by the participants in this study.

1.1.2 Gender in Spanish and Catalan

Even though the Spanish and Catalan languages are genetically different from Russian, there are similarities, and differences, in their gender systems as will be discussed below. A discussion on the Spanish gender system is presented first, followed by an overview of the Catalan gender system.

Spanish has two grammatical genders: masculine and feminine. As in Russian, Spanish nouns differ according to animacy. Animate nouns are gendered based on the biological sex of their referents;

that is, if the noun refers to a person or domestic animal, it can be masculine - for example, *el hombre* 'the man', *el gato* 'the tomcat' - or feminine – for example, *la mujer* 'the woman', *la gata* 'the cat'. Nouns that refer to inanimate objects are also specified for gender but their gender cannot be predicted based on semantics alone as in the case of animate nouns. In this case, nouns manifest gender through the use of suffixes. As a general rule, words ending with -o, for example, *el libro* 'the book' are masculine and those ending in -a, for example, *la mesa* 'the table' are feminine (as in Russian). A number of nouns have other inflected endings to indicate gender. This is the case for nouns ending in -ción, -sión, -tad or -dad, which are feminine (for example, *la nación* 'the nation'); or those that end in -z, -n, or -r, which are mostly masculine (for example, *la vez* 'the time/instance' or *el algodón* 'the cotton'). Nevertheless, there are various exceptions to the above-mentioned predominant patterns for gender assignment in inanimate nouns. Some of them can be explained by the origin of the noun – for example, words of Greek origin ending in -a (for example, *el problema* 'the problem') denote the masculine gender - but others (for example, *la leche* 'the milk', *la mano* 'the hand') are hard to explain.

In Catalan[7], gender is reflected through its morphological and (or) syntactic system (similar to Spanish and Russian). Again, if the noun refers to a person, it will be masculine or feminine respectively; for example, *l'home* 'the man' masculine and *la dona*

[7] The overview of the Catalan gender system is based on Badia i Margarit (1994) and Clua (2002).

'the woman' feminine. In the case of inanimate nous, gender is manifested through the use of suffixes. The masculine gender is most commonly marked by zero inflection endings (similarly to Russian) for example, *l'olor* 'the smell' - while the feminine gender is usually marked with -a (similarly to Spanish and Russian) - for example, *la cadira* 'the chair'. However, as in Spanish, there are numerous other inflection markers that do not follow the general pattern. For example, some masculine nouns end in a vowel, *el llibre* 'the book'; and some feminine nouns end in consonants, for example, *la font* 'the fountain', or in -ó, for example, *la raó* 'the reason', among others.

Given that Spanish and Catalan have comparable gender systems (despite some differences, such as the marking of gender on masculine nouns, etc., which are not relevant here), the two systems are discussed together below.

In sum, as can be observed from the discussion above, there are several similarities between Russian and Spanish and Catalan, namely: (a) the three languages are gendered, (b) all three languages have masculine and feminine gender, and (c) gender assignment is affected by semantics (in the case of animate nouns) and the morphological properties of nouns (in the case of inanimate nouns). Nevertheless, there are considerable differences between Russian and Spanish/Catalan. Russian is a three-gender language with the declensional system. In contrast, Spanish and Catalan are two-gender languages with no nominal declensions. Moreover, gender in inanimate nouns, as an arbitrary category, is not always congruent

across these languages. With regard to congruency, there are some common gender values attributed to certain nouns among Russian and Spanish/Catalan; for instance, the noun 'the box' - in Russian *'korobka'*, in Spanish *'la caja'*, and in Catalan *'la caixa'* – is assigned the feminine gender in all three languages. However, the noun 'the table' is masculine in Russian *'stol'* and is feminine in Spanish and Catalan (*'la mesa'* in Spanish and *'la taula'* in Catalan). Nouns showing this discrepancy in the gender value between the languages will be referred to as incongruent nouns. The neuter gender value is absent in Spanish and Catalan, so it is incongruent between the languages. In turn, neuter nouns in Russian can correspond to either masculine or feminine gender values in Spanish and Catalan. Some of the numerous examples of congruent and incongruent nouns among the languages are presented in Table 1.2.

Gender in Russian and Congruency	Russian	Spanish	Catalan	English
Masculine congruent	*stakan*	*vaso*	*got*	'glass'
Feminine congruent	*butylka*	*botella*	*ampolla*	'bottle'
Masculine incongruent	*stol*	*mesa*	*taula*	'table'
Feminine incongruent	*bol´*	*dolor*	*dolor*	'pain'
Neuter (masculine in L2)	*vremja*	*tiempo*	*temps*	'time'
Neuter (feminine in L2)	*okno*	*ventana*	*finestra*	'window'

Table 1.2: Examples of congruent and incongruent nouns in Russian, Spanish and Catalan

Moreover, nouns in Spanish and Catalan are not always congruent for their gender: e.g., the noun 'the vegetable' is feminine in Spanish *'la legumbre'* but masculine in Catalan *'el llegum';* and the noun 'the fear' is masculine in Spanish *'el miedo'* but feminine in Catalan *'la por'.* Such cases will be avoided in the current study. For the stimuli used in this study's design, only congruent in gender nouns in Spanish and Catalan were selected. In Chapter 3 (Section 3.2) the stimuli selection process is explained in detail.

1.2 On agreement

1.2.1 Agreement in Russian

Grammatical gender is an intrinsic characteristic of nouns that controls agreement phenomena within and outside the noun phrase (Corbett, 1991). As a result, the gender of a noun is inflected on its co-occurring elements (lexical categories). In Russian, the gender agreement is realized on the inflection markers of adjectives, participles, most pronouns (demonstrative, possessive, and relative), numerals, and past tense verbs. In addition, adjectives, participles, numerals, and pronouns agree with nouns in number and case. Below are presented two agreement constructions - adjectival and verbal – that are relevant to this study.[8]

[8] Since this study is focussing on adjectival and verbal agreements, other agreement constructions will only be discussed where necessary.

Adjectival attributive agreement

In Russian nominal phrases (NPs), attributive adjectives agree in gender, case, and number with the head noun. The inflection endings that the adjectives take are presented below in Table 1.3.[9]

Gender	Masculine	Feminine	Neuter
Suffix	-yj, -ij, -oj	-aja, -jaja	-oe, -ee
Examples	*nov-yj stol* new-M table 'The new table' *sin-ij stol* blue-M table 'The blue table' *bol´š-oj stol* big-M table 'The big table'	*nov-aja kniga* new-F book 'The new book' *sin-jaja kniga* blue-F book 'The blue book'	*nov-oe kreslo* new-N armchair 'The new armchair' *sin-ee kreslo* blue-N armchair 'The blue armchair'

Table 1.3: Gender agreement marking of attributive adjectives (nominative singular)

As can be observed from Table 1.3, the inflection endings of adjectives mark for the gender of the head noun. Crucially, in Russian, the pronunciation of the adjectives is stress-dependent

[9] Table 1.3 does not include other cases, as the target form in the study is the nominative singular.

(stress can occur on any syllable in the word). In the case of stem-stressed feminine and neuter nouns, the stress on the inflection ending of adjectives can help to distinguish the gender. Consider the noun phrases (example 6 for feminine, example 7 for neuter) in which the stress is positioned on the stem of the noun and the stem of the adjective, making the pronunciation of both entities ambiguous. The stress is marked in bold.

(6) *n**o**v-aja [əjə] kn**i**g-a [ə]*
new-F book-F
'The new book'

(7) *n**o**v-oe [əjə] kr**e**sl-o [ə]*
new-N armchair-N
'The new armchair'

In contrast, stress on the end of the adjectives helps to distinguish between feminine and neuter nouns, as shown below (example 8 for feminine, example 9 for neuter).

(8) *bol´š-**a**ja [ajə] kn**i**g-a [ə]*
big-F book-F
'The big book'

(9) *bol´š-**o**e [ójə] kr**e**sl-o [ə]*
big-N armchair-N
'The big armchair'

Adjectival predicative agreement

This agreement construction consists essentially of a noun (or pronoun; pronouns are not relevant to the study here), a copulative verb, and a predicate adjective.[10] The adjective agrees with the noun in gender and number. In the present tense, the Russian copula verb '*byt´'* is dropped[11], as examples 10-12 show.

(10) *stolØ* *nov-yj*
table-M (is) new-M
'The table is new'

(11) *knig-a* *nov-aya*
book-F (is) new-F
'The book is new'

(12) *vedr-o* *nov-oe*
bucket-N (is) new-N
'The bucket is new'

This agreement construction is similar to the agreement construction with the adjective in attribute position within NPs (as presented above). The formal difference between the two agreement

[10] In a predicative position, both long and short forms of the adjectives can be used, e.g., the long form: *(kniga) interesnaja*-F.NOM.SG vs. the short form: *(kniga) interesna* -F.SG, 'The book is interesting'. Short-form adjectives agree with the noun in gender and number, but not in case (as with the long form). Note that only long-form adjectives were used in this study.

[11] Note that in the past tense (*'byl'*), future tense (*'budet'*), and subjunctive (*'byl by'*) there is an overt copula.

constructions is related to word order: in the predicative position, the adjective follows the noun. In contrast, in the attributive position, the adjective precedes the noun within the NP. Also, the adjective in the actual construction is marked for gender (and number) as the adjective in the attributive position (see Table 1.3).

Verbal agreement

In Russian, verbs agree in person and number with the subject of a sentence. Additionally, verbs in the past tense agree with the subject in person, number and, importantly, gender. In this study, two constructions with the verbal agreement were tested. The first one included the overt copula verb *byl* 'was' in the past tense and a predicate adjective.[12] Both elements (the verb and the adjective) agree with the nouns in gender (13-15).

(13) *stolØ byl Ø nov-yj*
table-M was-M new-M
'The table was new'

(14) *knig-a byl-a nov-aya*
book-F was-F new-F
'The book was new'

[12] In Russian, gender is visible in all verbs in the past (in singular form). Initially, the experiments of the current study were designed with lexical non-copular verbs. However, it was decided to use only the copula verb *byl* in the past, because of its phonologically transparent form, which helps to determine the gender of the subject noun.

(15) *vedr-o byl-o nov-oe*
bucket-N was-N new-N
'The bucket was new'

Importantly, the copula verb is inflected by gender only in the singular form. The predicate adjective in this construction receives the same inflection endings in the nominative singular as the adjective in the attributive position (see Table 1.3). The copula verb *byt'* 'be' in the masculine gender has the form *byl* 'was'-M (with zero ending), in the feminine, it has the form *byla* 'was'-F (with the stress on the -a ending) and in the neuter, the form *bylo* 'was'- N (with the stress on the first syllable).

The copular sentences exemplified in 13-15 consist of the noun, the copula verb in the past tense, and the predicative adjective that receives the inflection ending in the nominative case. Optionally, in past or future tenses, adjectives in predicate position can take the instrumental case. The difference lays in semantics, namely, that adjectives in the nominative case denote a permanent property. In turn, adjectives in the instrumental case denote a temporary property. For example, the sentence *on byl p'jan-ym* (he was drunk-INS) could mean 'he was drunk then', whereas *on byl p'jan-yj* (he was drunk-NOM) suggests 'he was a drunk'. However, in the majority of the cases, the distinction is not visible, especially in copula constructions with inanimate nouns (Krasovitsky et al.,

2008).[13] For instance, the agreement construction with predicate adjectives in the nominative *stol byl nov-yj* (table was new-NOM) and in the instrumental case *stol byl nov-ym* (table was new-INS) have the same translation, 'The table was new'. Importantly, in this study, the form of the adjective in the instrumental case that takes the masculine gender agreement is identical to the adjective that takes the neuter gender agreement. For instance, in the constructions, *stolØ byl nov-ym* (table-M was new-INS) and *kresl-o bylo nov-ym* (armchair-N was new-INS) the adjectives do not provide any clue for gender. Anticipating the results, in this study no agreement was elicited with the predicate adjective in the instrumental case. All the elicited agreement forms were in the nominative case; that is, they were transparent for gender.

The second verbal construction tested in the current study consisted of a head noun, a copula verb in the past and a prepositional phrase. The copula verb, as in the previous copular adjectival construction, agrees with the noun in gender (and number), as illustrated in examples 16-18.

(16) *stolØ bylØ v dome*
table-M was- M in house
'The table was in the house'

[13] When the copula is zero, the predicate adjective always bears the nominative case.

(17) *knig-a byl-a v dome*
book-F was- F in house
'The book was in the house'

(18) *vedr-o byl-o v dome*
bucket-N was-N in house
'The bucket was in the house'

Based on a copula classification by Testelets (2008), the two verbal constructions above are different from the semantic point of view. Namely, the copula verb in examples 13-15 has a characterization (or attribution) meaning, whereas the copula construction in examples 16-18 has a locative meaning.

1.2.2 Agreement in Spanish and Catalan

With regard to gender agreement, gender marking in Spanish and Catalan[14] is realized in adjectives, pronouns, determiners (including articles, demonstratives and possessives) and some quantifiers (including numerals, quantitatives and indefinites). For instance, in NP, the Spanish feminine noun *mesa* 'table' in 19 agrees in gender with the definite determiner *la* and with the adjective *pequeña* 'small'.

[14] For a detailed overview of Spanish and Catalan agreements see Bel (2001).

(19) *la* *mes-a* *pequeñ-a*
the-DET, F table - F small-ADJ, F
'The small table'

Consider a similar example from Catalan. In NP (20), the Catalan masculine noun *llibre* 'book' agrees with the masculine definite determiner *el* and with the predicative adjective (participle) *abierto* 'open'.

(20) *el* *llibre* *obert∅*
the-DET, M book-M open-ADJ, M
'The open book'

However, there are several exceptional agreement forms. For example, in Spanish some adjectives remain invariant, such as *verde, azul, or grande* ('green', 'blue', or 'big'), e.g., *el libro*-M/*la silla*-F es *grande* 'the book/chair is big'. Catalan has also some invariant adjectival forms, e.g., in singular *l'homa*-M/*la dona*-F es *feliç* 'the man/woman is happy'.

At the sentence level, the adjectives also agree in gender (and number) with the subject noun they modify. In contrast to Russian, both Spanish and Catalan have an overt copula in this construction. The copula verb agrees with the subject noun in person and number (see example 21 for Spanish and example 22 for Catalan).

(21) *la* *chica* *es* *simpática*
The-DET, F girl-F is nice-ADJ, F
'The girl is nice'

(22) *el* *noi* *és* *simpàtic*
The-DET, M boy-M is nice-ADJ, M
'The boy is nice'

To sum up, Russian, a Slavic language, and Spanish and Catalan, both Romance languages, have different gender systems in terms of gender values and gender agreement. Russian has three gender values (masculine, feminine, and neuter) whilst Spanish and Catalan have only two (masculine and feminine). Neuter is a gender value that is only present in the heritage speakers' L1 (Russian), with no correspondence in the L2 gender system (Spanish and Catalan). The Russian gender agreement in NP differs from that in Spanish and Catalan in two ways. First, Russian does not have articles (like many other Slavic languages): there is no Russian equivalent for the Spanish and Catalan *el/la*. Although, in NP, Russian adjectives are largely prenominal (they can appear postnominally for stylistic or focus-related reasons), adjectives in Spanish and Catalan are generally postnominal (with some exceptions). These differences in gender agreement are not considered critical in the study. A key difference that is expected to affect gender agreement in some way lays in the presence of gender agreement in Russian verbs in the past. Neither in Spanish nor Catalan verbs are marked for gender.

1.3 Previous studies on acquisition of grammatical gender

Gender is one of the linguistic phenomena that is particularly difficult for second language speakers to learn. Studies have shown that L2 learners have difficulty achieving native-like levels with gender assignment and agreement (Franceschina, 2005; Hawkins and Franceschina, 2004; White et al., 2004). The difficulty with aspects of grammatical gender observed in L2 acquisition differs from observations of L1 acquisition, where difficulty with grammatical gender is rare but also possible (see, e.g., Carroll, 1989; and Pérez-Pereira, 1991). Various studies in L1 grammatical gender acquisition have demonstrated that gender is acquired in early childhood and stored along with semantic and phonological word properties (Paolieri et al., 2010). Furthermore, a sensitivity to the phonological and morphological principles of gender assignment in the acquisition of grammatical gender in various languages has been reported (see Karmiloff-Smith, 1979, for French; Mills, 1986, for German; Pérez-Pereira, 1991, for Spanish; Rodina and Westergaard, 2012, for Russian). In particular, grammatical gender is shown to be mastered by children early if the gender assignment rules are transparent. For instance, Spanish monolingual speakers produce gender markings by age 3-4 with almost 100% accuracy (Pérez-Pereira, 1991). In contrast, if the gender system is relatively complex and non-transparent, speakers may exhibit prolonged difficulties with its complete acquisition as in the case of monolingual Russian (Ceytlin, 2005, 2009; Gvozdev, 1961).

Unlike monolingual grammatical gender acquisition, grammatical gender mismatches in heritage speakers' production can appear even until age 11 (Anderson, 1999; Montrul and Potowski, 2007). Successful acquisition of grammatical gender by child heritage speakers very likely depends on various sociolinguistic factors, especially the amount of exposure they receive to the heritage language (Gathercole and Thomas, 2005; Mitrofanova et al., 2018; Sorace, 2005; Unsworth, 2014, 2016). The heritage speakers who have limited exposure to their heritage language may take an relatively long time to acquire grammatical gender, especially for noun types whose gender is somewhat unpredictable, i.e., opaque nouns (Montrul et al., 2014; Schwartz et al., 2014). In addition, studies demonstrate that the acquisition of gender by heritage speakers is also affected by crosslinguistic influences from the dominant language (see, e.g., Lemmerth and Hopp, 2017; Rodina and Westergaard, 2017; Schwartz et al., 2014). For instance, the crosslinguistic influence can have a facilitating effect on gender assignment and agreement (in the case of similarities between the L1 and L2 grammatical gender systems) or can impede grammatical gender acquisition (in the case of differences between the L1 and L2 systems).

In sum, comparing and contrasting heritage speakers and monolingual and bilingual populations in terms of their knowledge of grammatical gender enables the differences and similarities between these groups to be determined, and increases understanding of grammatical gender in general. In the next section, acquisition of

Russian grammatical gender by different learner groups, particularly of heritage speakers, will be discussed. Specific studies on Russian grammatical gender acquisition by monolingual children will be addressed first, and then studies on grammatical gender acquisition by, L2 learners, bilingual and heritage populations will be presented. The section also presents an overview of the relevant to this study language-internal, child-external, and child-internal factors that affect the acquisition of grammatical gender by heritage speakers.

1.3.1 Acquisition of gender agreement by monolingual speakers

The process of the acquisition of grammatical gender in Russian may be challenging as speakers must distinguish among three gender values.[15] This task is made more daunting by two more features: the distinctions between animate and inanimate nouns and a complex system of declensions. Regarding animate nouns, the learner can take advantage of semantic rules that assign gender in relation to biological sex. However, in the case of inanimate nouns, the learner cannot rely on these criteria but can use gender cues as a source of gender assignment. In turn, the morphophonological gender cues are not always transparent: some inanimate nouns have

[15] The literature review on monolingual gender acquisition is based on works by Dieser (2007), Gvozdev (1961), Ceytlin (2000, 2005, 2009), Popova (1973), Tribushinina, Voeikova and Noccetti (2015) and Voeikova (2011, 2015), among others.

transparent gender cues, while others are opaque. As has been claimed in other studies, transparent markings are acquired faster than opaque markings (see, e.g., Mitrofanova et al., 2018; Montrul et al., 2014). For instance, Russian-speaking children generally assign gender correctly at the age of two and this mainly occurs with transparent noun forms in the nominative singular agreement structures (Ceytlin, 2005, 2009; Gvozdev, 1961). Namely, children correctly produce agreement forms with masculine nouns with zero-endings and transparent feminine nouns ending in -a. Nevertheless, the acquisition of neuter gender (ending in a stressed vowel) is somehow delayed, approximately to between ages 3 and 4. In turn, opaque noun forms can present a difficulty for acquisition up to the age of 7. Such cases include feminine nouns ending in a consonant (23), which are often interpreted as masculine (Ceytlin, 2009; Gvozdev, 1961). Children confuse opaque feminine nouns with masculine ones, as example 23 shows.

(23) *hitr-yj myš’
sly-M mouse-F
‘The sly mouse’
Correct: hitraja-F myš’-F

The overgeneralizing by seeing opaque feminine nouns as masculine continues approximately up to age 7. Difficulties in gender assignment to masculine nouns ending in palatalized consonants are also possible. For instance, Ceytlin (2013, p. 226) reports a case of a 5-year-old child that could not define the gender

of the masculine noun *den´* ‘day’ (but for whom the gender assignment for transparent masculine nouns was not problematic). Likewise, the gender of opaque stem-stressed neuter nouns, e.g., *uho* ‘ear’, is acquired relatively late, around age 6. The late acquisition of stem-stressed neuter nouns is probably attributed to the low saliency of the ending; the unstressed nominative ending in neuter words sounds the same as in feminine nouns ending in unstressed -a (recall that neuter nouns ending in stressed -o are perceptually more salient and, therefore, acquired between ages 3 and 4). Example 24 illustrates incorrect gender production of the stem-stressed neuter noun *uho* ‘ear’ that agrees with the adjective *drugaja* ‘another’ in the feminine.[16]

(24) *drug-aja uh-a
other-F ear-F
‘The other ear’
Correct: drugoje-N uho-N

To summarize, the acquisition of grammatical gender and agreement by Russian monolingual children is a complex and rather long process. In general, the correct production of inanimate and transparent nouns of masculine and feminine gender occurs by the age of 2. Transparent neuter nouns are acquired later, at the age of 4. However, the acquisition of opaque inanimate nouns is somewhat delayed due to their phonological ambiguity. The mastering of non-

[16] The acquisition evidence suggests that neuter nouns are confused with feminine nouns but not the other way around.

transparent nouns continues to be difficult even until the age of 6-7. Such noun forms include (a) masculine nouns ending in a palatalized consonant, (b) feminine nouns ending in a consonant, and (c) neuter nouns ending in a non-stressed vowel. By the age of six, children have acquired the gender agreement paradigm in NP and the sentence level with adjectives and past tense verbs. To conclude, the outcomes relevant to the current study are that gender assignment and agreement in the different constructions focused on in this study are normally acquired by monolingual children by the age of 6-7, i.e. the age of the children in this study.

1.3.2 Acquisition of gender agreement by second language learners, bilingual, and heritage speakers

Generally, bilingual gender acquisition mirrors monolingual gender acquisition. The differences are usually qualitative and are found in the timing of the acquisition. For instance, Dieser (2007) studied the acquisition of grammatical gender in L1 Russian by two heritage speakers with German as L2. In this longitudinal study, spontaneous production data recorded when the children were between the ages of 2 to 7 years old were analyzed. Despite many erroneous agreement forms during the first stage of acquisition (up to age 3), the children could distinguish between the feminine and masculine gender. However, the concept of neuter was still not acquired: neuter gender was correctly assigned only to frequently used words, e.g., *moroženoe* 'ice-cream'. At the second stage of gender

acquisition, when aged 3-4 years, the children demonstrate the acquisition of non-ambiguous forms of inanimate nouns (masculine nouns ending in a consonant, feminine nouns ending in -a/ja). From the age of 4 on (the third stage of acquisition according to the author), correct agreement forms with neuter nouns appear more frequently. However, ambiguous forms of nouns with non-transparent gender cues still present difficulties for them. The errors in children's production mainly occurred in opaque inanimate nouns: feminine nouns ending in a consonant and stem-stressed neuters. According to this study, a three-gender system with feminine, masculine, and neuter, was established in the grammars of bilingual children by the age of 6-7.

In Schwartz et al. (2014) the noun-adjective gender agreement in heritage Russian was investigated. Seventy-three young Russian heritage speakers (aged from 3 to 5) of different L2s (English, Finnish, German, and Hebrew) and two control groups (3-4 and 4-5 year old) of Russian monolingual children (n=40) participated in the study. The stimuli included transparent and opaque forms of masculine, feminine, and neuter nouns. The quantitative analyses demonstrated the significantly better results of the older monolingual group (4-5 years) over heritage speakers and the younger monolingual group. The most challenging nouns were opaque feminine nouns (ending in a palatalized consonant) and transparent and opaque neuter ones. The results demonstrated that opaque feminine nouns were interpreted as masculine and neuter nouns were interpreted as feminine. Moreover, Schwartz and

colleagues found that L2s had a facilitating effect on grammar development in L1 Russian speakers; the German L2 group outperformed English, Finnish, and Hebrew L2 groups in the majority of measures. The authors speculated that this result was probably due to the fact that Russian and German share more features of grammatical gender than Russian and English, Finnish, or Hebrew. As in Dieser (2007), the authors found that the developmental pattern of gender acquisition of the heritage children with diverse L2s was similar to the monolingual group, albeit with a slight delay.

Similarly to Schwartz et al. (2014), possible L2 influence on knowledge of grammatical gender was found in Lemmerth and Hopp (2017). In the study carried out by Lemmerth and Hopp (2017), Russian-German simultaneous and early successive bilingual children (aged 7–9) were tested on their knowledge of grammatical gender in production and comprehension activities (namely, through a naming task and visual-world eye-tracking). Statistical analyses did not demonstrate any difference in noun-naming accuracy between congruent (i.e. matching in gender) and incongruent (i.e. mismatching in gender between Russian and German) nouns and no significant interaction with the participant group (simultaneous and successive bilingual group) was found. However, all children were qualitatively slightly better at producing congruent than incongruent nouns both in Russian and German. In contrast, the results for a comprehension task were not so homogeneous: in German, no congruency effect was yielded, but in

Russian, the results demonstrated that there was a significant main effect of congruency in nouns but only in the simultaneous bilingual group. The authors suggest that this might be related to proficiency in Russian: in the study, the simultaneous bilinguals had a lower proficiency in Russian than successive bilinguals (measured by the verbal fluency task). Thus, it might be that the crosslinguistic influence from German facilitates the assignment of gender to congruent nouns but in the case of incongruent nouns, the 'stronger' language dominates and impedes gender assignment in the 'weaker' Russian language. Other possible interpretations of the results proposed by the authors included differences in language exposure and the effects of age.

With regard to adult heritage speakers, Polinsky (2008) investigated gender assignment and agreement by adult Russian heritage speakers in the U.S. The participants included 12 English-Russian speakers (average age 27) with no literacy skills in Russian. They were compared to five monolingual Russian speakers. For the production experiment. masculine, feminine, and neuter (transparent and opaque) nouns were used. The participants had to decide which adjective *bol´šoj* 'big' or possessive pronoun *tvoj* 'your' agreed with the auditory presented nouns. The results demonstrated that opaque nouns, namely feminine nouns ending in a palatalized consonant and stem-stressed neuters, were problematic for the heritage speakers (similarly to the findings of Schwarz et al., 2014 but with children in that case). In the comprehension judgment task, noun-adjective agreement pairs were presented. The results

revealed two groups with respect to knowledge of grammatical gender: those who remained within the three-gender system and those who reanalyzed it into a two-gender system. The author noticed that the pattern was not incidental, but coincided with the proficiency level of heritage speakers (measured by speech rate): the participants with a higher proficiency level maintained a three-gender system.

In all the above-presented studies almost all the participants performed at-ceiling with regard to the masculine gender. Some of the authors explained this result as being the result of the "default" nature of masculine gender in Russian. The notion of default gender is explained below.

Default gender

Default gender arises when no other rules apply. As Corbett (1991) claims, any category of gender can be the default - it depends on various individual features of languages. For example, in Russian, the gender of the majority of nouns can be predicted based on semantic or morphological rules. However, these rules are sometimes contradictory, e,g, the noun *papa* 'daddy' is masculine with regard to semantics (denoting a male being) but feminine according to its morphology (it has an -a ending). In such cases, as noted by Corbett and Freser (1999), a default masculine gender is assigned. More specifically, the noun is assigned to declension class

I, which consists of masculine nouns. Corbett and Freser (1999) justify this by analyzing the Russian lexicon: a) declension class I possesses more nouns than the other four declension classes; and b) borrowed nouns are usually assigned to declension class I. In the case of indeclinable nouns (e.g, *palto* 'coat'), Corbett and Freser (1999) propose the following scheme for Russian: if the noun is animate it is assigned the masculine gender, and if it is inanimate then the neuter gender is assigned to it. Interestingly, it is not always the masculine gender that is assigned to nouns in the case of a lack of phonological, morphological, or semantic information. As Corbett (1991) notes, inanimate indeclinable nouns (i.e. nouns of declension type IV in Corbett's theory, 1991, p. 41) should be assigned to the neuter category. The frequency information supports this argument: in the case of indeclinable nouns, the neuter gender prevails and accounts for approx. 50% of indeclinable nouns of neuter gender, whereas only 30% are masculine (Uspenskaja, 2009).

Studies on gender processing

The way morphophonological cues affect knowledge of grammatical gender has been evaluated in terms of offline (see the works cited in the previous sections) and online data. For instance, in Taraban and Kempe (1999), the target sentences include an adjective and a verb in the past tense that agree in gender, number, and case with a noun. A forced-choice task consisted of selecting

the correct main verb by pressing a keyboard. Native Russian speakers and advanced L2 Russian learners obtained low accuracy and reaction time scores in sentences with opaque (i.e. ending in a palatalized consonant) masculine and feminine subject nouns (no neuter nouns were added in the study). Similar results were obtained in Akhutina et al. (1999) study. The authors employed online and offline techniques to explore grammatical gender agreement on adjectives. The offline data demonstrated that the monolingual participants made a minor number of errors with the transparent masculine (ending in a non-palatalized consonant) and transparent feminine (ending in -a) nouns. The reaction time data showed that noun-adjective masculine and feminine agreement with transparent nouns was equally easy to process. However, ungrammatical constructions with an adjective in the masculine but with a target noun in the feminine were significantly more difficult to process than ungrammatical constructions with an adjective in the feminine but with a target noun in the masculine. For opaque nouns, a significant difference in reaction times was found with both grammatical and ungrammatical noun-adjective pairs: feminine nouns obtained significantly longer reaction times than masculine ones. The results of this study were somehow predictable: agreement with transparent nouns is easier than with opaque nouns and grammatical trials (in comprehension tasks) are easier to process than ungrammatical trials. A less predictable result was found in the study by Akhutina et al. (2001). As in the previous study, Russian adult speakers demonstrated significantly slower latencies for ungrammatical possessive pronoun-noun pairs than for

grammatical ones for all genders. However, it took the participants unexpectedly more time to accept correct masculine-noun pairs than incorrect ones. The reaction times for correct masculine pairs were even longer than those for feminine and neuter pairs. According to the authors, the result was probably due to the unmarked nature of masculine gender. This finding is in line with the study made by Slioussar (2018), in which Russian monolingual adults completed a self-paced reading task. The stimuli included transparent and opaque inanimate masculine nouns (these were included as one group), transparent feminine nouns, and opaque feminine nouns. The agreement structure consisted of a subject noun, copula verb in the past, an adjective or participle, and a three-word prepositional phrase. The analyses of the results revealed that the reading time for masculine nouns in ungrammatical sentences (i.e., a masculine target noun but copula and adjective in the feminine) was longer than for ungrammatical agreement constructions with feminine nouns.

Background factors and gender knowledge

Many studies have been undertaken into the background factors that affect the development of morphosyntax in heritage speakers and the variability in their knowledge of grammatical gender in particular. Still, it is not clear what factors contribute to successful gender acquisition. One of the factors that has been proven to play a role in bilingual language development is language proficiency. As

has been claimed before, proficiency is highly correlated with knowledge of grammatical gender: high proficient speakers possess a better command of Russian gender than speakers with low proficiency (Polinsky, 2008). Additionally, heritage speakers with relatively high proficiency in heritage language have shown similar results when compared with monolingual speakers (Montrul, 2006; Montrul and Potowski, 2007). Another factor crucial for heritage language development is the amount of exposure. The amount of exposure to L1 in a majority-language-dominant environment can vary depending on such factors as what languages are spoken at home and outside the home (only L1 or both L1 and L2), and the frequency of their use. Unlike monolingual language environments, when the exposure to L1 prevails, heritage speakers are exposed to different languages at the same time and the proportion of this exposure is often not in favour of L1. In the case of heritage speakers, the major source of exposure to the heritage language is the home environment (Gathercole and Thomas, 2009, Unsworth, 2014; 2016). Typically, there are two models of home input: heritage speakers may be addressed in the heritage language only by one parent or can be exposed to the heritage language by both parents. Moreover, heritage speakers mainly acquire L1 in a naturalistic setting from their caregivers and (or) other family members such as siblings (Benmamoun et al., 2013; Montrul, 2012, 2016). Indeed, a sufficient amount of L1 exposure at home has proved to have a positive contribution to heritage language development (De Houwer, 2007; Gathercole and Thomas, 2009; Lu and Koda, 2011). In their study, Paradis et al. (2010) found that the

language of greater exposure at home (based on a parental questionnaire) is directly correlated with children's rate of acquisition of morpho-syntax (measured via elicitation tasks). The children who had English as the language of greater exposure at home were more proficient with English verb forms, whereas the children with more French input were more proficient with French verb morphology. Similar findings for English-Chinese bilingual children were demonstrated by Lu and Koda (2011): the frequent use of Chinese at home supported the development of literacy skills and oral vocabulary acquisition in Chinese. Similar results were found for Russian heritage speakers (Mitrofanova et al., 2018). In the study, Russian-Norwegian bilinguals were divided into two groups depending on their family type (one or two Russian-speaking parents). The children from the group where both parents were Russian speakers obtained better scores on Russian gender agreement production than the children with only one parent-speaker of Russian.

The amount of exposure is closely connected with the age of onset (Gathercole and Thomas, 2005; Montrul, 2016; Sorace, 2005). The age of onset to L2 is the age when a child starts hearing and thereby acquiring an L2. Early age of onset to L2 has proved to be a predictor of successful L2 acquisition (Montrul, 2008). On the other hand, it is also a crucial factor in the incomplete acquisition of a child's L1 or the attrition of vulnerable L1 language domains in adulthood (Anderson, 2001; Montrul, 2008; Polinsky, 2008). Several studies have demonstrated that sequential bilinguals tend to

be more proficient in their L1 when compared to simultaneous bilinguals. In their longitudinal study, Jia and Aaronson (2003) found that within a year of arrival in the U.S., young Chinese-speaking immigrants (between ages 5 and 9) had switched from L1 to L2, whereas older children continued to use the L1 with their Chinese-speaking parents and siblings. In other research on heritage languages, Carreira and Kagan (2011) found that the earlier heritage speakers start learning English, the less likely they will be to use their heritage language in adulthood. Furthermore, the respondents who were U.S.-born tended to rate their heritage language skills lower than those who arrived later. Caldwell-Harris et al. (2012) demonstrated that proficiency in L1 Russian increased with a later age of onset to English. The participants were divided into three groups depending on their age at arrival in the U.S. Late arrivals (those who arrived at 10 years and older) tended to have a similar proficiency level in L1 and L2 (self-report evaluation); middle arrivals (from 6 to 9 years old) became more dominant in the L2 English than the L1 Russian, and finally, early arrivals (from birth to aged 5) had limited L1 skills even if their home language was exclusively Russian. As Montrul (2016) notes, the earlier L2 acquisition starts in childhood, the more vulnerable are a child's L1 linguistic skills in the minority language. Thus, the general rule of how the age of onset influences proficiency in L1 can be formulated as follows: the later the acquisition of L2 starts, the higher is the L1 proficiency.

In light of the literature review presented above, it can be concluded that the acquisition of grammatical gender by monolingual Russian speakers, bilingual speakers, and, crucially to this study, heritage speakers is a complex process. The research available on Russian gender acquisition by young heritage speakers is somewhat scarce. Nevertheless, based on a few studies available, it is known that gender distinction in heritage Russian is acquired at the age of 6-7. However, phonologically opaque nouns cause difficulties for both young monolingual and heritage speakers. Furthermore, it seems that gender acquisition is especially challenging for heritage speakers that acquire Russian in combination with a language that does not have a gender distinction or has a more restricted system of genders. That is, the L2 can negatively affect knowledge of L1 gender. Thus, the current study seeks to explore the knowledge of Russian gender agreement in the production and comprehension of young heritage speakers. In particular, the performance of heritage speakers of Russian was compared with that of native speakers with full command of the Russian language. We also attest the role of possible crosslinguistic influence from L2s (Spanish and Catalan). Additionally, a number of morphological (transparency of the noun form) and syntactic features (agreement constructions) are examined as well as various sociolinguistic factors (language proficiency, amount of exposure to Russian, and age of onset with the L2) that may contribute to understanding the properties of heritage languages in general.

Summary of the chapter

This chapter has taken a detailed look at the gender system in Russian. The results of the different studies demonstrate that for L1, L2 learners, as for bilingual and heritage speakers, gender can be viewed as a challenging domain. To sum up, the gender attribution system in Russian, as well as in Spanish and Catalan is complex as it based on a variety of semantic and formal principles. Overall, the gender system in Spanish and Catalan share some features with Russian, but some features are different. First, in Russian, Spanish and Catalan, the gender of animate nouns can be assigned semantically and is based on the biological sex that the nouns denote. In the absence of clear semantic correlations, grammatical gender can be assigned morphophonologically: the speakers of both languages rely on the morphemes at the end of the nouns. Second, Russian has a neuter gender, which is absent in Spanish and Catalan. Moreover, in Russian and Spanish and Catalan, gender agreement is observed between nouns and adjectives in the nominal domain, and also between nouns and adjectives in copular constructions in the sentential domain. Finally, in the case of Russian, gender is manifested in subject-verb agreement in the past tense (unlike Spanish and Catalan). The acquisition of grammatical gender in Russian by monolingual speakers is viewed as completed by the age of 6-7. Child heritage speakers usually follow the same acquisition path as monolingual speakers, albeit with a slight delay. The successful mastery of grammatical gender by heritage speakers is influenced by different factors attested to in this study; among

them is the transparency of gender cues, crosslinguistic influences, language proficiency, the amount of exposure to the heritage language, and the age of onset to L2.

2. GENERAL PREDICTIONS AND RESEARCH QUESTIONS

Based on the relevant findings from Russian gender acquisition in L1, heritage, bilingual context as well as some findings coming from L2 field discussed in Introduction and Chapter 1, we now formulate the research questions concerning the factors (variables) addressed before that may have a contribution to gender agreement acquisition and knowledge. In the previous chapter, we have demonstrated that the grammatical gender is a vulnerable morphological feature that presents challenges for different types of bilinguals and L2 learners. We have seen that the process of successful gender acquisition is subject to various internal and external factors. Three groups of factors will be considered: language-internal factors, child-external, and child-internal factors.

In this study under language-internal factors, I refer to the factors which pertain to the Russian grammar system: morphological properties of the nouns per se and types of gender agreement. The object of this study is inanimate nouns which present a special challenge for speakers because their gender cannot be recovered based on their semantics as in the case of animate nouns. As we mentioned before, some morphophonological cues in Russian can predict the gender of a noun at a high level or be transparent, whether others can lead to erroneous gender agreement or be opaque. In addition, Russian provides an opportunity to investigate gender agreement on different word

classes (adjectives and verbs in the current study). To the best of our knowledge, there are no studies that compared gender agreement across different agreement constructions: normally, one construction type was used. Thus, in the dissertation, we intended to examine whether the command of gender can vary depending on the agreement construction (with adjectives and (or) verbs) and agreement domain (at a nominal or sentence level).

To the child-internal factors than can affect gender knowledge in L1 pertain Russian language proficiency and possible crosslinguistic influence from L2 (Spanish and Catalan). In this study, in order to attest crosslinguistic influence between two gender systems (Russian vs. Spanish and Catalan) we introduce a congruency variable. Congruency refers to coincidence in noun gender across Russian, Spanish, and Catalan. Incongruent words are nouns that have different gender values across these languages. However, we do not limit the crosslinguistic influence only to a lexical level. It may also be visible on results for agreement constructions, which we discuss in detail below. Another child-internal factor attested in this study is language proficiency. As reported in the previous research, one of the important characteristics of heritage speakers is that their L1 proficiency can significantly vary. Thus, this variability can also affect morphological skills and gender knowledge in particular.

The child-external factors that we expect to influence the command of Russian gender agreement include amount of

exposure to Russian and age of onset to L2. These background factors have been demonstrated to play a significant role in gender acquisition in heritage and bilingual populations. Of course, these two factors are not the only ones that matter. We have selected them as a starting point in exploring the individual background factors that can affect the linguistic skills of the studied speakers. To our knowledge, none of the studies were explicitly geared towards examining the production and comprehension of gender including all these factors mentioned above.

The primary goal of this study is to investigate the knowledge of Russian gender through different agreement constructions. Keeping in mind the ultimate goal of finding out what factors and in what way can affect gender agreement knowledge, we formulated several research questions (henceforth RQ) and predictions. The current chapter presents the general research questions and our expectations based on the relevant findings from the studies on L1, L2, bilingual, and heritage language acquisition. The specific predictions relevant to the production and comprehension experiments will be presented in Chapter 4 and Chapter 5 accordingly.

Gender values

In the previous chapters, gender and agreement in Russian, Spanish, and Catalan were described. Remember that despite belonging to different languages (Slavic vs. Romance) the gender systems have

some similarities. First, the three languages are gendered languages, which differ in the number and distribution of gender values. Also, similar to Russian, Spanish and Catalan have a set of rules to assign gender semantically to animate nouns and morphologically to inanimate nouns. The three languages have two gender values - masculine and feminine. However, Russian nouns also present a third, neuter gender, that is absent in Spanish and Catalan. Such discrepancies in the number of gender values (three vs. two) between languages may provoke difficulties in gender language acquisition (and learning), as various studies have demonstrated (Lemmerth and Hopp, 2017; Polinsky, 2008; Rodina, 2008; Rodina and Westergaard, 2017; Schwarz et al., 2015).

Let us remind the results in terms of gender values from the two close studies. Polinsky (2008) evaluated knowledge of Russian gender by adult heritage speakers (with L2 English) in grammaticality judgment task and oral elicited task. In both experiments, the participants showed near native-like performance for all masculine nouns. Feminine nouns were unproblematic but only those that end in a vowel -a/ja (transparent). In turn, the opaque feminine nouns (ending in a consonant) were treated as masculine. The neuter gender caused most of the errors and was the weakest gender value for heritage Russian speakers. The neuter nouns were mainly treated as feminine. Finally, the ranking of degree of difficulty of gender values at a three-point scale was proposed by the author (1 easiest- 3 most difficult): masculine (1) > feminine (2) > neuter (3). In another relevant study (Schwarz et al.,

2014) the issue of similarity between L1 and L2 morphological systems of bilinguals was addressed. The authors compared the Russian gender command among four bilingual groups (Russian as L1 and English, German, Finnish, and Hebrew as L2). The results demonstrated that the 'closer' the L2 to L1 is (regarding the presence of three gender values and gender agreement constructions), the fewer errors in Russian gender the bilinguals do. Similar error patterns as in the Polinsky study were reported with the difference that opaque feminine nouns (ending in a consonant) were changed to masculine and also to neuter. All in all, following these results and the results reported in Chapter 1, we hypothesized that there is a possible role of L2 in the acquisition of L1 Russian gender. It is expected that the heritage speakers might not have problems with masculine and feminine gender (because these values are present in Spanish and Catalan). Besides, a difficulty may arise with the neuter gender value because, firstly, it is absent in the grammars of Spanish and Catalan, secondly, it is the least frequent gender in Russian lexicon and, thirdly, it is acquired the last also in monolingual Russian. Taking into account that we have no previous studies on gender assignment and agreement by Russian heritage speakers living in the Catalan bilingual environment, the main research question with respect to gender is:

RQ1 Do heritage speakers gain full mastery of grammatical gender both in production and comprehension? This question is split into sub-questions:

RQ1.1 Is masculine the easiest gender value for the heritage speakers in both production and comprehension? Can it be

suggested that the masculine is used as a "default" gender in heritage Russian?

RQ1.2 Do heritage speakers have any difficulties with feminine gender? If yes, what are they and what underlies the pattern?

RQ1.3 Is the neuter category the most problematic? If so, are neuter nouns treated as feminine or are there any other patterns beneath?

The main prediction regarding gender values is that the children will be more accurate in agreement constructions with masculine nouns than with feminine or neuter. Neuter will be the most problematic category.

Noun form transparency

Across gender-marked languages, transparency of inflectional morphology was demonstrated to play an important role in in gender acquisition (Janssen, 2016; Kempe and Brooks, 2001; Rodina, 2008; Rodina and Westergaard, 2017). Research on monolingual (Ceytlin, 2005, 2009; Gvozdev, 1961;) and heritage Russian (Polinsky, 2008; Schwartz et al., 2014) has highlighted the role of transparency of gender cues that leads to perceptual salience in gender acquisition. Morphophonological transparency is a phenomenon that characterizes noun endings in terms of their phonological regularity in the language. In the study, we refer to the following nouns in Russian as transparent: (a) masculine nouns

ending in consonant; (b) feminine nouns (stem-stressed and final-stressed) ending in -a; (c) neuter final-stressed nouns ending in -o. These endings are highly predictive for noun gender, thus, gender can be recovered from the surface form of these nouns. In contrast, the following nouns are referred to as opaque: (d) masculine nouns ending in a palatalized consonant; (e) feminine nouns ending in a consonant; (f) neuter stem-stressed nouns ending in -o. Such suffixes are less reliable for establishing the gender and pose challenges even during L1 monolingual acquisition as evidenced in agreement errors (and described in Chapter 1). The previous research in heritage Russian has shown the children often confuse opaque feminine nouns with the masculine (d and e) due to the phonological similarity of the inflection endings (both end in a palatalized consonant). However, opposite errors are also possible, but less frequent. The transparent and, especially, opaque neuter nouns (c and f) are often confused with feminine nouns because in non-stressed position the inflection endings of neuter and feminine nouns sound similar (due to vowel reduction the suffix is pronounced as shwa [ə]). Sometimes neuter nouns are also treated as masculine. Change of neuter nouns to masculine was reported in Schwartz et al. (2014) but this type of error is rare. For instance, the comprehension data from the Polinsky (2008) study shows that heritage speakers accepted opaque neuter as feminine at a high rate (60%), opaque feminine nouns were accepted as masculine (20%), and only 10% of masculine nouns were accepted as feminine. In the already cited study by Schwartz et al. (2014) all groups (monolingual Russian, bilingual Russian-English, Russian-Finnish,

Russian-Hebrew, Russian-German) reanalyzed opaque feminine nouns ended in a palatalized consonant as masculine (43%). Stem-stressed neuters were treated as feminine (72%) and masculine (7%). Masculine nouns did not get many errors. Besides, the percentages of errors differ from group to group and depend on language combinations the children speak. To summarize, the available data on gender production and comprehension shows that mainly opaque noun forms are problematic and, especially opaque feminine and opaque neuter nouns. However, other patterns are also possible. Thus, the following research questions related to the role of noun form transparency were formulated:

RQ2.1 Does transparency of gender cues influence gender knowledge? If yes, in what way?

RQ2.2 What patterns of errors do occur?

We expect children to rely on gender cues, in a way that they will perform in a target-consistent manner in transparent nouns, but will have difficulties with opaque forms; these difficulties will be more evident as a result of interaction with gender values (as stated in RQ1). As for error patterns in production, we expect the heritage speakers to make similar errors as monolingual children when acquiring gender.

Crosslinguistic congruency effects

Gender in inanimate nouns, as an arbitrary category, often do not overlap across languages and this presents a challenge for heritage and bilingual speakers (Lemmerth and Hopp, 2017; Rodina and Westergaard, 2017; Schwartz et al., 2014). In this study, crosslinguistically congruent nouns share the gender values between Russian vs. Spanish and Catalan. For instance, the noun *korobka* 'the box' in Russian, in Spanish *la caja*, and Catalan *la caixa* all assign feminine gender. In turn, crosslinguistically incongruent nouns do not overlap between Russian vs. Spanish and Catalan. For example, the noun *stol* 'the table' is masculine in Russian and is feminine in Spanish *la mesa* and Catalan *la taula*. Note that differences in gender values between Spanish and Catalan were disregarded. Spanish and Catalan lack neuter gender. Hence, neuter nouns will be referred to as incongruent concerning the absence of this gender value in Spanish and Catalan.

The results for the congruency effect in the previous literature are variable. In Lemmerth and Hopp's (2017) study of Russian-German bilinguals, congruency effect was found only in the simultaneous bilingual group. Schwartz et al. (2014) demonstrated that the gender values that are similar in L1 and L2 are easier to acquire than features that differ across L1 and L2 and the results were dependent on language combinations the children spoke. In addition, Kupisch et al. (2013) investigated gender assignment in French among two groups of German-French bilinguals (French dominant and German

dominant) and two groups of German learners of L2 French (learning French in France and Germany). The results of four groups together demonstrated crosslinguistic influence of German grammar on French gender knowledge. More errors occurred when a noun's gender was incongruent in the two languages than when it was congruent. Even though the accuracy for both types of nouns was more than 80%, authors suggested that crosslinguistic influence from German is visible, but should not be overstated. Taking into account the previous findings, we formulated the following research questions:

RQ3.1 Is there any crosslinguistic congruency effect on gender agreement production and comprehension in heritage Russian? If the answer is yes, can the crosslinguistic influence be accounted for any of the internal (e.g., language proficiency) and external linguistic factors (e.g., amount of exposure)?

Due to the inconsistency of the results on the congruency effect in heritage and bilingual populations, no exact expectations could be made. Generally, the congruency effect will probably arise in a vulnerable area of gender knowledge (e.g., in opaque nouns, in a low proficient group of heritage speakers, etc.)

Gender and agreement constructions

Even if the noun itself is opaque for gender, the gender can be retrieved from the grammatical agreement. In Russian gender, the

agreement is manifested on adjectives in attributive and predicative positions and also on verbs in the past tense. In the current work, adjectival attributive agreement (henceforth referred to as Adjective-Noun) is investigated in the nominal domain. In the sentential domain other three agreement constructions are analyzed: (a) agreement between a subject noun and an adjective in the predicate position (Noun-Zero Copula Present-Adjective), (b) agreement between a subject noun and a copula verb in the past and an adjective in the predicate position (Noun-Copula Past-Adjective), and (c) agreement between a subject noun and a copula verb in the past (attested in construction with a prepositional phrase, named Noun-Copula Past-PP agreement construction).

Further, Russian and Spanish and Catalan differ in syntactic correspondence: Spanish and Catalan do not mark gender on verbs, while Russian does in the past tense, just mentioned. Under the assumption that crosslinguistic influence between Russian and Spanish and Catalan exists, one could predict that the gender agreement on verbs will be more difficult than on adjectives. In other words, the Noun-Copula Past-Adjective and Noun-Copula Past-PP constructions will probably present difficulties for the heritage speakers as they contain gender agreement on a copula verb. Furthermore, an intriguing combination presents the Noun-Copula Past-Adjective construction in which a 'double' gender agreement occurs-on a copular verb and adjective. To the best of our knowledge, no studies have been done with this construction type in the heritage Russian population. Based on the Derivational Complexity Hypothesis proposed by Jakubowicz and Strik

(Jakubowicz and Strik, 2008; Strik, 2009), one can suggest that Noun-Copula Past-Adjective construction would the most difficult for heritage speakers. In particular, the Derivational Complexity Hypothesis states that language acquisition is affected by a developmental constraint such as the computational complexity of a given language feature. The authors argue that all other things being equal more complex language features appear to be more problematic than less complex ones. The validity of the hypothesis was attested in monolingual, L2, and heritage populations (e.g., Frank, 2013; Hopp, Putnam, and Vosburg, 2019). Thus, Noun-Copula Past-Adjective is the most complex configurations because gender agreement (a) involves two constituents-adjective and verb, and (b) gender agreement on the verb is an absent feature in Spanish and Catalan. Also, structural complexity is a critical factor in language acquisition. In Russian, the inflection paradigm of attributive adjectives is more complex than of predicative adjectives. The latter ones agree with nouns in number and gender, whereas the attributive adjectives agree with nouns in number, gender, and case.

Taking into account the information presented above, the following research question was asked:

RQ4.1 Does a type of agreement construction affect gender production and comprehension?

We expect that four agreement constructions will be ranked on the following scale (1) of complexity (beginning with the easiest one):

(1) Degree of complexity for agreement constructions

Adjective-Noun=Noun-Zero Copula Present-Adjective>
Noun-Copula Past-PP>Noun-Copula Past-Adjective

Background factors and gender knowledge

Several factors have been reported to affect the success of gender acquisition in heritage languages. In the current study, we expect three factors to influence the command of gender agreement in production and comprehension, namely, Russian language proficiency, age of onset to L2, and amount of exposure to Russian. Not a surprise, that high proficiency heritage speakers possess a better knowledge of morphology than speakers with low proficiency (Polinsky, 2008; Mitrofanova et al., 2018). As previous research has revealed, one of the important characteristics of heritage speakers is that their L1 proficiency can vary: some of them have limited productive abilities and (or) even no literacy skills; meanwhile, others possess a native-like mastery of written and spoken modalities (Montrul, 2005, 2010; Valdés, 2005). Thus, a factor we must consider is the possibility that the knowledge of gender may be different in the relative level of proficiency. To control for it in this study, the Russian language proficiency was assessed groups based on the analyses of morphological and lexical errors in oral narratives (described further in Section 3.3.1). According to the results of the proficiency assessment, the children were divided into two proficiency groups. Additionally, the range of variability in heritage speakers' proficiency is supposed to be a result of

differential input conditions, including such aspects (but not limited to) as amount of exposure to L1 (Gathercole and Thomas, 2005; Sorace, 2005; Montrul, 2010, Unsworth, 2014, 2016a) and age of onset to bilingualism (Anderson, 2001; Caldwell-Harris et al., 2012; Carreira and Kagan, 2011). As it has been widely reported in the previous studies all domains of L1, and morphosyntax, in particular, are more affected when the exposure to the L2 (i.e., age of onset to L2) starts earlier. Meaning that the later a child comes into contact with L2 the better his/her L1 competencies will be (Montrul, 2016; Polinsky and Kagan, 2007). In turn, the amount of exposure can vary depending on factors such as what languages are spoken at home (L1 or/and L2), the frequency they are being used, and an overall amount of L1 exposure (at home and outside the home). According to the previous literature, we ask the following research questions:

RQ5.1 What is the role of the background factors (language proficiency, age of onset to L2, amount of exposure) on grammatical gender knowledge?

Based on the previous studies, I expect all three background factors to affect the command of gender. Consequently, I expect that the heritage speakers who were exposed to L2 Spanish and (or) Catalan earlier will have more profound problems with gender production and comprehension than children that started the acquisition of L2(s) later. Also, the heritage speakers who receive relatively more exposure in Russian (according to the questionnaire) will overall have fewer difficulties with gender agreement that those with less

exposure to Russian. I hypothesize that the children with a high proficiency level will over-perform low proficiency heritage speakers in both gender production and comprehension and, especially, according to Polinsky (2008), neuter gender will be the more intricate category for the lower proficient group since this value is absent in English (their L2).

Gender in online processing

Little is known about how heritage speakers process grammatical gender in real-time. Most of the studies on gender knowledge have used production tasks or offline comprehension tasks. In the current work, processing was measured using reaction time in the comprehension experiment where children were asked to decide whether a stimulus containing a (dis)agreement sequence was correct or not. Binary responses (yes/no) and time of response (reaction time) were recorded and analyzed. The analyses of reaction time included the variables presented above (a) grammatical gender per se (masculine, feminine, and neuter), (b) transparency of the noun form, (c) crosslinguistic gender congruency of nouns as well as a variable (d) called "grammaticality", i.e. when the agreeing elements (adjectives and (or) verbs) are either gender concordant (grammatical trials) with the noun or there is a gender mismatch between nouns and the agreeing elements (ungrammatical trials).

Using an auditory cued-shadowing task, Akhutina et al. (1999) investigated whether Russian monolinguals display differences in processing gender in determiner phrases and adjectival predicates. In all experiments, the monolingual Russian speakers showed masculine nouns being processed faster than feminine and neuter. The authors account for such a result for the "default" nature of masculine nouns (which are also higher in type frequency). Different results were found in Akhutina et al. (2001) and Slioussar (2018) who reported significantly slower latencies for the agreement constructions with masculine nouns than for the constructions with the feminine. As for transparency results, both adjectival and verbal agreement constructions with formally opaque for gender nouns were processed slower than with transparent nouns (Akhutina et al., 1999; Taraban and Kempe, 1999). The results of the previous studies regarding gender congruency effects are not clear. For instance, the effect was found in Italian-Spanish bilinguals (Paolieri et al, 2010) but not in Spanish and Catalan (Costa et al., 2003a). The study on Slavic language (Croatian) by Costa et al. (2003b) demonstrated that a gender congruency effect was observed on pronouns but not on adjectives. They speculate that such discrepancies may be due to the limitations of the task or probably connected with the nature of retrieval of freestanding morphemes (pronouns) versus inflections (adjectival agreement). Taking into account all the conditions presented above, we address the main following question regarding gender agreement processing by the heritage speakers.

RQ6.1 Do heritage speakers process gender agreement similarly as their monolingual counterparts? Are there differences regarding the set of linguistic factors analyzed?

RQ6.2 To what properties (e.g., gender values, gender transparency, agreement construction) are heritage speakers more sensitive when processing gender agreement?

In general, we expect that the results of reaction times will pattern with the accuracy data. Namely, neuter nouns will obtain slower reaction times than masculine and feminine, transparent nouns will be processed faster than opaque and grammatical trials will be processed faster than ungrammatical. We also hypothesize that a congruency effect will arise in some experimental conditions (though it is difficult to predict exactly in which).

The following secondary research questions are outcomes of our research design that allows us to compare the results of two groups of speakers (heritage speakers vs. monolingual speakers) and two types of task (production vs. comprehension). These issues cannot be ignored as they are relevant for shaping a full picture of gender agreement knowledge in heritage speakers. Thus, we include them in this section; however, the findings on them will be added in the final discussion where necessary and not presented separately.

Heritage speakers versus monolingual controls

To draw on our understanding of heritage speakers' language competence, it's important to choose a proper baseline group with who heritage speakers can be compared (Polinsky, 2017). The previous research on morphosyntax in heritage languages mainly compared the results of young heritage children (till 12 years old) with age-matched monolingual peers (Dieser, 2007; Gagarina, Klassert, and Topaj, 2010), younger monolingual children and older monolingual children (Schwartz et al., 2014). In this study age-matched monolingual children were chosen as an appropriate control group. This chose was motivated by several reasons. On the one hand, gender is usually acquired to the age of 7 in monolingual children, but slightly later in heritage and bilingual children (as already discussed in Section 1.3). On the other hand, the heritage speakers in our study receive formal input in Russian community school and all the children have literacy skills. Thus, the heritage speakers may perform at the monolingual level in some tasks because they are supposed to have already acquired the gender. The previous research reported that heritage speakers might show a delay in development, they nevertheless make the same types of errors as monolinguals (e.g. Dieser, 2007; Schwartz et al., 2014). Additionally, elicited gender production data from Unsworth et al. (2014) showed that gender agreement errors are found in sequential bilinguals but not in simultaneous bilinguals who were indistinguishable from monolinguals. Recently, Rodina and Westergaard (2017) showed that Russian-Norwegian bilinguals

with two Russian-speaking parents have similar performance when compared to monolinguals on gender assignment and agreement in heritage Russian. However, the bilinguals with the weaker Russian, who grew up in one-parent-one language families, showed not only a quantitative disadvantage as compared to monolinguals but also a different error profile (they predominantly used masculine agreement across the board). All these findings lead us to ask the following question:

RQ7.1 Do heritage speakers of the different proficiency levels differ from the monolingual controls and in what way?

In general, we should expect monolingual children to perform better than heritage speakers. Additionally, we expect high-proficient heritage speakers (a) to overperform less proficient participants and (b) to perform quantitatively and qualitatively similarly to monolingual controls.

Task type: production versus comprehension

It has been said in the previous studies that L1 comprehension generally precedes production (Hendriks, 2013; Hendrick and Koster, 2010) but this could be different for heritage language acquisition or in different linguistic areas. In monolingual Russian, the comprehension of nouns precedes the production, but in the case of adjectives, the comprehension often follows the production (Voeikova, 2015). The results of some studies available comparing

the production and comprehension of gender agreement in heritage Russian were not homogeneous. For instance, it was demonstrated that production tasks are performed better than comprehension tasks (e.g., Gagarina, 2011). In contrast, in the study of Russian-Polish Russian gender agreement, Janssen (2016) reported the lower results on the comprehension tasks than on the production. The current study will assess accuracy data for both production and comprehension of Russian gender agreement and the following research question arises:

RQ8.1 Do the production and comprehension of gender agreement differ?

Taking into account the previous contradictory findings, no clear predictions could be made. Since we hypothesize that once children can correctly produce gender agreement, they will also be able to comprehend the gender. The same prediction as for monolinguals regarding the possible production-comprehension asymmetries hold.

Summary of the chapter

The results of the different studies demonstrated that grammatical gender is a vulnerable morphological feature in heritage grammars: the gender values can even be reanalyzed and simplified. The gender attribution system in Russian as also in Spanish and Catalan is based on a variety of semantic and formal principles. Overall, the

gender system in Spanish and Catalan share some features with Russian, but some features are different. In sum, the successful mastery of the gender by heritage speakers is influenced by different factors to be attested in this study; among them is the gender values, transparency of gender marking, L2 influence, type of agreement construction, heritage language proficiency, amount of exposure to heritage language, and age of onset to L2. Based on this information we presented our research questions as also expectations regarding the results. The next chapter will take a detailed look at the methodology of the study.

3. GENERAL DESIGN AND METHODOLOGY OF THE STUDY

This study uses an experimental design to assess heritage speakers' command of grammatical gender. In order to address the research questions stated in Chapter 2, two experiments were elaborated: production (Tasks 1-4); and comprehension (Tasks 5-7). The detailed methodology for the production and the comprehension experiments and tasks can be found in Chapters 4 and 5 respectively. This chapter also presents a description of the participants (heritage speakers and monolinguals) and provides a methodology for, and an overview of, the assessment of the heritage speakers' proficiency in Russian.

3.1 Participants

Thirty typically developing multilingual children (13 boys, 17 girls), ranging in age between 7 and 11, took part in the study. The age range 7-11 was chosen based on evidence that grammatical gender in Russian is usually fully acquired between 6 and 7 years of age in monolingual children but later in heritage and bilingual children (Mitrofanova et al., 2018; Schwartz et al., 2014). It is important to note that studies on the acquisition of grammatical gender by heritage speakers are mainly focused on children below the age 6 and on adult populations (after puberty); the linguistic

development of heritage speakers aged 7-11, however, is an unstudied linguistic field.

The participants were recruited from a community-based school in Barcelona (Spain). In total, 35 children, whose parents agreed to participate, were chosen from the pool of 57. The selection criteria specified that each child would need to be a simultaneous or early sequential bilingual (trilingual) child, with a native or near-native command of Russian and Spanish and/or Catalan, and someone who did not have any speech disorders. The remaining children were not selected because: (a) they did not pass the age criteria established later for the study (they were younger than 7 or older than 11); (b) they were Russian monolinguals who had just started learning Spanish and/or Catalan, or (c) they were Russian-English bilinguals with some knowledge of Spanish and Catalan. The original group of participants (35 children) was later reduced in number to 30 because some children could not complete the whole set of tasks and their data were not included in the analyses. A group of 24 Russian monolingual children served as a baseline or control group. They were matched in age and socioeconomic status (average-high) with the multilingual participants. The monolingual children were recruited from a school in Istra (Russia, the Moscow Region). All Russian-speaking participants completed the same set of experimental tasks as the heritage speaker participants.[17] Finally, 30 Russian heritage speakers (with a mean age of 9 years, 4 months)[18]

[17] Except for a proficiency assessment task, Colour-naming test, and Receptive vocabulary test: these tests were designed only for the heritage speakers.
[18] The age of the heritage speakers at the time of the first experimental session.

and 24 Russian monolingual children (with a mean age of 9 years, 4 months) were selected to participate in this study (see Table 3.1 below).

	Heritage speakers	Monolingual controls
N	30	24
Age (*M*)	9.4 (range 7-11)	9.4 (range 7-11)
Male	13	11
Female	17	13

Table 3.1: Overview of heritage speaker and monolingual participants

A questionnaire for the parents was administered in order to obtain information about the participants and the sociolinguistic environment they live in. The population of Russian heritage speakers in Barcelona is of linguistic interest because of their trilingual language development (Russian-Spanish-Catalan)[19]. The questionnaire was intended to gather as much information as possible; at the same time it was comprehensive and short (see Appendix I for a full version of the questionnaire). The questionnaire was partly adapted from two existing questionnaires used for heritage speakers elaborated by Blumenfeld and Kaushanskaya (2007) and Lyutykh and Shumow (2013). The questionnaire consisted of 45 closed questions and 2 open questions. It included two main sections: (a) a section aimed at

[19] The heritage speakers in this study all live in Catalonia, where two official languages (Spanish and Catalan) are taught and spoken. For a detailed overview of the bilingual situation there, see Escobar Urmeneta and Unamuno (2008), Escobar Urmeneta, Evnitskaya, Moore, and Patiño (2011).

developing a profile of the parents that included questions about family income, parental age, education level, place of birth, years spent in Spain (for Russian-speaking parents), parental language proficiency, language use, and also parental attitudes and motivation with regard to their children learning Russian; and (b) a section aimed at developing a profile of the children that determined the children's age, place of birth, age of onset to Russian (Spanish and Catalan), and the amount and quality of their exposure to these languages. The questionnaire for the monolingual participants included 15 closed questions and aimed to collect information about the parents of the monolingual children (their age, education level and place of birth and their family's income), as well as the names and ages of the monolingual participants. Before filling out the questionnaire, the parents of the participants were given a consent form, explaining the goal of the study. All parents that indicated that they were interested in the results of the study received a summary of the results. It is worth noting that, for all participants, the questionnaire was filled in by the mothers (all Russian-speaking).

General information on the heritage speakers' families

The results of the questionnaire revealed that nearly 90% of the families were in the mid- and mid-upper income groups. Most of the parents had a higher educational level (56%) with the mothers (68%) being educated to a higher level than the fathers (32%). The

average age of the mothers was 39 years, which was slightly lower than the average age of the fathers, 44 years. All the mothers (n = 27) were born in Russia, Belorussia, or Ukraine.[20] Fourteen fathers came from Russia and 12 fathers were originally from Spain.[21] All the mothers and fathers speak at least one foreign language, mainly English (90%). All the parents reported using only their native language when speaking with their children, i.e, they use the one parent-one language strategy.[22]

The average length of the Russian-speaking parents' stay in Spain was 12 years (years range 4–21). Among the Russian-speaking mothers, 80% spoke Spanish as a foreign language, and 40% of these also spoke Catalan. Among the Russian-speaking fathers, the percentages were lower: 10% and 5% respectively. Such results point to a higher level of social integration of the mothers than the fathers to the Spanish- and Catalan-speaking societies.

The parents were asked some questions about their motivation and attitudes towards their children learning Russian. Most suggested that learning Russian was important for the children because (a) it would be useful for their future careers (75%), and (b) it enables them to communicate with their Russian-speaking relatives (65%). More than half of the parents (60%) believed that in the future their children would not understand and appreciate Russian culture. Only

[20] One mother was born in Belorussia, and 2 mothers were born in Ukraine; they stated that they were monolingual Russian speakers.
[21] One child was raised by only one parent (a mother).
[22] The bilingual Spanish-Catalan fathers used the language they were more dominant in.

10% of the parents were convinced that the children would be as proficient in Russian as they are.

General information on the heritage speakers

Several factors have been reported to affect the successful acquisition of both of the languages of a bilingual child. Among these are the amount of exposure and the age of onset to the L2 (Albirini, 2014; Gathercole and Thomas, 2005; Montrul, 2016; Unsworth, 2016). On the basis of the questionnaire, it was possible to calculate the amount of exposure the children had to Russian and the age of onset to L2 (Spanish and (or) Catalan). The amount of exposure they had to Russian and the age of onset to L2 will be correlated with the results of the production and comprehension experiments on the basis of the hypothesis that the more the child is exposed to the Russian language, the higher his/her scores on Russian gender agreement should be. If there are significant correlations, tests will be carried out to ascertain whether they predict accuracy in the gender tasks (in Chapters 4 and 5).

As mentioned before, the subjects in the study are 30 multilingual children. Twenty-two of these were born in Spain and began learning Spanish and Catalan between birth and 3 years old; 6 participants were born in Russian-speaking countries (Russia, Belorussia, and Ukraine) and moved with their families to Spain between the ages of 2 and 7 years old (average age of arrival = 4 years 8 months). On average, the children (n = 30) were first

exposed to the L2 at the age of 15 months (with the age at first exposure ranging from 0 to 84 months).

The amount of exposure the participants had to Russian was formulated on the basis of their current overall exposure to Russian in different contexts (Gathercole and Thomas, 2009; Unsworth, 2013). The participants' parents were asked to calculate and report an average amount of exposure (approximately, in percentages) weekly for Russian, Spanish, Catalan, and other languages at home and at school, including the Russian community school, and after-school activities. Russian was reported to be mainly used at home (72%). In addition, Spanish and Catalan were the languages used at school (30% and 70%, respectively) and in after-school activities (35% and 40%, respectively), with Russian being used in after-school activities, mainly watching television and reading accounting for 20%. Based on the questionnaire, the average exposure to Russian was 29% (with a range of 10% to 58%). Some parents reported that their child also had some exposure to English (10%). Table 3.2 summarizes the relevant background information on the heritage speakers.

	Heritage speakers (n=30)
Age of onset to L2 (in months)	Mean=15 Range=0-84

	Heritage speakers (n=30)
Overall amount of exposure to Russian (in %)	Mean=29% Range=10%-58%

Table 3.2: Background information on the heritage speakers (age of onset and amount of exposure)

To sum up, a general profile of a participant in the study would be a young heritage speaker who was born or migrated to Spain at preschool age, began learning Russian (L1) from birth (mainly at home) and Spanish and (or) Catalan (L2) before entering primary school (age 3). Russian is mainly spoken at home. However, the heritage speakers have limited exposure to Russian outside the home when compared with Spanish and Catalan.

3.2 General design of the production and comprehension experiments

Two experiments (production and comprehension) were designed to allow a clear analysis of the knowledge of Russian gender agreement by the heritage speakers. Before describing the tasks in the two experiments, in more detail, a general description of the materials and procedure applicable to both the production and comprehension experiments need to be made.

The production experiment was aimed at evaluating the command of gender agreement in Russian heritage language speakers through

an elicited production task. The elicited production task has been widely used to assess gender competence in L1, L2, and bilingual language acquisition contexts (Alarcón, 2006; Kupisch et al., 2013; Schwartz et al., 2014; Unsworth, 2013 among others). For this research study, the method was appropriate for several reasons. First, it was necessary to find nouns that satisfied all the criteria for the study (three gender values, form transparency, and crosslinguistic congruency); such target nouns might appear rarely in a child's spontaneous speech and might only be elicited in a controlled way. Secondly, the eliciting task allowed the command of gender agreement in a wide range of constructions to be assessed within a relatively short period. Finally, it was possible to use the eliciting task with children of different ages (from 7 to 11) and from different populations (bilingual vs. monolingual).

The comprehension experiment was aimed at assessing the heritage speakers' command of Russian grammatical gender using an online grammaticality judgment task (henceforth GJT). The stimuli were auditory, using DMDX software (Forster and Forster, 2003) and the participants were asked to respond by pressing one of the two keys. Both accuracy and reaction times (henceforth RTs) were measured. The combination of GJT and RTs together has been widely used to investigate language development and processing in monolingual and bilingual populations (Sagarra and Herschensohn, 2012; Bordag, Opitz, and Pechmann, 2006). The GJT has been proved to be a reliable method for tapping into children's knowledge of grammar. It has been argued that children can make judgments on

grammatical or ungrammatical items at about 3 years old as they have already developed basic metalinguistic skills for grammar (Gleitman, Gleitman, and Shipley, 1972). Moreover, RT recording has been used to measure language processing in adults as well as young populations (see, among many others, for example, Baisch, Cai, Li and Pinheiro, 2017).

Both the production and comprehension experiments assessed the command of grammatical gender in the nominal and sentential domain in specific agreement constructions; thus, each experiment was divided into separate tasks depending on the agreement construction. The production experiment consisted of four tasks (numbered 1-4):

Task 1. NP agreement: Adjective-Noun

krasnyj stol

red-ADJ table

'The red table'

Task 2. Sentential agreement: Noun-Zero Copula Present-Adjective

stol krasnyj

table red-ADJ

'The table is red'

Task 3. Sentential agreement: Noun-Copula Past-Adjective

stol byl krasnyj

table was-COP.PST red-ADJ

'The table was red'

Task 4. Sentential agreement: Noun-Copula Past-Prepositional Phrase

stol byl v komnate
table was-COP.PST in room
'The table was in the room'

The comprehension experiment was a mirror version of the production experiment but with one difference. Due to the similar results obtained for Adjective-Noun and Noun-Zero Copula Present-Adjective in the production experiment, it was decided to analyze only the NP construction (Adjective-Noun) in the comprehension experiment. Thus, the tests of the construction with Noun-Zero Copula Present-Adjective were excluded, leaving three agreement constructions in the comprehension experiment.
Thus, the comprehension experiment consisted of three tasks, these being numbered 5-7:

Task 5. NP agreement: Adjective-Noun

krasnyj stol
red-ADJ table
'The red table'

Task 6. Sentential agreement: Noun-Copula Past-Adjective

stol byl krasn-yj
table was-COP.PST red-ADJ
'The table was red'

Task 7. Sentential agreement: Noun-Copula Past-Prepositional Phrase

stol byl v komnate
table was-COP.PST in room
'The table was in the room'

In Chapters 4 and 5, detailed information about the number of experimental trials and the procedure for each task in the production and comprehension experiments will be provided. An overview of how the target nouns and adjectives were selected is given below.

Stimuli

In this section, the procedure for the selection of the stimuli (target nouns and adjectives) is presented. To avoid monotony in the tasks, two counterbalanced sets of inanimate nouns were created (Set 1 and Set 2). These nouns were used both for the production and comprehension experiments. The noun set for the production experiment contained 32 inanimate nouns (see Table 3.3) that were used to form 32 agreement constructions for each task. The noun set for the comprehension experiment contained 24 nouns (see Table 3.4). The comprehension experiment was a grammatical judgment task and required grammatical and ungrammatical items. This significantly increased the number of experimental trials and the high number of the trials could have caused fatigue in the children when doing the experiment. To reduce the number of experimental items, it was decided to randomly decrease the number of nouns in each noun set for comprehension.

The nouns for the sets were selected from the 5.000 most frequently used nouns based on the Russian National Corpus (Liashevskaya and Sharov, 2009). The nouns were chosen according to the following criteria:

1. They represented the three grammatical gender values in Russian (masculine, feminine, neuter).
2. They included nouns with transparent and opaque gender markers.
3. They included both crosslinguistically congruent and incongruent Russian nouns with regard to overlaps with gender in Spanish and Catalan.[23]

The nouns also had to be one-, two- or three-syllable words and be derived from basic lexical items expected in a child's vocabulary (the parents and the teachers from the community-school were asked to suggest these).

In addition, the following words were eliminated from the noun list:

1. Russian diminutives, as they have proved to facilitate gender acquisition of opaque nouns (Kempe et al., 2003), e.g., *morkov´Ø*-F and its diminutive *morkovk-a*.F 'carrot'.
2. In the case of synonyms, the less frequent nouns in the children's speech (based on the oral parental survey), e.g., *postel´* (less frequent) *–krovat´* (more frequent) 'bed'.
3. Nouns denoting abstract concepts, uncommon objects, and things that are difficult to depict, e.g., *vremya* 'time'.

[23] The congruency criterion was not applied to neuter nouns because this category is not present in Spanish and Catalan.

After the Russian nouns were chosen according to the criteria above, they were compared to Spanish and Catalan nouns. Again, the following exclusion criteria were applied:

1. Spanish and Catalan/Latinate/Russian cognates:

(a) Russian	(b) Spanish
noč' [ˈnoʧ]	*noche* [ˈnoʧe]
'The night'	'The night'

2. Nouns with opaque morphological cues in Spanish or Catalan:

(a) Spanish	(b) Catalan
paredØ	*polsØ*
wall-F	dust-F
'The wall'	'The dust'

3. Nouns that have different gender values in Spanish and Catalan:

(a) Spanish	(b) Catalan
hoja	*full*
sheet-F	sheet-M
'The sheet'	'The sheet'

Finally, for the production experiment, 64 nouns (32 nouns in each set) were chosen. The nouns were distributed according to the experimental conditions (for example, the noun distribution from Set 2 for Tasks 2 and 4 in production are illustrated in in Table 3.3): 3 masculine nouns, both transparent, i.e., ending in a consonant, and congruent, i.e. sharing the same gender in Russian and the L2s

(Spanish and Catalan) , e.g., *stakan* ‘glass’; 3 masculine nouns, both transparent and incongruent , i.e. having different gender values in Russian and th L2s , e.g., *stol* ‘table’; 3 masculine nouns, both opaque, i.e., ending in a palatalized consonant, and congruent, e.g., *remen´* ‘belt’; 3 masculine nouns, both opaque and incongruent, e.g., *nogot´* ‘nail’; 3 feminine nouns, both transparent, i.e., ending in –a[24], and congruent, e.g., *butylka* ‘bottle’; 3 feminine nouns, both transparent and incongruent, e.g., *bočka* ‘barrel’; 3 feminine nouns, both opaque, i.e., ending in a palatalized consonant, and congruent, e.g., *cep’* ‘chain’; 3 feminine nouns, both opaque and incongruent, e.g., *tetrad’* ‘notebook’; 2 neuter nouns, both transparent and incongruent (masculine in L2s), e.g., *jajco* ‘egg’; 2 neuter nouns, both transparent and incongruent (feminine in L2s), e.g., *lico* ‘face’; 2 neuter nouns, both opaque and incongruent (masculine in L2s), e.g., *mylo* ‘soap’; 2 neuter nouns, both opaque and incongruent (feminine in L2s), e.g., *jabloko* ‘apple’.

A complete list of the nouns in Sets 1 and 2 for the production and comprehension experiments can be found in Appendices II and III respectively.

[24] In this study all feminine nouns ending in –a are seen as transparent despite the phonetical stress. Note that in oral production stem-stressed feminine nouns can be confounded with stem-stressed neuter nouns due to the reduction of the final vowel. However, previous studies demonstrate that such errors are rare. In fact, the piloting of the experiment showed that the neuter gender was never used with feminine nouns.

Gender	Transparency	Congruency	Russian nouns	Spanish translation	Catalan translation
M	T	C	*sok* 'juice' *podarok* 'present' *nosok* 'sock'	*el zumo* *el regalo* *el calcetín*	*el suc* *el regal* *el mitjó*
		I	*kover* 'carpet' *arbuz* 'watermelon' *čemodan* 'suitcase'	*la alfombra* *la sandia* *la maleta*	*la catifa* *la síndria* *la maleta*
	O	C	*ogon'* 'fire' *rul* 'steering wheel' *kirpič* 'brick'	*el fuego* *el volante* *el ladrillo*	*el foc* *el volant* *el totxo*
		I	*fonar'* 'torch' *nogot´* 'nail' *kamen'* 'stone'	*la linterna* *la uña* *la piedra*	*la llanterna* *l'ungla* *la pedra*
F	T	C	*ložka* 'spoon' *kofta* 'shirt' *kružka* 'cup'	*la cuchara* *la camiseta* *la taza*	*la cullera* *la samarreta* *la tassa*
		I	*tarelka* 'plate' *šljapa* 'hat' *palka* 'stick'	*el plato* *el sombrero* *el palo*	*el plat* *el barret* *el pal*
	O	C	*dver´* 'door' *kist´* 'brush' *ten´* 'shadow'	*la puerta* *la brocha* *la sombra*	*la porta* *la brotxa* *la ombra*
		I	*stupen´* 'step' *obuv´* 'shoes' *vermišel´* 'pasta'	*el escalon* *el calzado* *el fideo*	*l'escalon* *el calçat* *el fideu*
N	T	I (M in L2)	*pal´to* 'coat' *vedro* 'bucket'	*el abrigo* *el cubo*	*l'abric* *el cubell*

		I (F in L2)	*okno* 'window' *pero* 'feather'	*la ventana* *la pluma*	*la finestra* *la ploma*
	O	I (M in L2)	*derevo* 'tree' *telo* 'body'	*el arbol* *el cuerpo*	*l'arbre* *el cos*
		I (Fin L2)	*odejalo* 'blanket' *kreslo* 'armchair'	*la manta* *la butaca*	*la manta* *la butaca*
Total nouns			32		

Table 3.3: Production experiment. The numerical distribution of nouns from Set 1 by experimental conditions
Note. M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent

For the comprehension experiment, the number of nouns from the production experiment was randomly reduced from 3 to 2 for nouns with masculine and feminine genders. Regarding neuter nouns, there was the same number of nouns as in the production experiment (8 nouns of each gender).[25] Finally, 24 nouns formed the stimuli set for the comprehension experiment (see Table 3.4).

[25] It was supposed that, due to the absence of the neuter gender in Spanish and Catalan, the participants would struggle with this gender value more than with the masculine or feminine. Thus, it was decided to leave the same amount of neuter nouns as in the production experiment in order to make a more fine-grained analysis of the command of neuter.

Gender	Transparency	Congruency	Russian nouns	Spanish translation	Catalan translation
M	T	C	*sok* 'juice' *podarok* 'present'	*el zumo* *el regalo*	*el suc* *el regal*
		I	*kover* 'carpet' *arbuz* 'watermelon'	*la alfombra* *la sandia*	*la catifa* *la síndria*
	O	C	*ogon´* 'fire' *rul´* 'steering wheel'	*el fuego* *el volante*	*el foc* *el volant*
		I	*fonar´* 'torch' *nogot´* 'nail'	*la linterna* *la uña*	*la llanterna* *l'ungla*
F	T	C	*ložka* 'spoon' *kofta* 'shirt'	*la cuchara* *la camiseta*	*la cullera* *la samarreta*
		I	*tarelka* 'plate' *šljapa* 'hat'	*el plato* *el sombrero*	*el plat* *el barret*
	O	C	*dver´* 'door' *kist´* 'brush'	*la puerta* *la brocha*	*la porta* *la brotxa*
		I	*stupen´* 'step' *obuv´* 'shoes'	*el escalon* *el calzado*	*l'escalon* *el calçat*
N	T	I (M in L2)	*pal´to* 'coat' *vedro* 'bucket'	*el abrigo* *el cubo*	*l'abric* *el cubell*
		I (F in L2)	*okno* 'window' *pero* 'feather'	*la ventana* *la pluma*	*la finestra* *la ploma*
	O	I (M in L2)	*derevo* 'tree' *telo* 'body'	*el arbol* *el cuerpo*	*l'arbre* *el cos*

		I (F in L2)	*odejalo* 'blancket' *kresol* 'armchair'	*la manta* *la butaca*	*la manta* *la butaca*
Total nouns			24		

Table 3.4: Comprehension experiment. The numerical distribution of nouns from Set 2 by experimental conditions
Note. M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent

The knowledge of grammatical gender in the production and comprehension experiments was assessed in agreement constructions. To create agreement constructions for tasks 1, 2, and 3 (the production experiment) and tasks 5 and 6 (the comprehension experiment), colour names were used.[26] According to Gvozdev (1961) and Tribushinina et al. (2015), colour adjectives appear in a Russian monolingual child's speech by the age of two and constitute the largest semantic category in a child's speech production. Moreover, basic colour words have been widely used in various studies on grammatical gender acquisition; among them are Kupisch et al. (2013), Montrul and Potowski (2007) and Perez-Pereira (1989). Such experimental method mitigate against obtaining non-relevant agreement forms (e.g., possessive - noun) or even an absence of responses: a child understands that the colour of the object (and not its form or size, etc.) should be named and his/her attention is directed to this. The colours for the study were selected because they are simple to pronounce (words that are not

[26] In Task 4 and Task 7, verbal agreement was assessed.

longer than three syllables were chosen), easily depictable, and occur in the vocabulary of children at the ages tested.

For each noun, coloured drawings were chosen (64 pictures in total). Twenty-eight pictures were taken from the object databank of Snodgrass and Vanderwart (1980). For the remaining 36 nouns, the pictures were taken from Google clip art forms. The original pictures were black and white line drawings which were then coloured in 7 different colours using Photoshop CS6. The colours of the target pictures were typical colour representations of such objects (when possible) to facilitate answers (e.g., the sun is yellow and not black, green, etc.). Also, each picture was coloured in one colour, possibly the most typical of the object, to avoid ambiguity in answers (e.g., a picture of a tree should be all green and not brown and green). The selected colour names in the three gender forms in the nominative singular (the form which was elicited) are presented in Table 3.5. A phonetical transcription with a stress mark is also provided for each adjective.

Adjective	Masculine	Feminine	Neuter
1.‘yellow’	*želtyj* [žéltyj]	*želtaja* [žéltəja]	želtoje [žéltəjə]
2. ‘green’	*zelenyj* [zelényj]	*zelenaja* [zelénəja]	*zelenoje* [zelénəjə]
3. ‘red’	*krasnyj* [krásnyj]	*krasnaja* [krásnəja]	*krasnoje* [krásnəjə]
4. ‘white’	*belyj* [bélyj]	*belaja* [béləja]	*beloje* [béləjə]

5.‘grey’	*seryj* [séryj]	*seraja* [sérəja]	*seroje* [sérəjə]
6.‘black’	*černyj* [čérnyj]	*černaja* [čérnəja]	*černoe* [čérnəjə]
7.‘light blue’	*goluboj* [golubój]	*golubaja* [golubája]	*goluboe* [golubójə]

Table 3.5: Colour adjectives (in the masculine, feminine and neuter agreement forms and their transcriptions) used in the gender production and comprehension experiment

In the baseline pronunciation of Russian, most colour adjectives are stressed on the stem and it is difficult to distinguish between feminine and neuter adjectives as both adjectives in the nominative form have a phonetically similar suffix, for example see the transcription of. the adjective ‘red’ (1a-1c) :

(1) ‘red’

a. *krasnyj* [krásnyj]-masculine
b. *krasnaja* [krásn**əja**]-feminine
c. *krasnoe* [krásn**əjə**]-neuter

However, in the colour adjective ‘light blue’ the neuter gender is unambiguously encoded by its inflectional ending -oe (in the nominative singular). Phonologically, this ending provides listeners with a strong cue with respect to the neuter gender of the noun and one can distinguish between feminine and neuter, as examples 2a-2c illustrate:

(2) ‘light blue’

a. *goluboj* [golubój]-masculine
b. *golubaja* [golub**ája**]-feminine
c. *goluboe* [golub**ójə**]-neuter

That’s the reason that all depictions of the neuter nouns were light blue.

For the production and comprehension experiments, the heritage speakers needed to know the nouns and colour names (especially, to avoid any discrepancies in using *goluboj* ‘light blue’ because of the absence of this colour name in Spanish and Catalan). To accomplish this goal, two tests were elaborated: a Colour-naming test (see Section 3.3.2) and a Receptive vocabulary test (presented in Section 3.3.3).

3.3 Background measures

3.3.1 Proficiency assessment of heritage speakers

To establish the general language level in heritage Russian, a proficiency assessment procedure was administered. As previous studies have demonstrated, heritage language proficiency can vary tremendously and it is not easy to find an appropriate technique to assess it (Benmamoun et al., 2013; Montrul, 2005, 2010, 2016). In

this study, the language skills of the participants were evaluated with the help of oral narratives. This method provides rich information about the linguistic development of children and allows for the evaluation of productive language abilities in both monolingual and bilingual learning contexts (Gutiérrez-Clellen, 2004; Pearson, 2002). The narrative assessment considers the diversity of the speakers (Gutiérrez-Clellen et al., 2000): it is appropriate for any proficiency level, even with an illiterate population. Finally, narratives are relatively easy to elicit, requiring little material in order to develop a mostly reliable set of linguistic data (Pavlenko, 2008). Narrative assessment has been widely used with children aged 7 to 11, i.e., the age of the participants in the current study.

To evaluate proficiency in this study, a picture description task eliciting an oral narrative was employed. The children were presented with the picture book "Frog, where are you?" (Mayer, 1969), which has been used in several language research studies. The participants were asked to narrate the story about the frog in the book. The data collection guidelines were adapted from Berman and Slobin (1994). Materials included a paper copy of the book, recording equipment (an audio digital recorder with an external microphone and a video camera), and a protocol for recording the date of the data collection, the order in which it was collected, and the number of children it was collected from. The task was conducted by the researcher one-on-one in a quiet empty classroom with a table and two chairs.

After collecting the recordings, they were transcribed by the researcher using Pearson's (2002) convention for transcription and were then verified by two native Russian speakers. Disagreements between the transcriber and each verifier were resolved by listening to the audio to determine the final transcriptions to be used for analysis. The verified transcriptions were coded following the CLAN protocol (MacWhinney, 2000), allowing for semi-automated analysis with the CLAN programs. Exact repetitions, revisions, and interjections (e.g., uh, um) were excluded from the analyses. The corpus was divided into utterances based on the intonation, pauses, and syntax of a sentence. The utterance definition was adapted from Loban (1976): each utterance should express a complete idea and, grammatically, should consist of one main clause and all its subordinate clauses. Language proficiency assessment was based on error calculation (Peets and Bialystok, 2015). An error was understood as belonging to the morpho-syntactic or the lexical-semantic levels; both types of error were analyzed separately. We do not provide a detailed analysis of errors here; case, number, or gender errors were all coded as morpho-syntactic errors. Also, the errors were not subcategorized into omission, commission, or addition. A detailed overview of the errors would be a worthwhile subject for another paper. Phonetical errors were not included in the analyses (only a few errors were made). Discourse-functional aspects were not analyzed since (a) these features tend to appear later on in a child's narratives (Berman, 2004), and (b) the goal of the study was an assessment of grammar and vocabulary skills only. All errors were semi-automatically annotated by the researcher (a

Russian philologist was consulted) using a coding scheme that captured the morpho-syntactic and lexical errors. Unintelligible forms were excluded from the analysis. The percentage of morpho-syntactic and lexical-semantic errors were calculated. Morpho-syntactic errors topped the list at 83 percent followed by lexical-semantic errors (17%).

The sentences below are some examples of common errors made by the heritage speakers in their oral narratives. The lexical errors (illustrated in examples 3-6) referred to semantically incorrect word choice (of nouns, verbs, prepositions, or conjunctions). In the example below, the child used the verb *zvonit'* (ring) probably instead of *zvat'* (call):

(3) Mal'čik **zvonil* ljagušku
Boy **rang* frog
Possible sentence in native Russian: Mal'čik *zval* ljagušku
'The boy called the frog'

Also, there were several transfer errors, mostly from Spanish or Catalan (the transferred items were phonologically similar in Spanish and Catalan, so it was difficult to determine the language of the transfer). As example 4 shows, a child used the Spanish word *bosque* (or Catalan *bosc*) instead of the Russian word *les* (forest).

(4) Mal'čik pošel v **bosk* i kričal
Boy went in **bosk* and yelled

Possible sentence in native Russian: Mal'čik poshel v *les* i kričal

'The boy went to the forest and was yelling'

Interestingly, the participants made several errors with prepositions. Consider example 5, in which the child used the preposition *na* 'on' instead of *v* 'in'.

(5) Potom oni uekhali iskat´ **na* park
Then they went search **on* park
Possible sentence in native Russian: Potom oni uekhali Iskat´ *v* park
'Then they went to search in the park'

In example 6, the participant used an incorrect conjunction *počemu* 'why' instead of *potomu čto* 'because'. This error arose probably because of a crosslinguistic influence from the L2s: in Spanish and Catalan the same word *porque* is used for both 'why' and 'because'.

(6) Sobačka hotela poigrat´ **počemu* ona dumala čto èto mjačik
Doggie wanted to play **why* she thought that it ball
[Possible sentence in native Russian: Sobačka hotela poigrat' *potomu čto* ona dumala čto èto mjačik]
'The doggie wanted to play because she thought it was a ball.'

Even though there were several lexical errors, most errors were made on the morpho-syntactical level. Namely, the heritage

speakers had problems with the following features: case (examples 7 and 8) and number marking (8), gender marking (7) and aspect (9). Consider the following utterances from the narratives below:

(7) Incorrect verbal gender agreement and a noun case error.

Sobačka igralsja s *komariki
Doggie played-M s *komariki-NOM
Correct: Doggie played-F with mosquitoes-INS
'The doggie played with mosquitoes'

(8) Incorrect number or case of a noun.

Našel *dva *lâguška
Found *two-NOM *frog-NOM, SG
Correct: Found two-ACC frogs-GEN, PL
'He found two frogs'

(9) Wrong use of imperfective aspect (instead of perfective).

On hotel *vylezat' iz dyrki čtoby posmotret'
He wanted *get-IPFV out hole to look
Correct: He wanted get-PRF out hole to look
'He wanted to get out of the hole to look'

Examples 10 and 11 illustrate several difficulties with lexical access and retrieval: some of the participants were unable to find a proper lexical item, e.g., a noun, a verb, a preposition. Consider example 10, in which the child pointed to the reindeer in the picture but

could not remember the word (marked as Ø in the example) for it in Russian (and did not use a word from Spanish or Catalan either).

(10) Mal'čik videl čto eto byl Ø
Boy saw that this was Ø
Possible sentence in native Russian: Mal'čik videl čto eto byl *olen'*
'The boy saw that it was a reindeer'

In example 10, the absence of an obligatory preposition *na* (at) with the verb smotrel (look) when referring to animates is evident.

(11) I sobačka smotrela Ø ljagušku
And doggie looked Ø frog
Possible sentence in native Russian: I sobačka smotrela *na* ljagušku
'And doggie looked at the frog'

To assess the children's narratives, two measures of accuracy were developed: accuracy at sentence level (accuracy measure 1) and accuracy at word level (accuracy measure 2). The proficiency score for each participant was the sum of these two measures. This was done in order to adapt the assessment to the elicited narratives. For instance, some of the narratives consisted of long utterances and few errors, whereas other narratives had short utterances and few errors. Evidentially, the former ones are not equal to the latter ones. Consider also another narrative in which the child did not make

errors in the majority of utterances but made many errors in one long utterance. Thus, it was decided to use both measures in order to tap into their Russian language skills. The first accuracy measure reflected a ratio of error-free utterances over the total number of utterances (following Larsen-Freeman, 1978, 2006). Error-free utterances were defined as utterances in which no error was found regarding morphology, syntax, word choice, word use, and so on.

The second accuracy measure was quantified as a ratio of error-free words divided by the total number of words (following Chastain, 1990). As it was said before, because of the variability in the narratives, it was assumed that a more valid indicator of proficiency would be provided by a combination of the two measures. In order to make the measures equivalent, they were converted into a decimal figure by multiplying by 10 (e.g., $0.943 \times 10 = 9.43$). Both measures make up a range scale from 0 to 10. Finally, the figure of one proficiency measure was added to another accuracy measure figure, resulting in a single proficiency score for each child. The final value range was from 9.92 to 20.00). All the proficiency measures are summarized in Table 3.6 for all participants (individual proficiency scores are provided in Appendix IV).

	Total Utterances	Error-free utterances	Total words	Error-free words	Accuracy measure 1	Accuracy measure 2	Proficiency score
Mean	30.13	21.27	215	202	7.12	9.36	16.48
SD	7.12	9.07	63.42	64.35	2.60	0.70	3.28
Range	17-48	5-48	191-239	178-226	1.85-10.00	7.88-10.00	9.92-20.00

Table 3.6: Group-average proficiency measures

Based on the proficiency assessment results, the participants were divided into two groups: a low proficiency group and a higher proficiency group. Those who scored 9.92-17.47 on the proficiency were considered as the low proficiency group. The ones who scored 17.75-20.00 were considered as the high proficiency group. The ANOVA demonstrated a significant difference in proficiency score between the two groups ($F(1, 28) = 52.189$, $p < .001$). The descriptive information about the two proficiency groups of heritage speakers is depicted in Table 3.7.

Group	Number	Mean	SD	Range
Low	15	13.88	2.7	9.92-17.47
High	15	19.08	0.8	17.75-20.00

Table 3.7: Descriptive information of two proficiency groups of heritage speakers

3.3.2 Receptive vocabulary test

Since knowledge of the target nouns can affect the results of the study (vocabulary scores were demonstrated to correlate with grammatical knowledge as discussed in Polinsky, 2006; Polinsky and Kagan, 2007), it was decided to measure receptive knowledge of the nouns that were chosen for the study. With this aim, a Receptive vocabulary test was designed and implemented.[27] The paper-and-pencil test consisted of 64 target nouns (that were chosen previously, see Section 3.2) and 128 distractors. The nouns and depictions of them were selected from the list of Snodgrass and Vanderwart (1980). Each child was required to identify and mark on a test blank the picture (one of three pictures in a string) that best matched a word spoken by the researcher. For example, the researcher pronounced a target word *oblako* 'cloud' and the child's task was to mark the correct pictorial representation in the string of three pictures (see Figure 3.1).

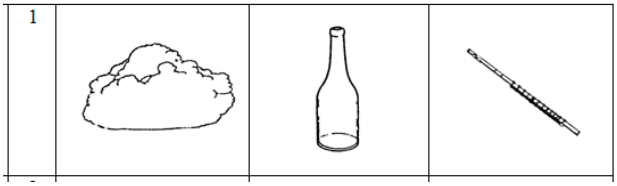

Figure 3.1: An example of Receptive vocabulary test

The Receptive vocabulary test was piloted with four Russian-Spanish-Catalan multilingual children, two boys and two girls (7, 8,

[27] The test was partially based on the Peabody Picture Vocabulary Test (PPVT; Dunn and Dunn, 1997).

10, and 12 years old respectively) and three Russian monolingual children, one boy and two girls (7, 8, and 11 years old respectively). The children were asked to comment if the pictures were not clear enough. All children were 99% accurate in identifying the target nouns. Three pictures were substituted because they did not represent the words clearly according to the children's answers. The Receptive vocabulary test was implemented in a group to the heritage speakers once before the production and comprehension experiments started. All heritage speakers were 99% accurate in identifying the nouns from the test.[28]

3.3.3 Colour-naming test

The Colour-naming test was designed to evaluate the children's knowledge of the colour adjectives that were used in the agreement constructions in the production and comprehension experiments. The Colour-naming test consisted of pictures of 7 coloured pencils. The coloured pencils were shown on a white background displayed on a computer screen using PowerPoint. The pencils appeared in a fixed order one after the other, produced by a click, starting with red (see Figure 3.2).

[28] It was decided that the Receptive vocabulary test was the most economic (could be done in group) and reliable measure of knowledge of the nouns. It was assumed that if the target nouns were understood, i.e., they were present in the children's receptive vocabulary; they also should be a part of their productive vocabulary due to their rather high frequency. Additionally, all the heritage speakers' parents reported (in personal communication with the researcher) that they used the target nouns in child-directed speech on a regular base.

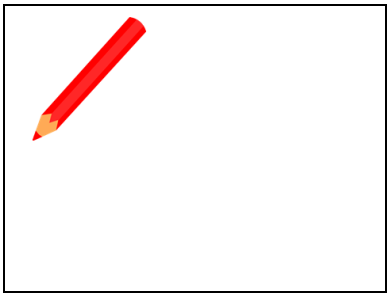

Figure 3.2: An example of a slide from the Colour-naming test

Before administering the test to the heritage speakers, it was piloted with one Russian-Spanish-Catalan multilingual boy and one Russian monolingual boy (7 and 11 years old respectively). None of them had any problems with the test. The task was to name in Russian the colour of the pencil displayed on the laptop screen. The researcher asked *'Kakogo cveta karandaš?'* 'What colour is the pencil?' The expected answer was in the nominative case, singular, e.g. *krasnyj*-M.SG 'red'. In general, heritage speakers did not demonstrate any difficulties in naming the colours, except for two participants who used the word *sinij* 'blue' instead of *goluboj* 'light blue'.[29] However, when the children were corrected, they remembered the word and repeated the test without errors. The heritage speakers took the Colour-naming test individually. Once when the production experiment started and once before the comprehension experiment started.

[29] The error was possibly provoked by the fact that Spanish and Catalan encode a single basic term for the word blue (*azul* in Spanish and *blau* in Catalan). Russian encodes two terms: *sinij* 'dark blue' and *goluboj* 'light blue'. Studies of colour naming and categorization demonstrated that the less frequent colour category tends to weaken or even disappear from the colour lexicons of bilinguals (Andrews, 1994).

Summary of the chapter

This chapter has described the overall methodology of the present study, highlighting the participants' characteristics and the materials that were used in the production and comprehension experiments. The Russian proficiency assessment demonstrated that the heritage speakers formed two proficiency groups (low and high). For the production experiment, two sets of nouns were elaborated (32 nouns in each set). The same sets but with a reduced number of nouns (24 in each set) were created for the comprehension experiment. The heritage speakers were successful in the Receptive vocabulary test and the Colour-naming test, meaning that they knew the nouns and the colours used in the experiments. The following chapters (Chapters 4 and 5) will provide detailed descriptions of the materials and the procedure for, as well as the results of, each task in the production and comprehension experiments.

4. PRODUCTION EXPERIMENT TASKS: DESIGN AND RESULTS

The previous chapter looked at the general methodology of the production and comprehension experiments, gave an overview of the participants, and outlined the methodology used to elicit relevant background variables (language proficiency, age of onset to L2, and amount of exposure). This chapter aims to present in detail the design and results of the four experimental tasks (Task 1-4) in the production experiment.

In this chapter Section 4.1 summarizes the methodology of the production experiment and includes (4.1.1) the description of materials and procedure, (4.1.2) timing of data collection for the production part, (4.1.3) the explanation of analyses of the results, (4.1.4) and the specific predictions for the production experiment (see Chapter 2 for an overview of the general research questions and predictions). Taking into account that the materials and procedure for eliciting the agreement constructions slightly vary from task to task, in Sections 4.2-4.5 we describe the materials, procedure, and results of each experimental task individually. In Section 4.6.1, the comparison of results for the agreement constructions is provided. Section 4.6.2 explores the relationship between gender knowledge in production and background measures: language proficiency in Russian, the age of onset to L2, and the amount of exposure to Russian. Section 4.6.3 presents the

results of the error analyses in production. Finally, Section 4.7 provides a discussion of the findings in the production experiment.

4.1 General overview of the production experiment

4.1.1 Materials and procedure for the production tasks

For the four tasks that make up the production experiment, 64 nouns were selected (see Chapter 3, Section 3.2 for more details). For each noun, a coloured drawing was assigned. The drawings were presented on a computer screen using PowerPoint. Each slide contained one picture. The slides were randomized manually for each participant before each experimental session. The production experiment was conducted with individuals in a silent room. The equipment included a table, two chairs, a portable computer, a voice recording device, and a pencil-and-paper examination protocol. The children were involved in a game in which they interacted with the researcher (i.e., the author of the dissertation). No assistant was engaged. Each child was shown one object at a time while listening to the corresponding Russian noun spoken by the researcher. Their task was to produce gender agreement in the nominative singular with an adjective, a verb, or both. The command of grammatical gender in production was assessed in four different agreement constructions, as stated previously. Each agreement construction formed an experimental task. For each task, 32 target nouns were used (noun Sets 1 and 2). For example, to elicit an adjectival

agreement in the nominal domain (Task 1), a child was asked to name the colour of the object that he/she saw on the PowerPoint slide. For example, looking at the red image of a book, and having heard the word *kniga* 'book', the participant was expected to produce an adjectival agreement construction *krasnaja kniga* 'red book'. If the child had problems, the researcher tried to elicit responses by asking a probing question *"Kakogo cveta kniga?"* 'What colour is the book?'

Each experimental task began with a familiarization block consisting of three test slides. If any of the test slides was responded to incorrectly (when compared to the expected answer), feedback was provided by the researcher aiming to correct the response. The test slides were repeated until the correct answers were produced.

4.1.2 Timing of the data collection

Both groups (heritage and monolingual speakers) completed the production experiment within five months, from February to June 2016. The experimental data with the monolingual group was collected during two visits to Russia (2-week stays) in February and in May 2016. An experimental session with each child lasted approximately 15 minutes. Between the experimental sessions with the heritage speakers, there was a minimum of a 3-week pause. For example, each child completed Task 1 on February 15th; consequently, Task 2 was conducted on March 7th (Task 3 in April-May and Task 4 in May-June). The reasoning here was to allow the

children to rest and avoid familiarization with the target nouns. The agreement construction types, the set of nouns assigned for the tasks (1 or 2), the timing of the experimental tasks, and examples of the expected answers are presented in Table 4.1 below.

Task	Noun sets	Timing	Expected answer
Task 1 Adjective-Noun	Set 1 (32 nouns)	Feb-Mar, 2016	*krasnyj stol* 'The red table'
Task 2 Noun-Zero Copula Present-Adjective	Set 2 (32 nouns)	Mar-Apr, 2016	*stol krasnyj* 'The table is red'
Task 3 Noun-Copula Past-Adjective	Set 1 (32 nouns)	Apr-May, 2016	*stol byl krasnyj* 'The table was red'
Task 4 Noun-Copula Past-PP	Set 2 (32 nouns)	May-June, 2016	*stol byl v komnate* 'The table was in the room'

Table 4.1: Production experiment with heritage group: noun sets, timing, examples

4.1.3 Data analysis

The answers to Tasks 1-4 in the production experiment were recorded using a voice recording device. All the data were transcribed and coded by the researcher and checked by the Russian philologist. The collected data were compiled and organized in Excel. All responses were scored correct '1' or incorrect '0'. None of the responses from the participants had to be discarded: there were no missing responses or unanalysable items. The quantitative analyses were conducted using the IBM SPSS Statistics 21 software package. The *p*-value was set at .05. In order to test knowledge of grammatical gender in Tasks 1-4 (Sections 4.2-4.5), the data were analyzed with one-way ANOVAs with accuracy as the dependent variable and gender, transparency, and congruency as the within-subject factor and with the group (heritage speakers vs. monolingual controls) as between-subject factors. In Section 4.6.1, the heritage speakers' performance across the four agreement constructions is compared. To do this, one-way and repeated measures ANOVAs were run. To test the relationship between the knowledge of grammatical gender of the heritage speakers and their Russian language proficiency (and to compare their performance with the monolingual children), three-way (3x2x2) mixed factorial ANOVAs were performed with gender, transparency, and congruency as within-subject factors, and with the group (low proficient vs. high proficient heritage speakers and monolingual controls) as the between-subject factors (see Section 4.6.2). The relationship between knowledge of grammatical gender of the

heritage speakers and background factors such as age of onset and amount of exposure is assessed for any significant correlation in Section 4.6.2. If there is a correlation, a regression analysis will be applied. Finally, I present a qualitative analysis of the errors made in production (Section 4.6.3). Each section finishes with a summary.

4.1.4 Predictions

As discussed in Chapter 2, the central aim of the study was to investigate the command of Russian gender agreement by young heritage speakers in Spain using both production and comprehension experiments. Trying to investigate this as fully as possible, different internal and external factors that might affect gender knowledge were added and studied: gender value, the transparency of the noun form, crosslinguistic noun congruency, and type of agreement construction, language proficiency, and the amount of exposure and age of onset to L2. Furthermore, the results gained from the experiments with the heritage speakers were compared with those from the monolingual children. General hypotheses regarding these variables were presented in Chapter 2; here, I briefly review the predictions, focusing on those that are specific to the production experiment.

Prediction 1. Gender values

The main prediction regarding gender values is that the children will be more accurate in agreement with masculine nouns than with feminine or neuter, probably because, according to previous studies and findings on agreement, the masculine is viewed as the default gender. In the case of neuter agreements, errors were expected because of the lack of this gender in Spanish and Catalan grammars. A further factor to take into account is that the neuter is the weakest gender value in Russian and is acquired later than the feminine and masculine. The results for the feminine gender can vary and may depend on other factors (i.e., transparency of the noun form, congruency, agreement construction, etc.).

Prediction 2. Noun form transparency

Given that morphophonological form can facilitate knowledge of grammatical gender, it might be expected that nouns with transparent gender markers will not provoke many difficulties. In contrast, it was expected that producing agreement with morphophonologically opaque nouns in all gender values might be challenging for the heritage speakers.

Prediction 3. Crosslinguistic congruency effects

The results of previous research regarding crosslinguistic congruency effects are not homogeneous. Most studies on gender acquisition in an L2 reveal a congruency effect; in contrast, a crosslinguistic influence is not apparent in studies of heritage speakers and bilinguals. Therefore, it was expected that results for

crosslinguistic influence would not be straightforward, and might be found in the vulnerable areas of knowledge of grammatical gender agreement (e.g., agreement forms with opaque nouns, in the low proficient group of heritage speakers).

Prediction 4. Gender and agreement constructions

The performance of the heritage speakers across agreement constructions was assessed to see whether it varied. More specifically, knowledge of grammatical gender was assessed on two levels of agreement: the nominal and the sentential. To this end, gender markings on adjectives in attribute and predicate position, which is shared between Russian and Spanish and Catalan, was compared with gender marking on verbs, which is unique to Russian. Based on these differences in the morphosyntactic realization of gender between Russian and Spanish and Catalan, it was expected that Russian heritage children would be less accurate regarding gender marking on verbs than gender marking on adjectives. It was also predicted that the constructions in which both copula verb and adjective agree with a noun (Noun-Copula Past-Adjective; Task 3) would cause more difficulties than the construction in which only the copula verb agrees with a noun (Noun-Copula Past-PP; Task 4) due to the supposed cognitive difficulty of processing and producing the former agreement construction.

Prediction 5. Heritage speakers vs. monolingual controls

The studies on gender agreement have demonstrated that heritage speakers might show a delay in development; they nevertheless follow the same developmental steps as monolingual children and make the same types of errors as their monolingual counterparts. Thus, the monolinguals are expected to be more accurate than heritage speakers in producing agreement with opaque and incongruent noun that may cause difficulties for the heritage speakers. Additionally, the same errors made by the monolingual speakers with regard to grammatical gender production are expected (see Chapter 2 for more detail).

Prediction 6. Gender and background factors

In the study, the relationship between the heritage speakers' knowledge of gender and background variables such as language proficiency, amount of exposure to Russian, and age of onset to L2 are investigated. One hypothesis is that the heritage children with a higher proficiency level in Russian will (a) outperform low proficiency heritage speakers, and (b) perform similarly to the monolingual children. Moreover, two sociolinguistic factors that can potentially lead to mastery of grammatical gender are examined in the group of the heritage speakers. Based on previous studies, it might be that both the amount of exposure to Russian and the age of onset to L2 will be good predictors of accuracy in the gender agreement production.

In the next sections, the procedure and results of the four tasks in the production experiment are presented.

4.2 Task 1: NP agreement: Adjective-Noun

4.2.1 Materials and procedure

This task was aimed at testing the knowledge of gender agreement in NP in Russian through an oral semi-elicited production task. In the elicited agreement construction, the noun was in the nominative singular form. In the expected answer, an adjective would precede the noun and agree with it in gender (masculine, feminine or neuter), number (singular) and case (nominative), as shown in (1):

(1) Nominal agreement construction in Task 1 in production.
želt-yj *limonØ*
yellow-M.SG.NOM lemon-M.SG.NOM
'The yellow lemon'.

Materials

For this task, 32 inanimate nouns from Set 1 were selected and visual depictions of them were used. The main task included 32 slides for the elicitation of the equivalent number of adjectives (colour names). The distribution of 32 nouns across experimental conditions (gender, transparency, congruency) for Task 1 is presented in Table 4.2.

Gender	Transparency	Congruency	Number nouns by condition	Expected answer – examples’
M	T	C	3	*želtyj stakan* ‘The yellow glass’
		I	3	*zelenyj list* ‘The green leaf’
	O	C	3	*zelenyj korabl’* ‘The green ship’
		I	3	*želtyj kljuch* ‘The yellow key’
F	T	C	3	*želtaja zvezda* ‘The yellow star’
		I	3	*krasnaja kniga* ‘The red book’
	O	C	3	*zelenaja cep’* ‘The green chain’
		I	3	*želtaja kost’* ‘The yellow bone’
N	T	I (M in L2)	2	*goluboe kolco* ‘The light blue ring’
		I (Fin L2)	2	*goluboe lico* ‘the light blue face’
	O	I (M in L2)	2	*goluboe zerkalo*

				‘The light blue mirror’
		I (F in L2)	2	*goluboe jabloko* ‘The light blue apple’
Total			32	

Table 4.2: Numerical distribution of 32 nouns across experimental conditions for production Task 1 with examples of expected answers
Note. M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent

Procedure

The participants were presented with the coloured pictures (one picture - one colour) on a computer screen using a PowerPoint slideshow. The children’s task was to name the colour and the object that they saw on the slide. For example, looking at the yellow-coloured image of a lemon (Figure 4.1), a child was expected to produce the utterance in the nominative case singular *želtyj lemon* ‘yellow lemon’.

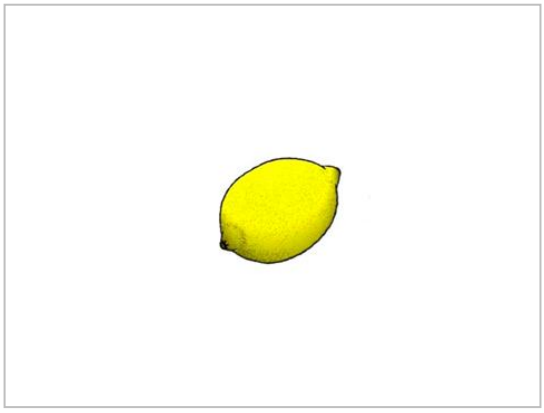

Figure 4.1: Example of a slide from a presentation for Production Task 1

The experiment lasted a maximum of 15 minutes with a heritage speaker and approximately 10 minutes with a monolingual child. Also, each experimental session with the heritage speakers started with the Colour-naming test. As was explained in Section 3.3.3 in detail, this served to prevent possible semantical and phonetical difficulties in naming the colours.

4.2.2 Results

Heritage speakers

Gender values

There was a statistically significant difference between the three gender values according to ANOVA ($F(2, 957) = 28.609$, $p < .001$). A *post hoc* test revealed that there was a significant difference between the constructions with masculine ($M=0.96$, $SD = 0.19$) and feminine gender ($M=0.85$, $SD = 0.36$), $p < .001$ and between feminine and neuter agreements ($M=0.76$, $SD = 0.43$), $p < .001$ (see Figure 4.2).

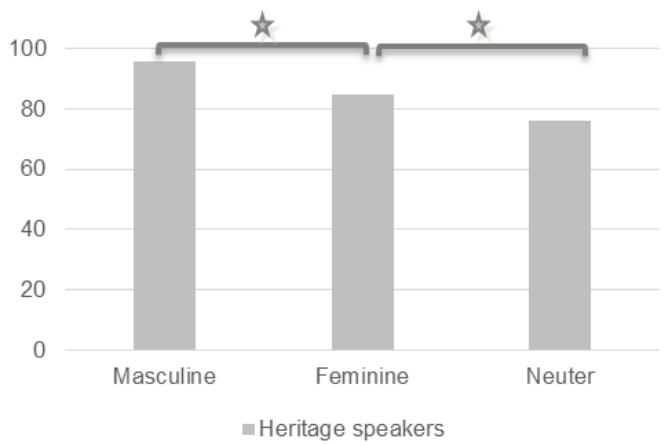

Figure 4.2: Accuracy in production. Adjective-Noun. Gender categories. Heritage speakers

Noun form transparency

A significant interaction between the effects of gender and transparency, F (2, 954) = 3.451, p = .007, was also yielded. As shown in Figure 4.3, masculine and feminine agreement forms were significantly easier than neuter when the word form was transparent (p <.001 for both). Nevertheless, when the word form was opaque (Figure 4.4), feminine and neuter agreement forms were significantly more difficult than masculine (p <.001 for both). Also, a significant difference was found between transparent and opaque feminine nouns (p <.001), transparent feminine nouns being produced significantly more accurately than opaque feminine nouns.

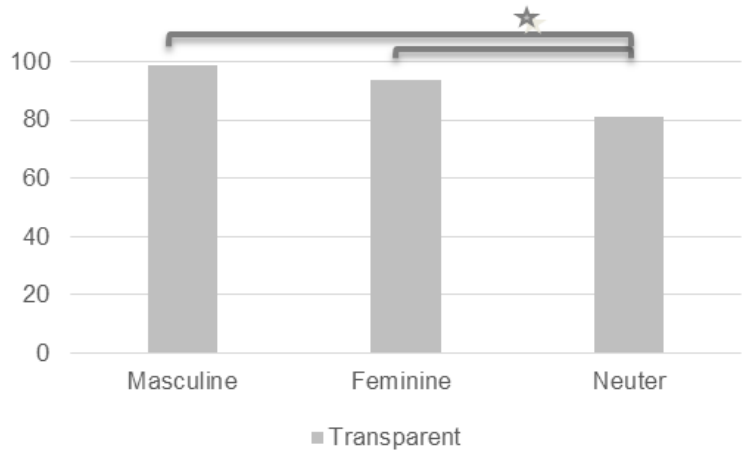

Figure 4.3: Accuracy in production. Adjective-Noun. Transparent noun forms. Heritage speakers

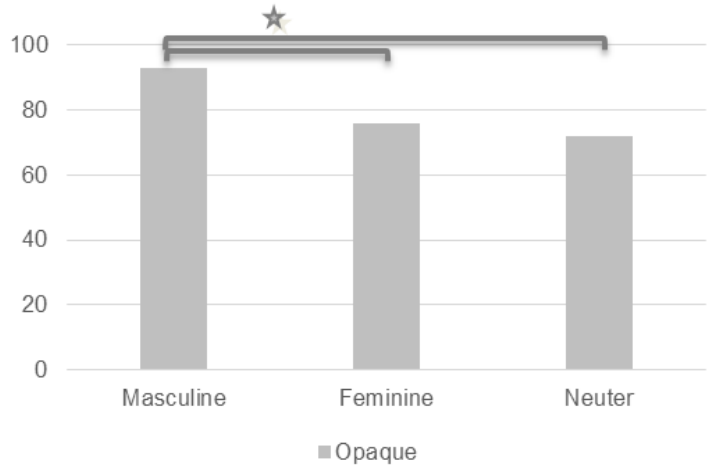

Figure 4.4: Accuracy in production. Adjective-Noun. Opaque noun forms. Heritage speakers

A relationship between gender and congruency could not be demonstrated, F (1,716) = 1.69, p = .19

Heritage speakers vs. monolingual controls

Gender values

Overall, the results indicated that the monolingual controls were at-ceiling and outperformed the heritage speakers. The analyses demonstrated that there was a significant difference in grammatical gender accuracy between the groups ($F(5, 1914) = 121.685$, $p < .001$). A *post hoc* test ($p < .001$) indicated that there was a difference between the heritage speakers and the monolingual group with regard to feminine and neuter ($p < .001$ for both) but not regarding the masculine (see Figure 4.5).

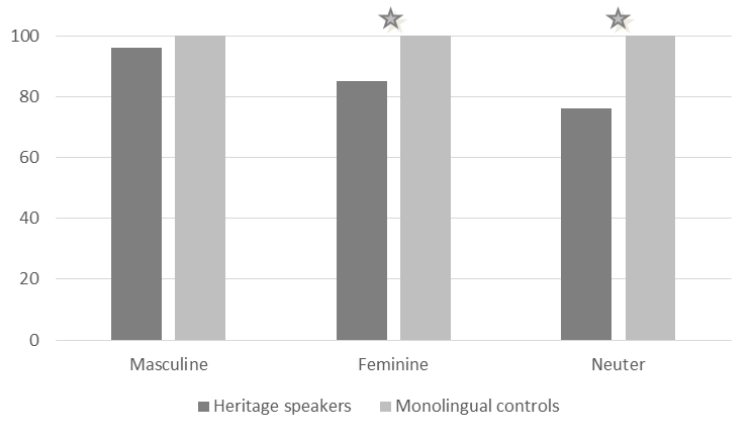

Figure 4.5: Accuracy in production. Adjective-Noun. Gender categories. Heritage speakers vs. monolingual controls

Noun form transparency

An interaction between the transparent forms of nouns and the group was found ($F(5, 954) = 25.549$, $p < .001$). *Post hoc* contrasts

showed that the difference between groups occurred in agreement constructions with neuter nouns (p <.001) but not with masculine and feminine nouns (Figure 4.6). These results show that transparent masculine and feminine nouns were almost unproblematic for heritage speakers and matched the results of the monolingual control group. An interaction between opaque noun forms and groups was also yielded (F(5, 954) = 101.702, p. <.001) the heritage speakers were less accurate than the monolinguals with regard to the use of opaque feminine and neuter nouns (p <.001 for both) but not with opaque masculine ones (Figure 4.7).

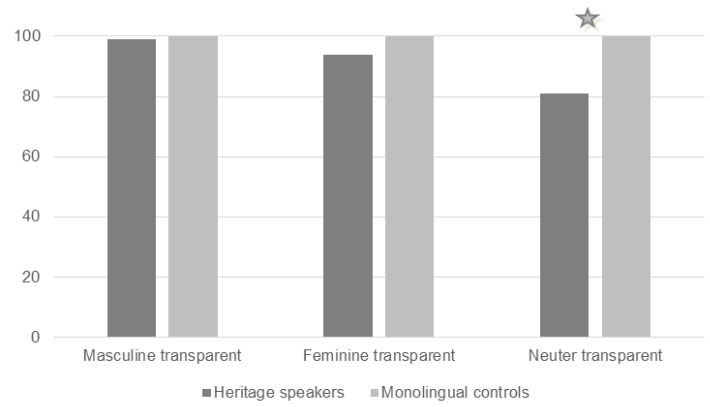

Figure 4.6: Accuracy in production. Adjective-Noun. Transparent noun forms. Heritage speakers vs. monolingual controls

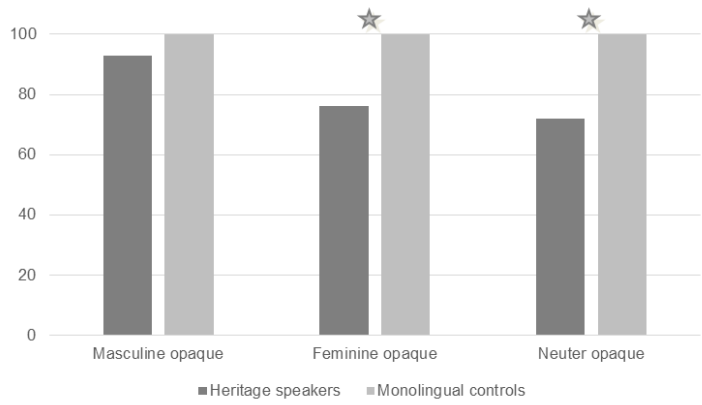

Figure 4.7: Accuracy in production. Adjective-Noun. Opaque noun forms. Heritage speakers vs. monolingual controls

Summary of section 4.2.2

The accuracy rates in the Adjective-Noun agreement constructions revealed that the most unproblematic grammatical gender for heritage speakers is the masculine. Agreement forms with feminine nouns were accurate only when the noun form was transparent. Neuter appeared to be the most difficult gender for the heritage speakers. In all conditions, the monolinguals behaved at-ceiling. The heritage speakers appeared to be a close match to the monolinguals only in masculine transparent and feminine transparent conditions. No effect of congruency was detected.

4.3 Task 2. Sentential agreement: Noun-Zero Copula Present-Adjective

4.3.1 Materials and procedure

Task 2 was designed to assess gender agreement in the sentential domain. The agreement construction consisted of a subject noun, a zero copula in the present tense, and a predicate adjective in the nominative form. As was discussed in Chapter 1, in Russian, the copula verb is zero in the present tense but is non-zero in the past or future tenses. The construction is apparently similar to the construction in Task 1. The difference lies in the word order: in Task 1, the adjective precedes the noun, and in Task 2, the adjective follows the noun; compare examples 2 and 3 below:

(2) Task 1:

želt-yj	*limonØ*
yellow-M.SG.NOM	lemon-M.SG.NOM

'The yellow lemon'

(3) Task 2:

limonØ	*Ø*	*želt-yj*
lemon-M.SG.NOM	COP ZER.PRS	yellow- M.SG.NOM

'The lemon is yellow'.

Materials

For Task 2 nouns from Set 2 were used and visual depictions of them. In total, 35 inanimate nouns (3 of them were practice items), and their depictions in colour were shown in a PowerPoint presentation.

Procedure

The procedure was identical to the procedure used in Task 1 with one difference being that in Task 2 the children were asked to name the object first and then the colour. The task did not cause any difficulties.

4.3.2 Results

Heritage speakers

Gender values

The results of Task 2 were very similar to those of Task 1. There was a statistically significant difference between the three genders ($F(2, 957) = 25.149$, $p < .001$). A *post hoc* test revealed that there was a significant difference between masculine ($M=0.96$, $SD = 0.19$) and feminine ($M=0.87$, $SD = 0.34$), $p < .001$ and between

feminine and neuter agreement forms (M=0.78, SD = 0.42), p <.001 (see Figure 4.8).

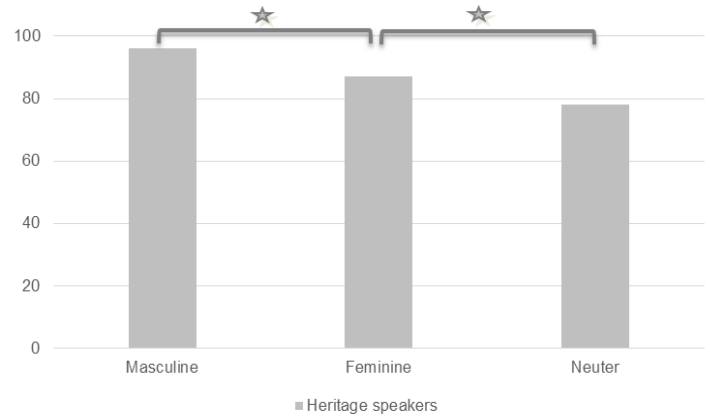

Figure 4.8: Accuracy in production. Noun-Zero Copula Present-Adjective. Gender categories. Heritage speakers

Noun form transparency

As in the previous task, there was a statistically significant interaction between gender and transparency, F (2, 954) = 12.466, p <.001. A *post hoc* analysis showed that agreement constructions with masculine and feminine nouns were easier than with neuter nouns when the word form was transparent (p <.001 for all) (see Figure 4.9). In turn, when the word form was opaque, feminine, and neuter forms were significantly more difficult to produce accurately than masculine forms (p <.001 for all) (see Figure 4.10).

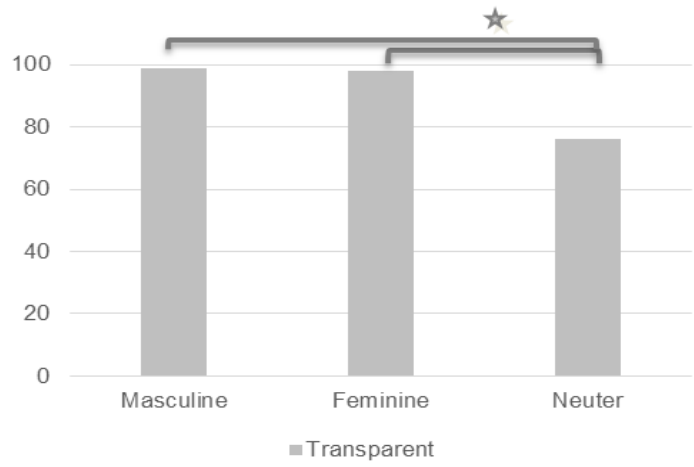

Figure 4.9: Accuracy in production. Noun-Zero Copula Present-Adjective. Transparent noun forms. Heritage speakers

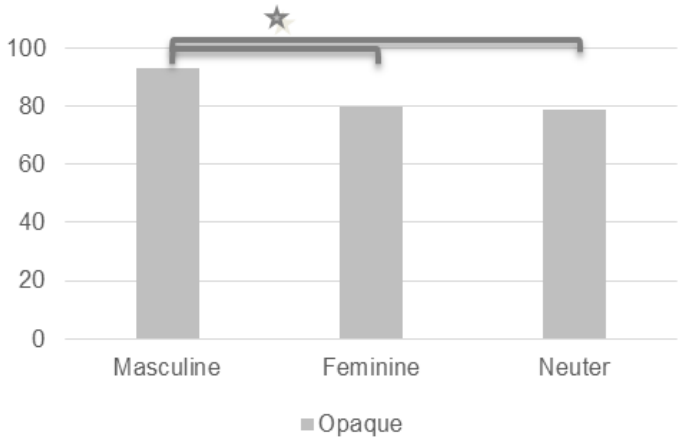

Figure 4.10: Accuracy in production. Noun-Copula Zero Present-Adjective. Opaque noun forms. Heritage speakers

Heritage speakers vs. monolingual controls

Gender values

Similarly to the Adjective-Noun construction, in the Noun-Zero Copula Present-Adjective construction, ANOVA demonstrated a significant difference between the heritage speakers and the monolinguals in production of feminine and neuter forms ($F(5, 1914) = 848.429$, $p < .001$ for both) but not of the masculine (see Figure 4.11).

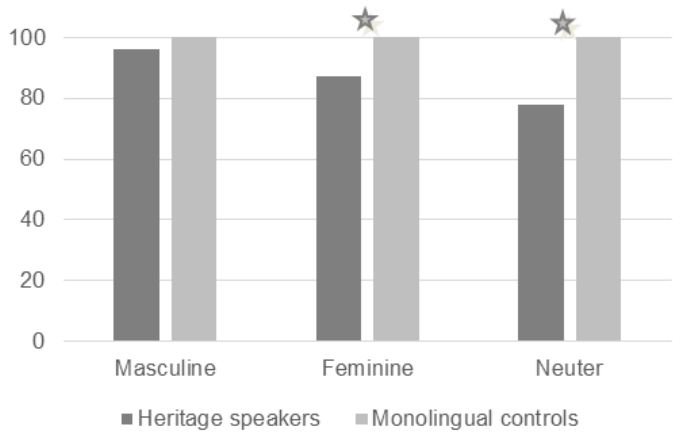

Figure 4.11: Accuracy in production. Noun-Zero Copula Present-Adjective. Gender categories. Heritage speakers vs. monolingual controls

Noun form transparency

A significant relationship was found between transparent nouns and the two groups ($F(5, 954) = 26.148$, $p < .001$) and between opaque nouns and the two groups ($F(5, 954) = 87.359$, $p < .001$). A *post hoc* test showed that the difference between the heritage speakers and the monolinguals was only with the opaque feminine ($p < .001$), and the transparent and opaque neuter forms ($p < .001$ for both) but not

with the transparent feminine, or the transparent and opaque masculine forms. Figure 4.12 (transparent nouns) and Figure 4.13 (opaque nouns) display these findings.

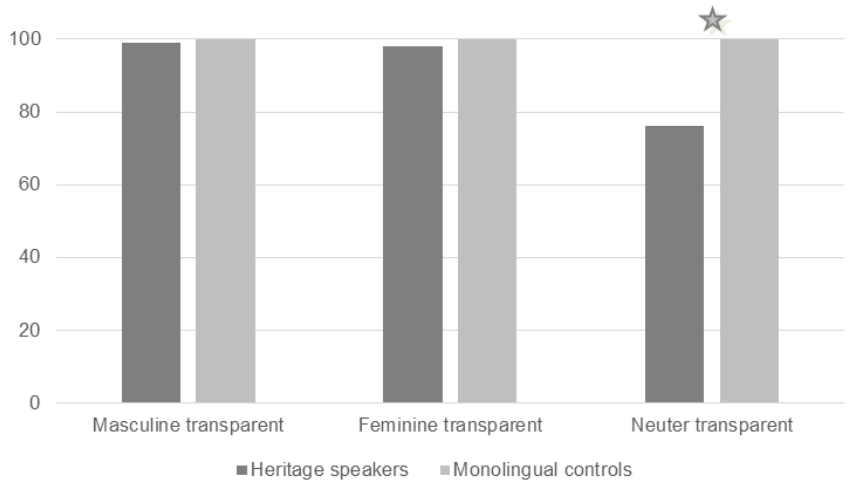

Figure 4.12: Accuracy in production. Noun-Zero Copula Present-Adjective. Transparent noun forms. Heritage speakers vs. monolingual controls

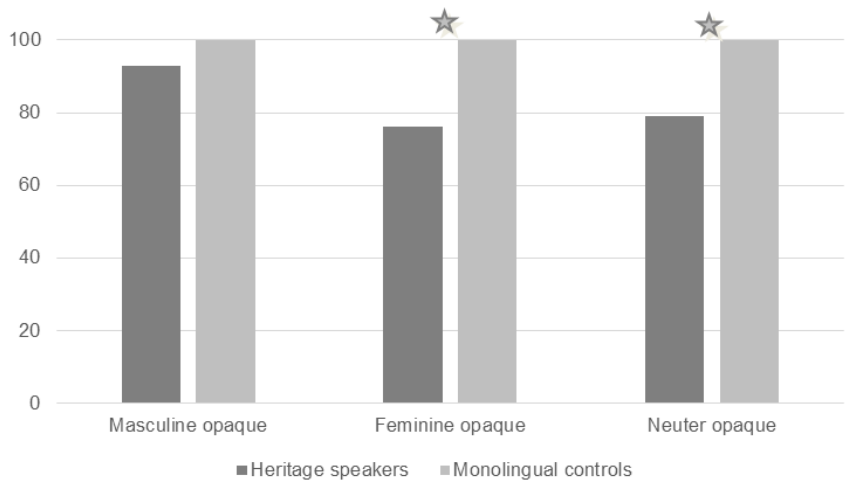

Figure 4.13: Accuracy in production. Noun-Zero Copula Present-Adjective. Opaque noun forms. Heritage speakers vs. monolingual controls

Similarly to Task 1 a relationship between gender and congruency could not be demonstrated, F (1,716) =.166, *p* =.68.

Summary of section 4.3

The results were identical to the results obtained for the Adjective-Noun agreement constructions. Again, production of agreement forms with masculine nouns was the easiest for heritage speakers. The agreement with feminine nouns was relatively easy to produce only in its transparent form. The accuracy results for neuter nouns were significantly lower than those for masculine and feminine nouns. Again, in all conditions, the monolinguals behaved at-ceiling. Heritage speakers performed similarly to monolinguals with regard to production of the transparent masculine and transparent feminine forms. No effect of congruency was detected. Moreover, the comparison of the two tasks leads to the conclusion that the order of the agreed elements (the formal difference between Task 1 and Task 2) was irrelevant for the gender agreement production in the heritage speakers' group (as also in the monolingual group).

4.4 Task 3 Sentential agreement: Noun-Copula Past-Adjective

4.4.1 Materials and procedure

The agreement construction in Task 3 consists of a subject noun, copula verb *byl* 'was' in the past tense, and a predicate adjective. In this construction, both the copular verb in the past form *byl* 'was' and the predicate adjective agrees with the subject in gender (masculine, feminine or neuter) and number (singular).[30] An example of the agreement construction for Task 3 is illustrated below (4):

(4) *zvezd-a* *byl-a* *želt-aja*
star- F.SG.NOM was-F.SG yellow- F.SG.NOM
'The star was yellow'

Materials

The same nouns and pictures as in Task 1 were used (Set 1). As in the previous tasks, there were 32 target nouns and three practice nouns.

Procedure

To elicit the answers in the past tense, it was explained to the participants that they would play a game in which their memory capacity would be tested. On each slide, the participants saw a target object in colour (Figure 4.14a). After 10 seconds

[30] In such an agreement construction, predicate adjectives can exhibit some options with respect to case assignment, namely, they may have the same case as that of the subject (i.e., nominative) or bear a case which is different from that of the subject (i.e., instrumental). In fact, only adjectives in the nominative case form were elicited; no adjectives in the instrumental case were recorded.

(approximately), the researcher changed the slide, and the same object as on Slide 1 was displayed but in black and white (Figure 4.14b). The task was to name the colour of the object that appeared first.

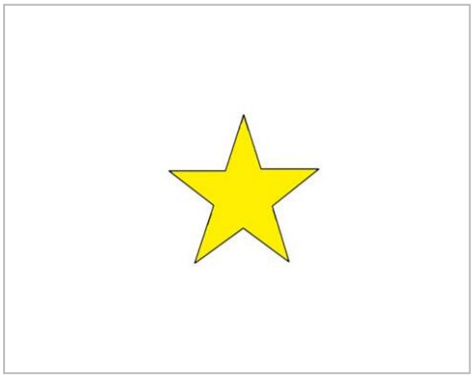

Figure 4.14a: Example of Slide 1 from the presentation for Production Task 3

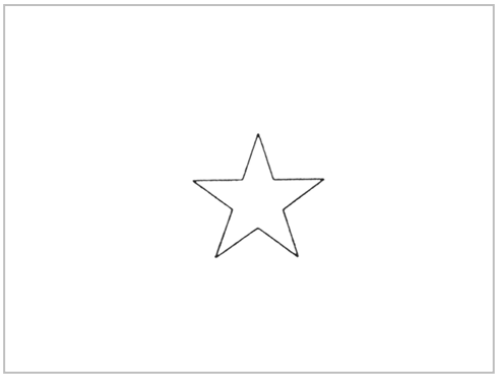

Figure 4.14b. Example of Slide 2 from the presentation for Production Task 3

Each experimental session lasted approximately 20 minutes with a heritage speaker and 15 minutes with a monolingual child.

4.4.2 Results

Before proceeding with the results for this construction, an important note on the data analysis should be made. In this construction, the analyses of the children's responses yielded different answer patterns: (a) both a correct copula verb and an adjective; (b) both an incorrect copula verb and an adjective; (c) a correct copula and an incorrect adjective; and (d) an incorrect copula and a correct adjective. Only a few errors for types c and d were elicited that's the reason they were eliminated from the data. Also, if a participant produced an answer with both an incorrect copula verb and an adjective (type b), for example, *oblak-o *byl-a *golub-aja* (cloud-N was-F light blue-F), it was coded as one error. Aditionally, with type b a few answers in which both the copula and the adjective were incorrect but the gender of these elements was not the same were elicited. For instance, in the agreement construction with the neuter noun, a child produced the copula in the feminine and the adjective in the masculine, e.g., *oblak-o *byl-a *golub-oj* (cloud-N was-F light blue-M). Three percent of the errors were of these types in the data, mainly with neuter nouns. Due to the low frequency, they were not included in the analyses.[31]

[31] The different error pattern can probably shed light on the mechanism of agreement selection in the heritage language: (a) if the same gender is assigned to the copula and adjective as one constituent or (b) if the gender is assigned independently to these constituents. This could be a topic for future research.

Heritage speakers

Gender values

There was a statistically significant difference between the accuracy scores for the three genders (F(2, 957) = 102.937, *p* <.001). Similarly to the previous two constructions, a *post hoc* test revealed (see Figure 4.15) that there was a significant difference between masculine (M=0.96, SD = 0.20) and feminine forms (M=0.87, SD = 0.34), p <.001 and between feminine and neuter forms (M=0 .68, SD = 0. 47), p <.001.

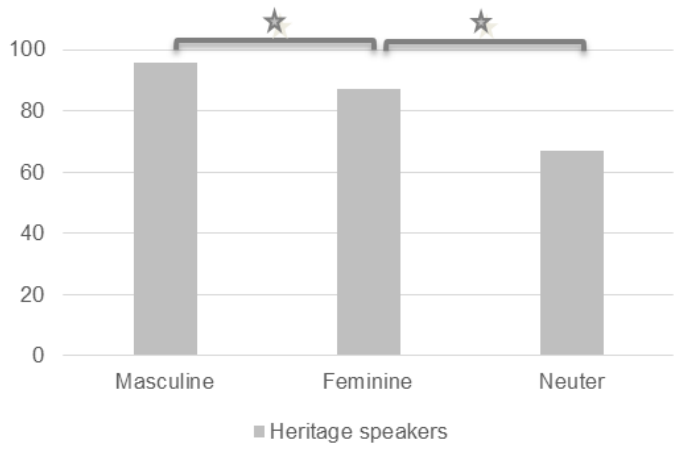

Figure 4.15: Accuracy in production. Noun-Copula Past-Adjective. Gender categories. Heritage speakers

Noun form transparency

There was a statistically significant relationship between gender and the transparency of the noun form, F (2, 1914) = 2.837, *p.* <.001. A

post hoc test showed that masculine and feminine agreement forms were significantly easier to produce accurately than neuter when a word form was transparent (p <.001 for all). A slightly different result was found in this construction compared to the former two agreement constructions. Namely, when the word form was opaque, there was a significant difference between the three genders: the masculine form was easier than the feminine (p =.06), and the feminine form was easier than the neuter (p <.001). Figure 4.16 (for transparent nouns) and Figure 4.17 (for opaque nouns) illustrate these findings.

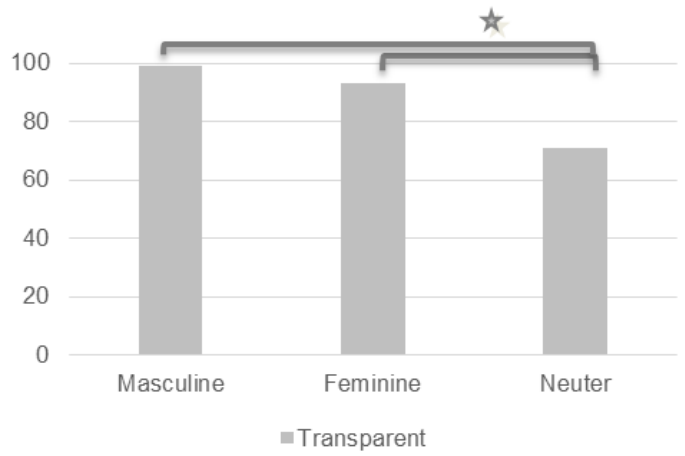

Figure 4.16: Accuracy in production. Noun-Zero Copula Present-Adjective. Transparent noun forms. Heritage speakers

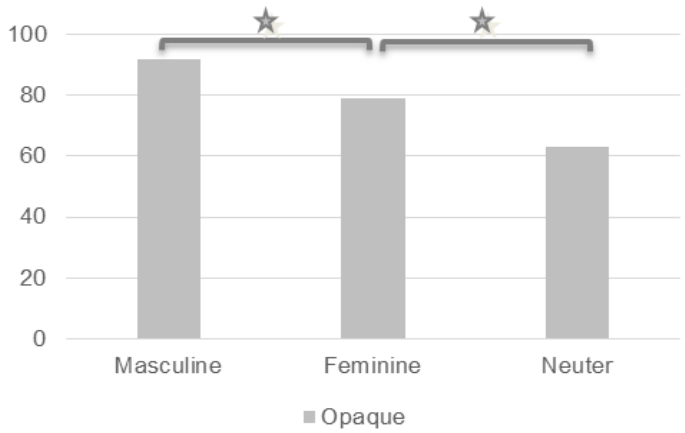

Figure 4.17: Accuracy in production. Noun-Zero Copula Present-Adjective. Opaque noun forms. Heritage speakers

Heritage speakers vs. monolinguals

Gender values

According to ANOVA, there was an effect between the groups in gender agreement with this construction ($F(5, 1914) = 814.829$, $p < .001$). A *post hoc* test revealed that statistically significant differences between the groups appeared in the feminine and neuter forms, $p < .001$ (for all) but not in the masculine gender form (Figure 4.18).

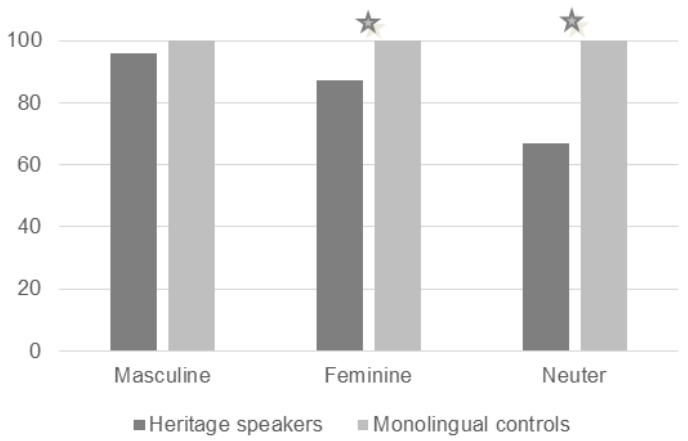

Figure 4.18: Accuracy in production. Noun-Copula Past-Adjective. Gender categories. Heritage speakers vs. monolingual controls

Noun form transparency

As in the previous constructions, a significant difference was found with transparent nouns ($F(5, 954) = 88.118$, $p < .001$) (see Figure 4.19) and opaque nouns (see Figure 4.20) ($F(5, 954) = 218.733$, $p < .001$) (see Figure 4.20) between the heritage speakers and the monolinguals. A *post hoc* test showed that the difference between the groups was only in the opaque feminine forms ($p < .001$), the transparent and opaque neuter forms ($p < .001$ for both) but not in the transparent masculine, opaque masculine, and transparent feminine forms.

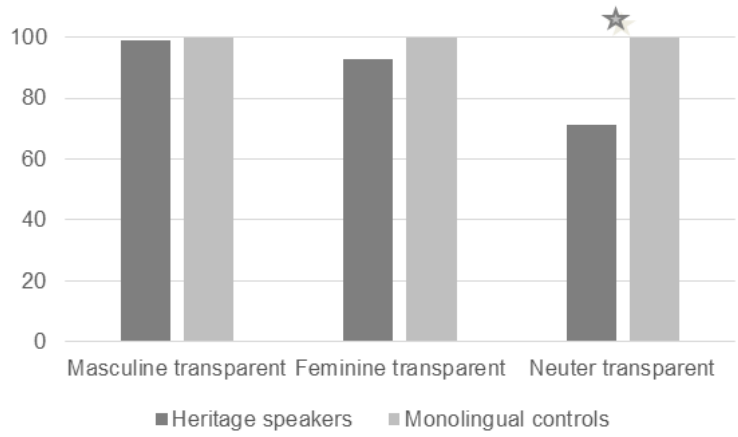

Figure 4.19: Accuracy in production. Noun-Copula Past-Adjective. Transparent noun forms. Heritage speakers vs. monolingual controls

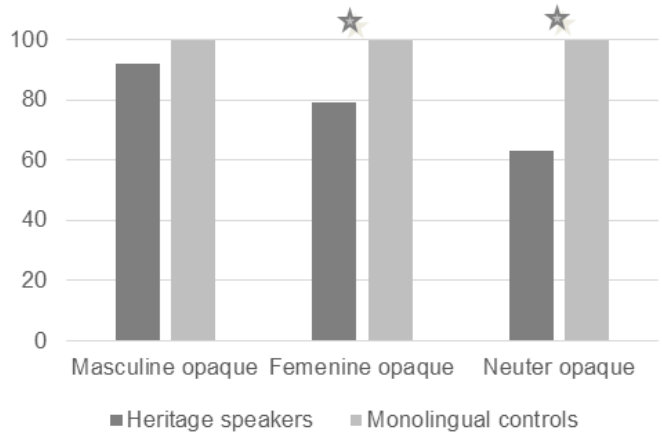

Figure 4.20: Accuracy in production. Noun-Copula Past-Adjective. Opaque noun forms. Heritage speakers vs. monolingual controls

Again, a relationship between gender and congruency could not be demonstrated, F (1,1436) =3.578, *p* =.059.

Summary of section 4.3.2

The results in this construction almost repeat the pattern in the previous two constructions. Namely, the accuracy rates in the Noun-Copula Past-Adjective agreement construction revealed that gender agreement with the transparent and opaque masculine nouns and transparent feminine nouns was unproblematic for the heritage speakers. The constructions with opaque feminine and neuter (transparent and opaque) nouns appeared to be the most difficult for the heritage speakers. In all conditions, the monolinguals behaved at-ceiling. Similar to the previous agreement constructions, no effect of congruency was found.

4.5 Task 4. Sentential agreement. Noun-Copula Past-Prepositional Phrase

4.5.1 Materials and procedure

In Task 4, the agreement construction consisted of a subject noun, copula verb *byl* 'was' in the past tense, and a prepositional phrase (5)

(5) limon byl na stole
lemon-M,SG,NOM was-M,SG on table
'The lemon was on the table'

In addition, there is a structural difference between Tasks 3 and 4 which might affect the results. In this task, only the copular verb agrees with the subject noun in gender, whereas in Task 3, two constituents - the verb and the adjective - agree with the noun.

Materials

The same nouns and pictures as in Task 2 were used (Set 2, see Appendix II). As in the previous tasks, there were 32 target and three practice nouns. Additionally, four pictures were added (a house, a table, a chair, and a bed). These pictures were aimed to elicit prepositional phrases. The prepositional phrases were also written on the slides to facilitate the children's answers.[32]

The following seven prepositional phrases were used:

1) *na nebe* 'in the sky'
2) *na stole* 'on the table'
3) *na stule* 'on the chair'
4) *na ulitse* 'in the street'
5) *na krovati* 'on the bed'
6) *pod krovat'u* 'under the bed'
7) *v dome* 'in the house'.

[32] The pilot study demonstrated that the heritage speakers had difficulties with the choice of preposition and case ending of nouns in the prepositional phrase. In order to focus exclusively on eliciting agreement constructions, the prepositional phrases were written on the slides (all the children had literacy skills in Russian).

Procedure

In Task 4, the stimuli were also presented using PowerPoint. In order to elicit the agreement construction, a sequence of two slides was created. On each slide, the children saw two different pictures of the same object. It was explained to the participants that the objects changed place and their task was to name the object's position on the second slide. For example, in Slide 1 (Figure 4.21a), they see a picture of the target noun *oblako* 'cloud', which is positioned inside the house. On Slide 2 (Figure 4.21b), the same picture of the cloud appears in the right upper corner outside the depiction of the house. Also, on Slide 2 (the target slide), there is the written prepositional phrase *na nebe* 'in the sky' under the picture of the cloud.

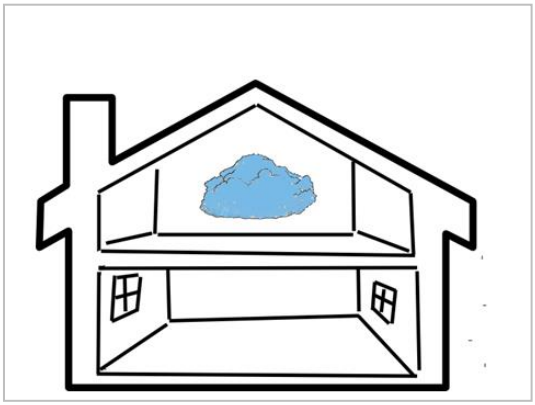

Figure 4.21a: Example of Slide 1 from the presentation for Production Task 4

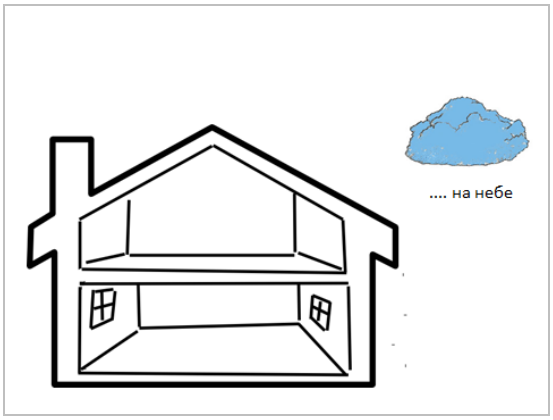

Figure 4.21b: Example of Slide 2 from the presentation for Production Task 4

The researcher elicited the correct agreement by asking the children to look at Slide 1 and saying to them "*Segodnya oblako v dome"* 'Today the cloud is in the house'. Then the children were asked to look at the next, changed, slide and the researcher said "*No včera…"* 'But yesterday'. The expected answers by a participant for Slide 2 was "*Oblako bylo na nebe"* 'The cloud was in the sky'. Initially, there were seven practice slides (with all seven prepositional phrases) to familiarize the learners with the task. In total, the task included 64 slides for the elicitation of 32 agreement constructions. Each experimental session lasted approximately 30 minutes with a heritage speaker and 20 minutes with a monolingual child. As in previous tasks, experimental sessions with the heritage speakers started with the Colour-naming test.

4.5.2 Results

Heritage speakers

Gender values

There was a statistically significant difference between the three genders as determined by one-way ANOVA (F(2, 957) = 61.105, *p* <.001). A *post hoc* test revealed that there was a significant difference between production of the masculine (*M*=0.91, *SD* = 0.29) and neuter forms (*M*=0.56, *SD* = 0.49), *p* <.014 and between the feminine (*M*=0.83, *SD* = 0.38) and neuter forms, *p* <.001 (see Figure 4.22). This result was different from the previous three constructions, in which there was also a difference between the masculine and feminine agreement forms.

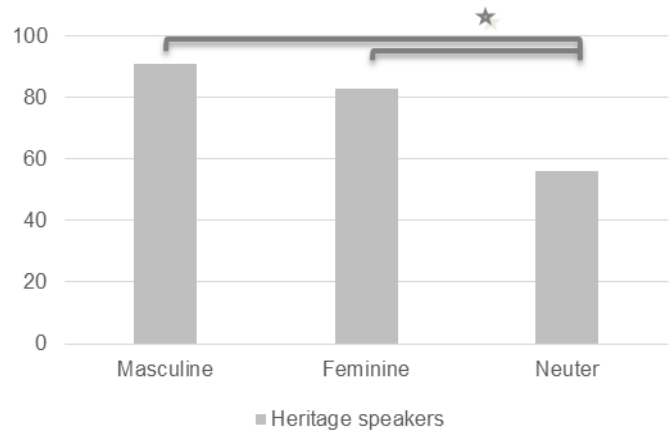

Figure 4.22. Accuracy in production. Noun-Copula Past-PP. Gender categories. Heritage speakers

Noun form transparency

As in the previous tasks, there there was a statistically significant relationship between gender and transparency, ANOVA, F (2, 954) = 6.370, *p.*=002. A *post hoc* test showed that masculine and feminine gender forms were significantly easier to produce than neuter when the word form was transparent (p <.001). Similarly to the Noun-Copula Past-Adjective construction, when the word form was opaque, there was a significant difference between the production of the three gender forms: the masculine was easier than the feminine (p <.001), and the feminine was easier than the neuter form (p <.001). Figure 4.23 (transparent nouns) and Figure 4.24 (opaque nouns) illustrate these findings.

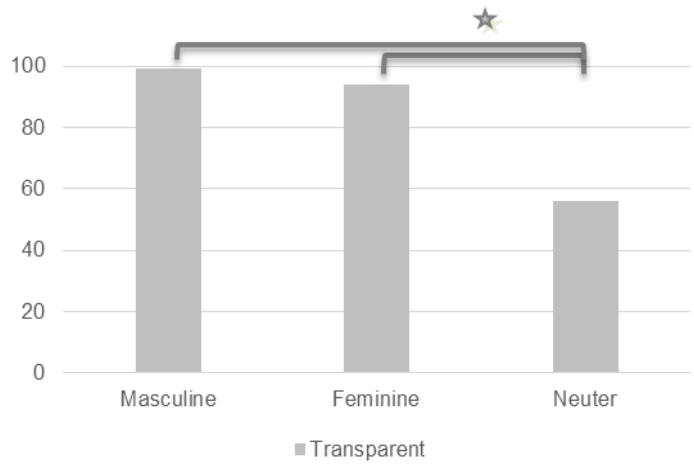

Figure 4.23: Accuracy in production. Noun-Copula Past-PP. Transparent noun forms. Heritage speakers

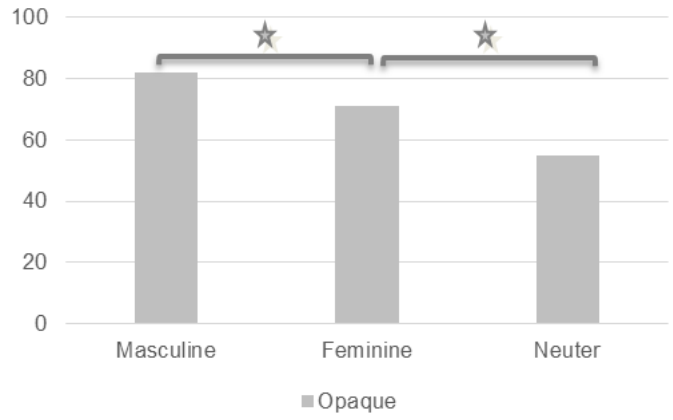

Figure 4.24: Accuracy in production. Noun-Copula Past-PP. Opaque noun forms. Heritage speakers

Heritage speakers vs. monolinguals

Gender values

According to ANOVA, there was a relationship between group type and gender ($F(5, 1914) = 528.145$, $p < .001$). A *post hoc* test revealed that statistically significant differences between the groups appeared with the feminine and neuter forms ($p < .001$ for all) but not with the masculine (see Figure 4.25).

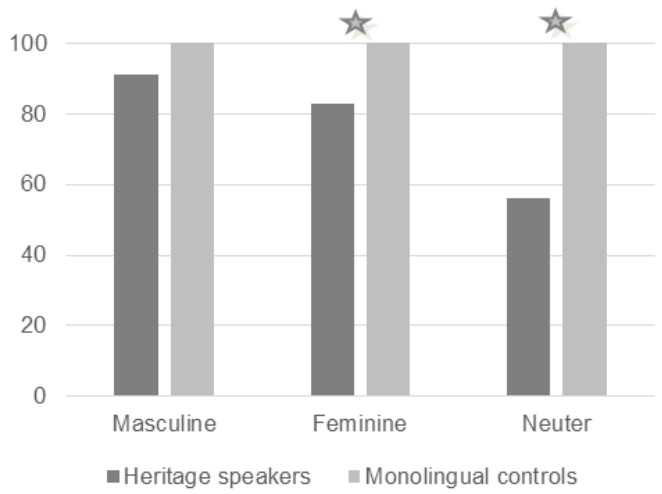

Figure 4.25: Accuracy in production. Noun-Copula Past-PP. Gender categories. Heritage speakers vs. monolingual controls

Noun form transparency

As with the previous constructions, a significant difference was found regarding transparent nouns ($F(5, 954) = 59.773$, $p < .001$) (see Figure 4.26) and opaque nouns (see Figure 4.27) between the heritage speakers and the monolinguals ($F(5, 954) = 182.545$, $p < .001$). A *post hoc* test showed that the difference between the groups was in the opaque masculine, opaque feminine ($p < .001$), transparent and opaque neuter forms ($p < .001$ for both) but not in the transparent masculine and transparent feminine forms. It is notable that only with this construction did the heritage speakers' performance on opaque masculine nouns not reach the monolingual baseline.

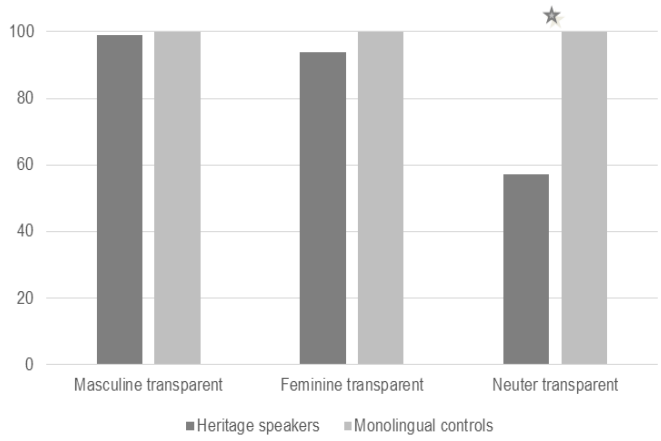

Figure 4.26: Accuracy in production. Noun-Copula Past-PP. Transparent noun forms. Heritage speakers vs. monolingual controls

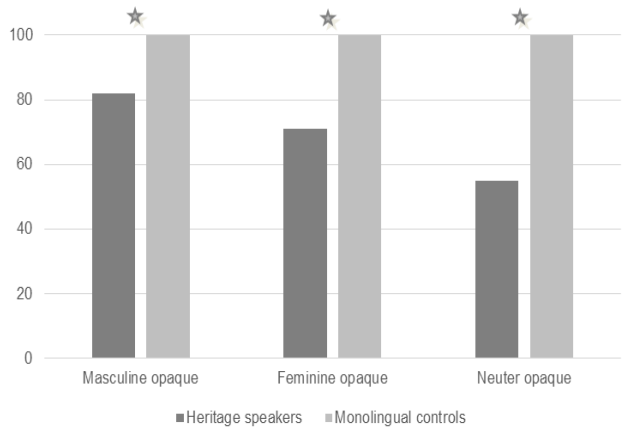

Figure 4.27: Accuracy in production. Noun-Copula Past-PP. Opaque noun forms. Heritage speakers vs. monolingual controls

Crosslinguistic congruency effects

Heritage speakers

In contrast to the three tasks presented above, with regard to the Noun-Copula Past-PP constructions, a relationship between gender and congruency was demonstrated, F (1,731) =1.110, p =.02. The relationship revealed that a significant difference between production of the three gender values was with incongruent forms being produced less accurately than the agreement constructions with congruent nouns (Figure 4.28). Namely, the constructions with incongruent masculine nouns were produced significantly more accurately than the constructions with the incongruent feminine nouns (p =.003). Neuter nouns, on the other hand, were produced significantly less accurately than incongruent masculine and feminine nouns (p <.001 for all).

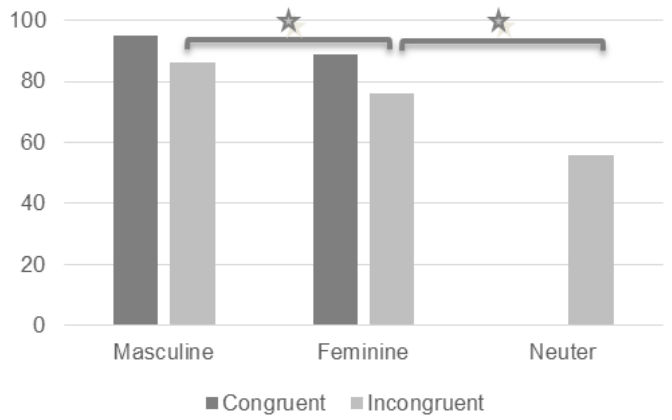

Figure 4.28: Accuracy in production. Noun-Copula Past-PP. Cross-linguistically congruent and incongruent nouns. Heritage speakers

In order to test the congruency effect found above, follow-up repeated-measures ANOVAs focusing on gender, transparency, and congruency as within-subject factors were run. The effects of gender, transparency, and congruency were found to be significant,

and there was a significant relationship between these three factors (F(2,731) = 4.230 p =.015). Figure 4.29 shows this relationship. It was caused by the fact that the heritage speakers did not perform so well in agreement constructions with opaque incongruent masculine and opaque incongruent feminine nouns. This result indicates that the heritage speakers were sensitive to noun form and influence from L2 when producing gender agreement in the Noun-Copula Past-PP construction.

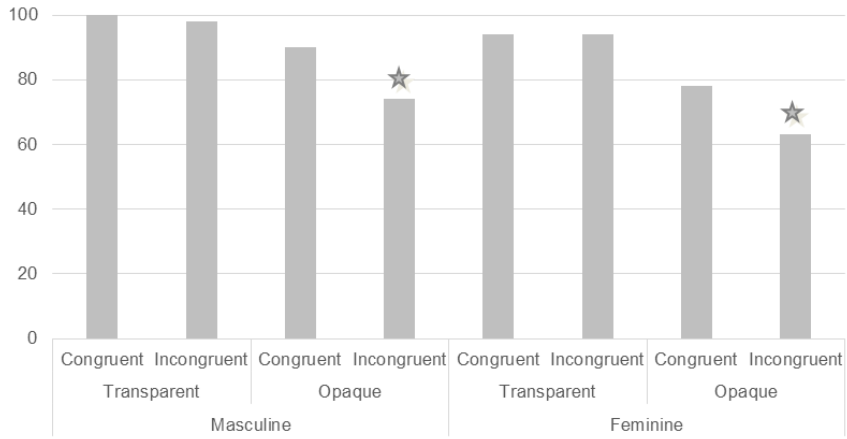

Figure 4.29: Accuracy in production. Noun-Copula Past-PP. Means for gender, transparency, and congruency. Heritage speakers

Summary of section 4.5.2

In the Noun-Copula Past-PP construction, the heritage speakers had different results when compared with the three previous agreement constructions. The masculine and feminine forms were easy to produce only when the subject noun form was transparent. However, when the noun form was opaque, the production of

masculine and feminine gender values posed difficulties. With regard to the neuter gender (with both transparent and opaque forms), the heritage speakers had not only the lowest accuracy rates when compared to other gender values but also when compared to other agreement constructions (in Task, 1, 2, and 3). As in previous constructions, the monolinguals behaved at-ceiling in all conditions. The performance of the heritage speakers was identical to that of the monolinguals only with regard to transparent masculine and transparent feminine nouns. Additionally, only in this construction was the relationship of gender, transparency and congruency yielded, meaning that the production of gender agreement was negatively affected by the form of the noun and by L2 Spanish and Catalan crosslinguistic influence.

4.6 Other results

4.6.1 Gender and agreement constructions

In this section, accuracy in the production of grammatical gender values across four agreement constructions is analyzed. First, accuracy in the production of gender values across four agreement constructions is considered. Secondly, the relationship between all four agreement constructions and the independent variables of gender value, noun form transparency, and crosslinguistic congruency is analyzed. Only the results for the heritage speakers are presented. The accuracy scores of the monolingual children

were 100% and therefore were not subjected to further statistical analysis.

Gender values across agreement constructions

As determined by a one-way ANOVA ($F(4, 3828) = 9.620$, $p < .001$), a significant difference in accuracy was only found between Noun-Copula Past-PP (M=0.79, SD = 0.41) and all three agreement constructions: Adjective-Noun (M=0.87, SD = 0.34), p <.001; Noun-Zero Copula Present-Adjective (M=0.88, SD=0.33), p <.001; and Noun-Copula Past-Adjective (M=0.85, SD = 0.36), p <.001 (see Figure 4.30).

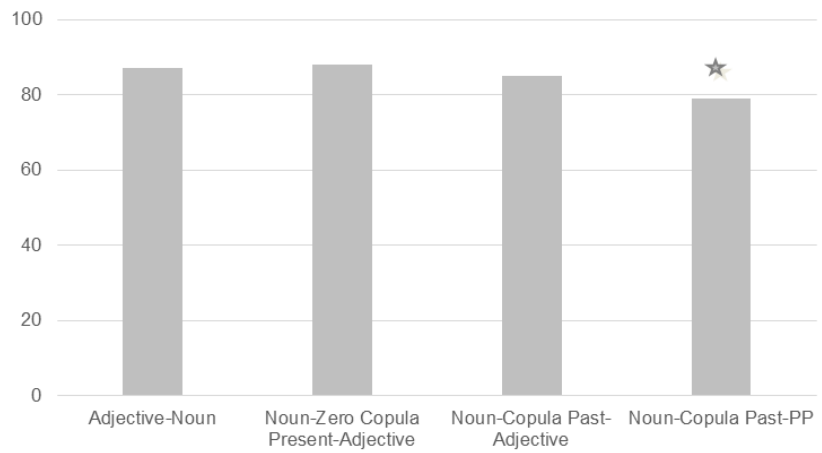

Figure 4.30: Accuracy in production. Four agreement constructions. Heritage speakers

A one-way ANOVA demonstrated a relationship between the type of agreement construction and gender, F (4,1196) = 11.523, *p.* <.001. This relationship was based on production of the the neuter gender, which was produced significantly less accurately in Noun-Copula Past-PP (*M*=0.56, *SD* = 0.49), when compared to Adjective-Noun (*M*=0.76, *SD* = 0.43), *p.* <.001; Noun-Zero Copula Present-Adjective (*M*=0.78, *SD* = 0.42), *p.*<.001; and Noun-Copula Past-Adjective (*M*=0.68, *SD* = 0.46), *p* =.005. With regard to masculine and feminine gender values, no significant differences were found between the constructions (Figure 4.31).

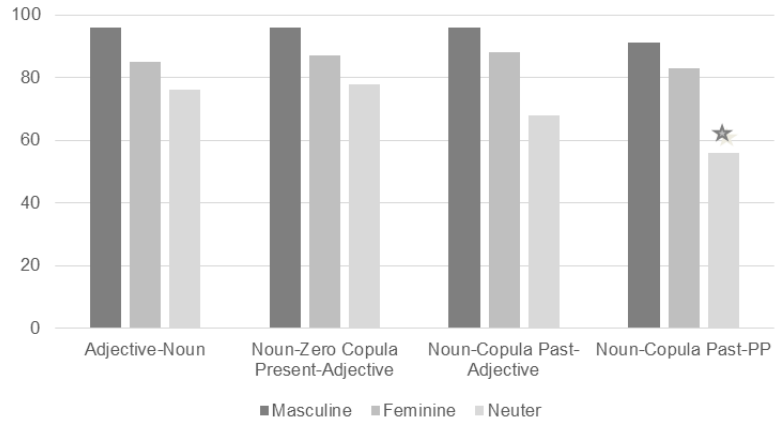

Figure 4.31: Accuracy in production. Four agreement constructions. Gender categories. Heritage speakers

Noun form transparency across four agreement constructions

No relationship between the type of agreement construction and transparency was revealed. However, the heritage speakers were less accurate in the production of opaque nouns in Noun-Copula

Past-PP (*M*=0.71, *SD* = 0.45) than in Adjective-Noun (*M*=0.81, *SD* = 0.39), Noun-Zero Copula Present-Adjective (*M*=0.83, *SD* = 0.38), and Noun-Copula Past-Adjective (*M*=0.80, *SD* = 0.39). The findings are illustrated in Figure 4.32.

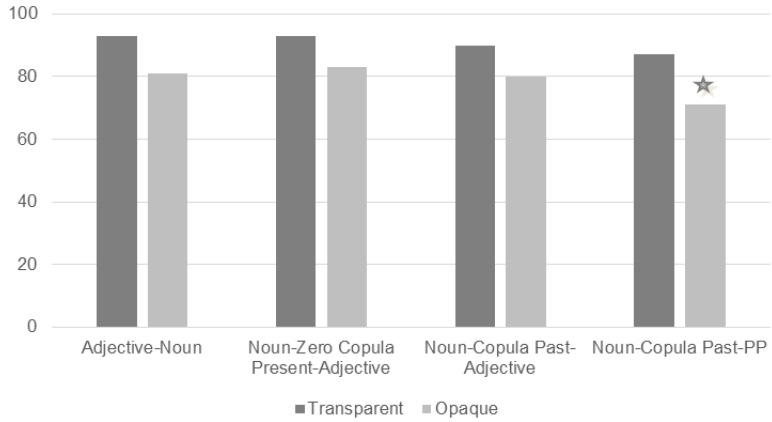

Figure 4.32. Accuracy in production. Four agreement constructions. Transparent and opaque noun forms. Heritage speakers

Moreover, a significant relationship between gender and congruency was demonstrated, F (3, 3599) = 6.227, *p* <.001.

This was due to the incongruent nouns in Noun-Copula Past-PP (*M*=0.80, *SD* = 0.38) being produced significantly less accurately than in the other three agreement constructions (see Figure 4.33): Adjective-Noun (*M*=0.92, *SD* = 0.28), *p* <.001; Noun-Zero Copula Present-Adjective (*M*=0.91, *SD* = 0.31), *p* =.004; Noun-Copula Past-Adjective (*M*=0.90, *SD* = 0.27), *p* <.001.

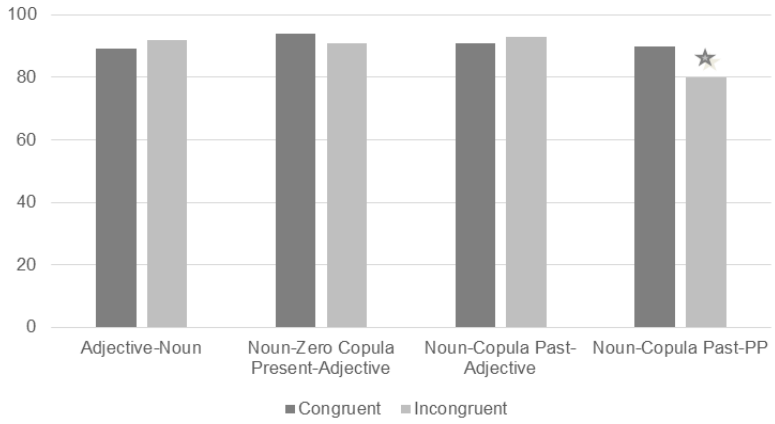

Figure 4.33: Accuracy in production. Four agreement constructions. Cross-linguistically congruent and incongruent nouns. Heritage speakers

In order to test the congruency effect found above, an ANOVA with gender, transparency, and congruency as within-subject factors was run. Significant main effects of agreement construction, gender, transparency, and congruency were observed, as well as a significant relationship between these four factors ($F(8, 3599) = 3.169$ $p = .002$). A *post hoc* analysis showed that opaque incongruent masculine and opaque incongruent feminine nouns scored significantly lower in Noun-Copula Past-PP constructions than the same nouns in the three other agreement constructions (see Figure 4.34); this result is in line with the relationship noted in Section 4.5.2. In all four constructions, neuter nouns obtained the lowest scores, and especially difficult were the neuter nouns in Noun-Copula Past-PP constructions. They were produced significantly less accurately than opaque neuter nouns in the three other constructions ($p < .001$ for all).

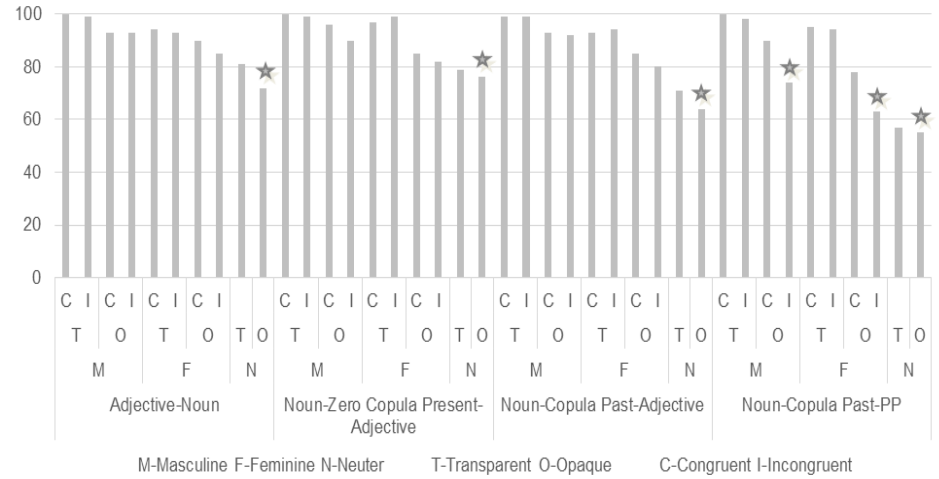

Figure 4.34: Accuracy in production. Four agreement constructions. Means for constructions, gender, transparency, and congruency. Heritage speakers

Summary of Section 4.6.1

The comparison of the four agreement constructions revealed that the heritage speakers were less accurate in the Noun-Copula Past-PP construction than in the other constructions. This result was due to the low scores in production of the opaque incongruent masculine, opaque incongruent feminine, and transparent and opaque neuter nouns. In other words, the production of gender agreement in Noun-Copula Past-PP constructions was significantly more affected by the type of noun gender markers and the crosslinguistic influence from the L2 than in the other constructions.

4.6.2 Gender and background factors

In this section, the role of proficiency in gender knowledge is analyzed. There are two reasons why it is important to be able to take into consideration the general language proficiency of heritage Russian speakers in comparisons of the results of the experimental tasks presented in Sections 4.2-4.5. First, proficiency in the heritage language was found to be an important predictor of performance in the production of grammatical gender values and in comprehension tasks (Janssen, 2016; Lemmerth and Hopp, 2017; Mitrofanova et al., 2018; Polinsky, 2008). Secondly, the heritage speakers are not homogeneous in their Russian language skills and this fact might potentially influence their performance on gender tasks. As explained in detail in Chapter 3, Section 3.2, a picture description task eliciting an oral narrative was employed for the proficiency assessment. Based on the proficiency scores, the heritage speakers were placed in low and high proficiency groups (see Chapter 3, Section 3.3.1). In this section, therefore, the ways in which the proficiency level influences knowledge of grammatical gender are discussed, including the factors observed in Sections 4.2-4.5 (gender values, noun form transparency, and crosslinguistic noun congruency. To control for the effects of proficiency, repeated measures ANOVAs with gender, transparency, and congruency as within-subject factors, and group (low vs. high proficiency heritage speakers) as between-subject factors, were performed for each agreement construction. The results of the two proficiency groups of the heritage speakers were also compared with the monolingual

controls. The rationale for this comparison is the possible closeness of the heritage speakers from the high proficiency group to the monolingual baseline. Furthermore, the analyses will be undertaken to consider whether the relevant background measures are good predictors of accuracy in gender agreement production. The variables (age of onset to L2 and amount of exposure) were obtained from the parental questionnaire. The age of onset represented the age of the child (in months) when he/she was first exposed to other languages than Russian (Spanish and (or) Catalan) regularly. The amount of exposure to Russian was an average percentage of the children's current amount of overall exposure to Russian in different contexts (at home, at school, and in other activities) on a weekly basis. Knowledge of gender agreement was quantified as a cumulative percentage of correct answers in the production of four agreement constructions. The background measures will be examined for any significant correlation with the gender knowledge variable. If there is a correlation, a regression analysis will be applied to see which measures predict the best command of grammatical gender.

Gender and proficiency

NP agreement: Adjective-Noun

Accuracy scores for Noun-Adjective construction were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) x2 (congruent vs. incongruent) x3 (low proficiency vs. high proficiency heritage speakers vs. monolingual controls) analysis of variance. The analyses yielded a significant effect of group, gender, and transparency on accuracy scores, which was qualified by an interaction of the group, gender, and transparency ($F(12, 1692) = 26.867$, $p < .001$). *The post hoc* analyses demonstrated that the results of the group of low proficiency heritage speakers significantly differed from those of the group of high proficiency heritage speakers and the monolinguals with regard to opaque feminine, transparent neuter, and opaque neuter nouns (see Figure 4.35). In other conditions (with agreement constructions containing transparent masculine, opaque masculine, and transparent feminine forms), no difference was found between the groups. The results of the group of high proficiency heritage speakers matched those of the monolingual group, whose performance was at-ceiling.

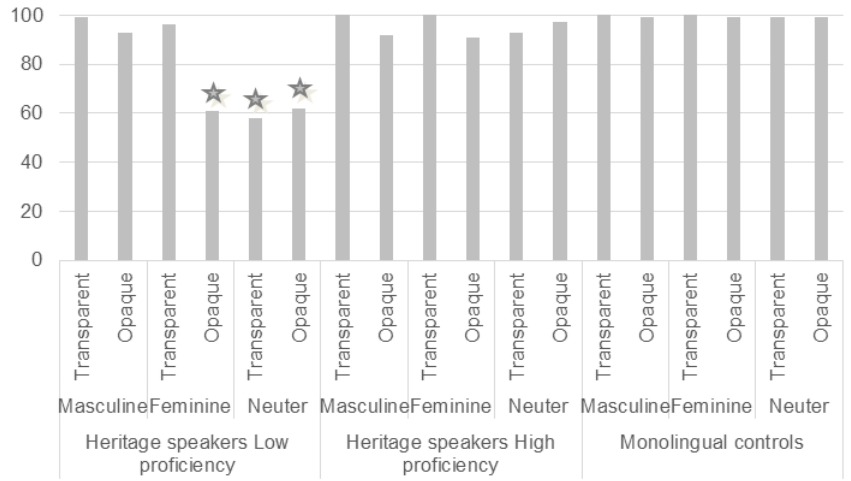

Figure 4.35: Accuracy in production. Adjective - Noun. Gender and proficiency. Means for group, gender, and transparency. Heritage speakers vs. monolinguals

Sentential agreement. Noun-Zero Copula Present-Adjective

In this construction, the analyses yielded a significant effect for group, gender, and transparency, which was qualified by an interaction of the group, gender, and transparency ($F(12, 1692) = 25.325$, $p < .001$). *Post hoc* pairwise comparisons of the groups within conditions revealed the same contrasts as with the previous construction (as Figure 4.36 shows). Namely, the results of the group of low proficiency heritage speakers significantly differ from those of the group of high proficiency heritage speakers and the monolinguals with regard to opaque feminine, transparent neuter, and opaque neuter nouns. In other conditions (with constructions containing transparent masculine, opaque masculine, and

transparent feminine forms) no difference was found between the groups. The results of the group of high proficiency heritage speakers matched those of the monolingual group, whose performance was at-ceiling.

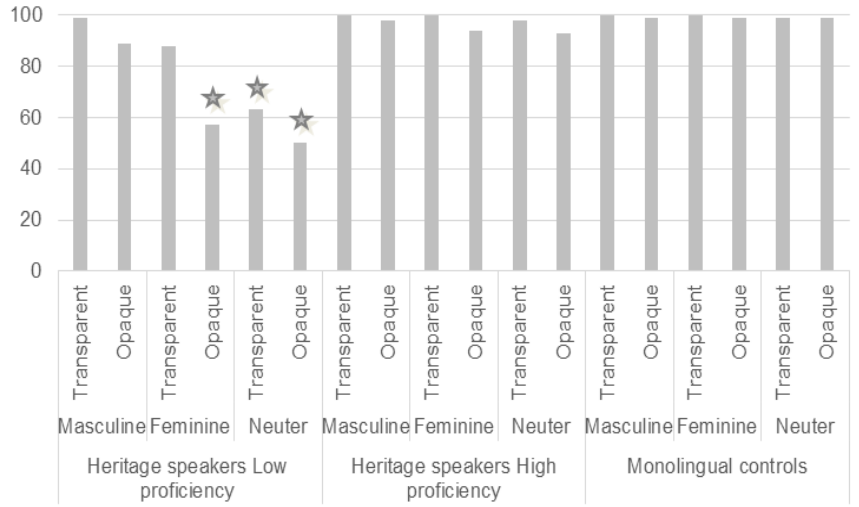

Figure 4.36: Accuracy in production. Noun-Zero Copula Present-Adjective. Gender and proficiency. Means for group, gender and transparency. Heritage speakers vs. monolinguals

Sentential agreement. Noun-Copula Past-Adjective

As in the previous two constructions, the analyses demonstrated a significant effect for group, gender, and transparency, which was qualified by an interaction of the group, gender, and transparency ($F(12, 1692) = 32.145$, $p < .001$). *Post hoc* pairwise comparisons of the groups within conditions revealed similar contrasts to the previous two constructions. Namely, the results of the group of low

proficiency heritage speakers significantly differ from those of the high proficiency heritage speakers group and the monolinguals with regard to opaque feminine, transparent neuter, and opaque neuter nouns. In other conditions (with constructions containing transparent masculine, opaque masculine, and transparent feminine nouns), no difference was found between the groups (see Figure 4.37). The results of the group of high proficiency heritage speakers matched those of the monolingual group, with the exception of opaque neuter nouns, which were produced less accurately by the group of high proficiency heritage speakers.

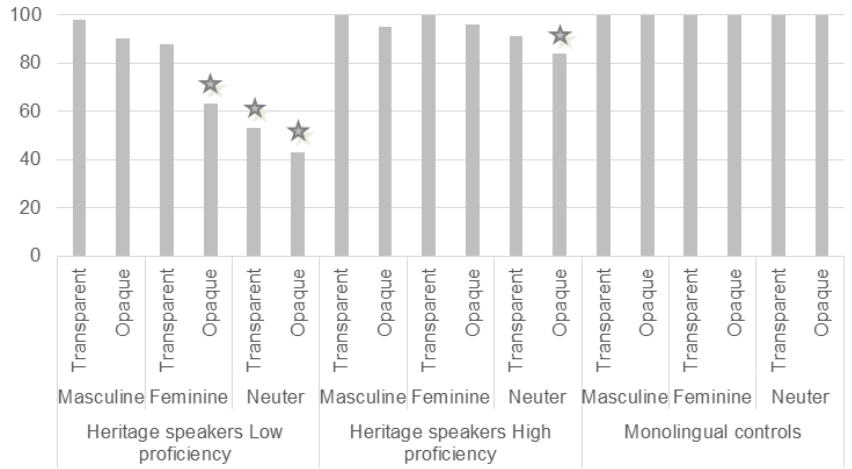

Figure 4.37. Accuracy in production. Noun-Copula Past-Adjective.Gender and proficiency. Means for group, gender and transparency. Heritage speakers vs. monolinguals

Sentential agreement. Noun-Copula Past-Prepositional Phrase

Similar to the previous three constructions, the analyses demonstrated a significant effect for group, gender, and transparency which was qualified by an interaction of the group, gender, and transparency ($F(12, 1692) = 45.709$, $p < .001$). Moreover, in contrast with the other constructions, the results showed a significant main effect of congruency, which was qualified by an interaction of the group, gender, transparency, and congruency ($F(6, 1272) = 4.606$, $p < .001$).

Post hoc pairwise comparisons of the conditions in the relationship between the group, gender, and transparency demonstrated a slightly different pattern when compared to the results regarding the previous construction (Noun-Copula Past-Adjective). Namely, the results of the group of low proficiency heritage speakers significantly differed from those of the group of high proficiency heritage speakers and monolinguals not only with regard to opaque feminine, transparent neuter, and opaque neuter nouns but also with regard to opaque masculine nouns (as illustrated in Figure 4.38). In other conditions (transparent masculine and transparent feminine forms) no difference was found between the groups. The results of the group of high proficiency heritage speakers matched those of the monolingual group, with the exception of opaque neuter nouns, which were produced less accurately by the group of high proficiency heritage speakers.

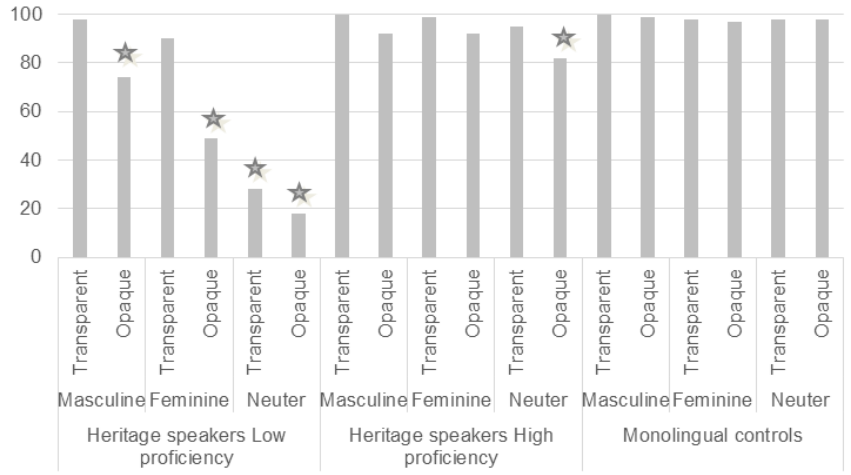

Figure 4.38: Accuracy in production. Noun-Copula Past-PP. Gender and proficiency. Means for group, gender and transparency. Heritage speakers vs. monolinguals

Post hoc pairwise comparisons of the conditions in the relationship between group, gender, transparency, and congruency demonstrated that the effect of congruency obtained in Noun-Copula Past-PP construction in Section 4.5.2 was due to the low performance of the group of low proficiency heritage speakers. As was also demonstrated earlier, the agreement constructions using opaque incongruent masculine nouns and opaque incongruent feminine nouns were problematic for these participants (see Figure 4.39).

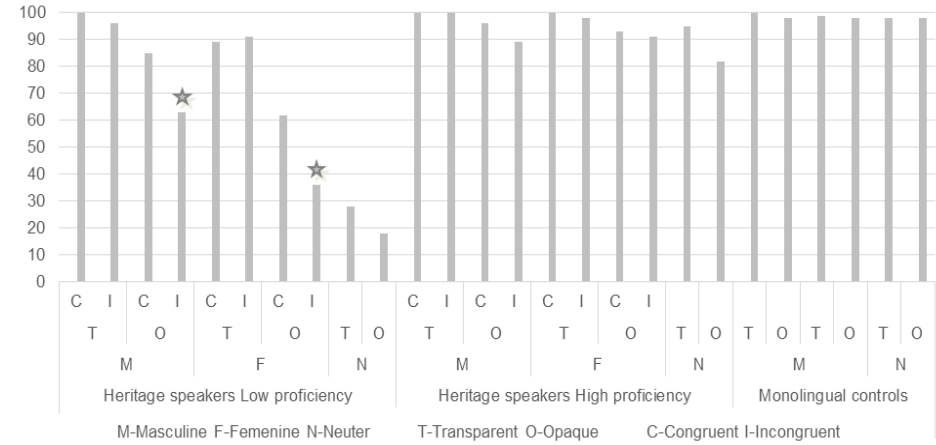

Figure 4.39: Accuracy in production. Noun-Copula Past-PP. Gender and proficiency. Means for group, gender, transparency, and congruency. Heritage speakers vs. monolinguals

Gender and age of onset vs. amount of exposure

In this part, the degree to which age of onset to L2 and amount of exposure influence knowledge of grammatical gender in Russian and its production is examined in the group of heritage speakers The following variables were included in the analyses: the variable gender knowledge was quantified as a percentage of correct answers produced (ranging between 46% and 100%). The age of onset represented the age of a child in months when he/she was first exposed to languages other than Russian (Spanish or Catalan, or both) on a regular basis and ranged from 0 to 84 months; and the amount of exposure to Russian was figured as a percentage of children's current amount of overall exposure to Russian in different contexts (at home, at school, and in other activities) and

ranged from 10% to 58%. The variables are summarized in Table 4.3 below.

	Heritage speakers (n=30)
Gender knowledge in production	Mean=85% Range=46%-100%
Overall amount of exposure to Russian (in %)	Mean=29% Range=10%-58%
Age of onset to L2 (in months)	Mean=15 Range=0-84

Table 4.3: Sociolinguistic variables for heritage speakers. Production experiment

For single correlations, a Spearman's rank-order was run. Concerning the relationship between the age of onset to L2 and knowledge of grammatical gender, there was a positive correlation, which was significant (p = .015). In the case of the relationship between the amount of exposure to Russian and knowledge of grammatical gender in the production experiment, the analyses also yielded a positive correlation between both variables, which was statistically significant (p <.001) and stronger than the previous correlation (Table 4.4). To unveil a more complex and accurate picture of 'true' relationships, multiple regression analyses were performed. The results yielded statistically significant values ($F(2, 28) = 12.227$; p <.001). Moreover, the results showed that the only significant variable affecting the production of grammatical gender

forms was the amount of exposure a child had had to Russian (p = .004 as depicted in Table 4.4), meaning that the more exposure to Russian a child has, the better is the child's command of grammatical gender in production.

Variable	b	SE b	β	t	*P*
Constant	65.126	5.320		17.632	.000
Amount of exposure	.600	.188	.488	3.193	.004
Age of onset	.082	.085	.327	2.138	.065

Table 4.4: Multiple regressions on background variables

Summary of section 4.6.2

The findings have been assessed from the perspective of the role of proficiency in the heritage language. It was predicted that the heritage speakers from the high proficiency group would score significantly better on the production of gender agreement forms than the heritage speakers from the low proficiency group. This turned out to be the case. Moreover, the heritage speakers from the high proficiency group scored similarly to the monolingual control group in all conditions, except for with constructions using opaque neuter nouns in the Noun-Copula Past-Adjective and Noun-Copula Past-PP. In turn, the heritage speakers from the low proficiency group were outperformed by the heritage speakers from the high

proficiency group on the task as a whole (in all agreement constructions) as well as on feminine and neuter gender forms (the more problematic values when compared to the masculine). The scores for masculine nouns between the two proficiency groups of the heritage speakers were similar and matched those of the monolingual group. The transparency of a noun form had an impact on the production of feminine nouns for the heritage speakers from the low proficiency group in all agreement constructions: agreement forms with transparent feminine nouns were produced significantly better than those with opaque feminine nouns. The interaction of transparency and congruency was found only in the Noun-Copula Past-PP construction in the low proficiency group: opaque and incongruent masculine nouns and opaque and incongruent feminine nouns obtained low accuracy scores. Within the low proficiency group of the heritage speakers, performance on neuter (both transparent and opaque) forms was lower than on the other genders in all agreement constructions. No difference was found between the production of transparent and opaque neuter nouns. To sum up, the language proficiency factor turned out to be a significant predictor of the production of grammatical gender agreement forms; the high proficiency heritage speakers were as accurate as the monolingual children. In turn, the deficiencies found in the production of grammatical gender values were all due to low proficiency in heritage Russian. Contrary to the predictions, the amount of exposure to Russian was the only significant predictor of correct production of grammatical gender in Russian. The effect of age of onset to L2 could not be demonstrated.

4.6.3 Error analysis of the production tasks

Task 1: NP agreement: Adjective-Noun

The overall number of errors regarding gender agreement from Task 1 (Adjective-Noun) is displayed in Figure 4.40. The heritage speakers mainly used the masculine forms of adjectives, with the use of feminine noun forms accounting for 44% of errors and the use of neuter forms for around 26%. The feminine form of adjectives was mainly used with masculine (10%) and neuter (20%) nouns. Neuter was used neither with masculine nor with feminine nouns.

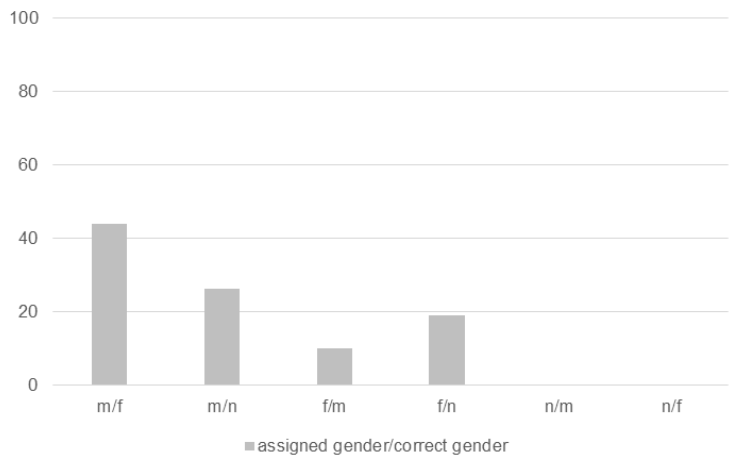

Figure 4.40: Error analyses in production. Adjective-Noun. Percentage of errors in gender categories. Heritage speakers

The errors were analyzed according to transparency. As depicted in Figure 4.41, heritage speakers showed a tendency to incorrectly produce agreement forms in the masculine with opaque feminine

nouns (35%). For example, the masculine form of the adjective was used to agree with the opaque feminine noun (5)

(5) **želt-yj kost´*
yellow-M bone-F
Correct: *želt.aja*-F *kost´*-F
'The yellow bone'

There were only a few errors of agreement with feminine transparent nouns (9%).

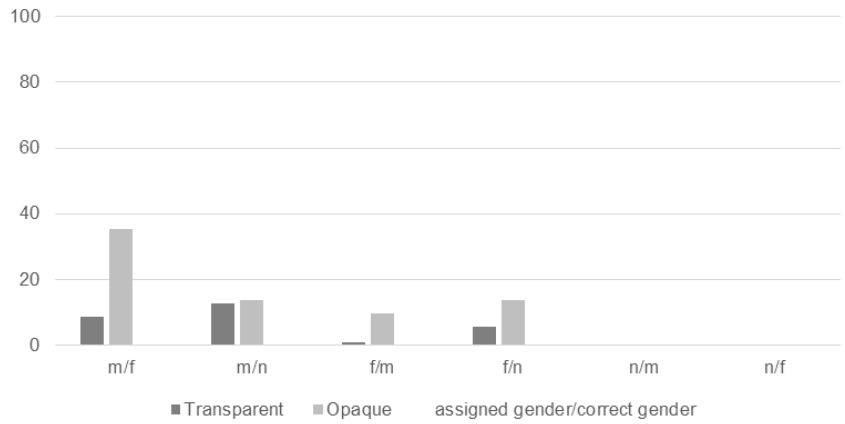

Figure 4.41: Error analyses in production. Adjective-Noun. Percentage of errors in transparent and opaque nouns. Heritage speakers

Additionally, masculine gender forms were equally used with both transparent and opaque neuter nouns (around 12% and 13% of errors respectively). For example, the masculine adjectival form was used to agree with the opaque neuter noun *jabloko* 'apple' (6).

(6) **golub-oj* *jabloko*
light blue-M apple-N
Correct: *golub.oje*-N *jabloko*-N
'The light blue apple'

Feminine agreement forms were incorrectly used with opaque masculine nouns (10%) and opaque neuter nouns (14%), as illustrated in examples 7 and 8.

(7) **sin-jaja* *kluč*
blue-F key-M
Correct: *sin.ij*-M *kluch*-M
'The blue key'

(8) **golub-aja* *jabloko*
light blue-F apple-N
Correct: *golub.oje*-F *jabloko*-N
'The light blue apple'

In general, there were more errors with opaque nouns (70%) than with transparent ones (30%).

The relationship between incorrect gender agreement and crosslinguistic congruency could not be demonstrated statistically, so it is not included in the error analyses of this task.

Task 2: Sentential agreement: Noun-Zero Copula Present-Adjective

In Task 2 (Noun-Zero Copula Present-Adjective), the majority of errors were made with feminine values (40%) and neuter values (48%). As in the previous construction, the heritage speakers mistakenly used masculine forms to agree with feminine nouns (41%) and with neuter nouns (24%). In turn, agreement forms in the feminine were incorrectly produced with masculine and neuter nouns (11% and 24% respectively). Again, neuter forms were not assigned either to masculine or feminine nouns (as illustrated in Figure 4.42).

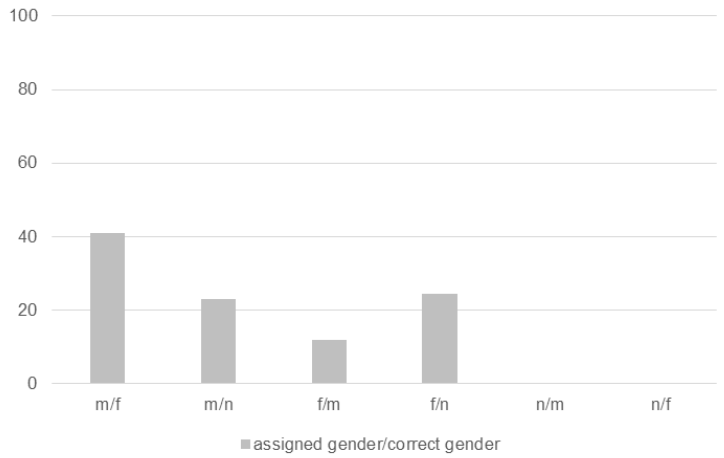

Figure 4.42: Error analyses in production. Noun-Zero Copula Present. Percentage of errors in gender categories. Heritage speakers

The gender errors on the transparent and opaque nouns are illustrated in Figure 4.43 below.

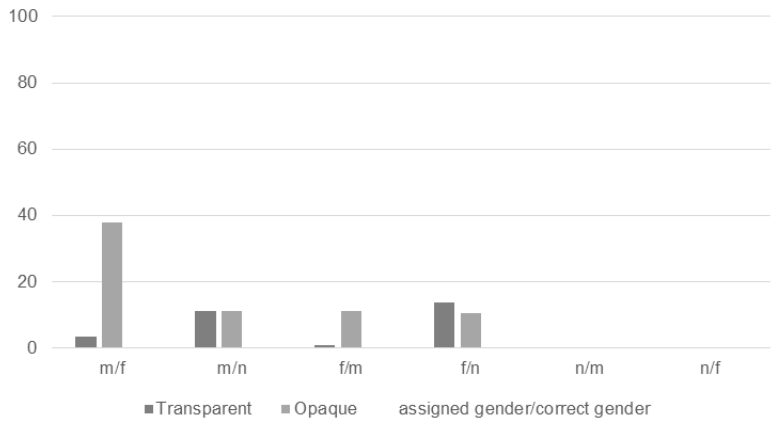

Figure 4.43: Error analyses in production. Noun-Zero Copula Present-Adjective. Percentage of errors in transparent and opaque nouns. Heritage speakers

Similarly to Task 1, there were more errors with opaque forms than with transparent ones. Again, the majority of error (38%) occurred when the masculine form was used with opaque feminine nouns, as example 9 shows.

(9) **želt-yj kist´*
yellow-M brush-F
Correct: *želt.aja*-F *kist´*-F
'The yellow brush'

In 11% of the errors, opaque masculine nouns were mistaken for feminine (10).

(10) **krasn-aja rul´*
red-F steering wheel-M

Correct: *krasn.yj*-M *rul'*-M
'The red steering wheel'

Interestingly, masculine and feminine forms were produced with transparent and opaque neuter nouns in equal proportion (23% and 23%, respectively). For example, the transparent noun *okno* 'window' was incorrectly produced with an adjective in the masculine form (11).

(11) **golub-oj* *okno*
light blue-M window-N
Correct: *golub.oje*-N *okno*-N
'The light blue window'

Task 3 Sentential agreement: Noun-Copula Past-Adjective

The Noun-Copula Past-Adjective construction triggers gender errors with the copular verb and the adjective, as stated previously. The participants demonstrated three main error types in their answers (other error patterns were eliminated due to their low number in the data):

Type 1. An error when the copula and the adjective are of the same gender (77% of all errors).

Type 2. An error in a copula but no error with the adjective (12% of all errors).

Type 3: No error with the copula but an error with the adjective (11% of all errors).

In the analyses, the errors from Type 1 were counted as one error. Due to the low percentage of Type 2 and Type 3 errors, these errors were analyzed together with Type 1.

The results repeated the pattern demonstrated in the previous constructions, namely, that agreement forms in the masculine were mainly produced with feminine (34%) and neuter (24%) nouns. Differently to the previous tasks, in this construction, the number of errors made when neuter nouns were perceived as feminine was rather high (32%). Only 10% of the errors were due to masculine nouns were perceived as feminine. Figure 4.44 illustrates these findings.

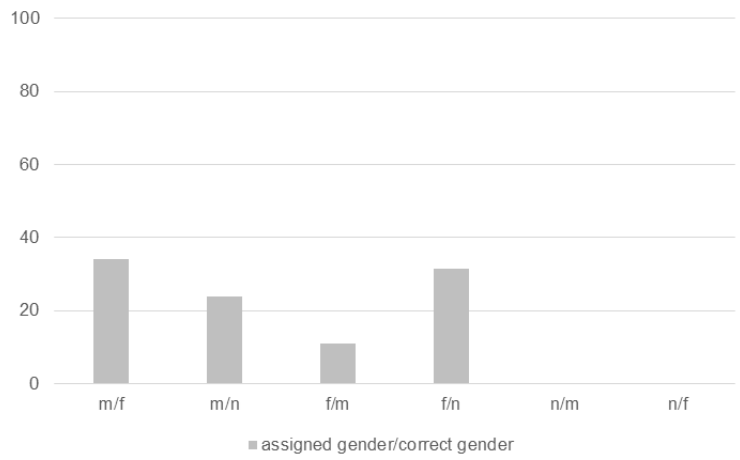

Figure 4.44. Error analyses in production. Noun-Copula Past-Adjective. Percentage of errors in gender categories. Heritage speakers

When transparency and gender were analyzed, as expected, the majority of errors occurred with opaque nouns (see Figure 4.45). For instance, 24% of errors were due to masculine values being applied to opaque feminine nouns ending in a palatalized consonant (12).

(12) **kost´ byl bel-yj*
bone-F was-M white-M
Correct: *kost´*-F *byl.a*-F *bel.aja*-F
'The bone was white'

Twenty-six percent of errors occurred when opaque neuter nouns were taken to be feminine as in 13.

(13) **zerkalo byla golub-aja*
mirror-N was-F white-F
Correct: *zerkalo*-N *byl.o*-N *bel.oje*-N
'The mirror was white'

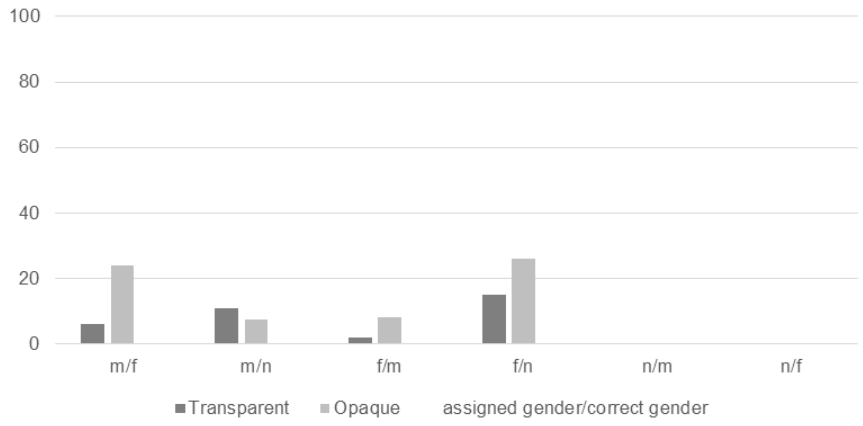

Figure 4.45. Error analyses in production. Noun-Copula Past-Adjective. Percentage of errors in transparent and opaque nouns. Heritage speakers

Task 4 Sentential agreement: Noun-Copula Past-Prepositional Phrase

In Task 4, the majority of errors were made with neuter nouns (52%) (see Figure 4.46). Feminine nouns being seen as masculine accounted for 31% of errors; masculine nouns being taken for feminine accounted for 17% of errors.

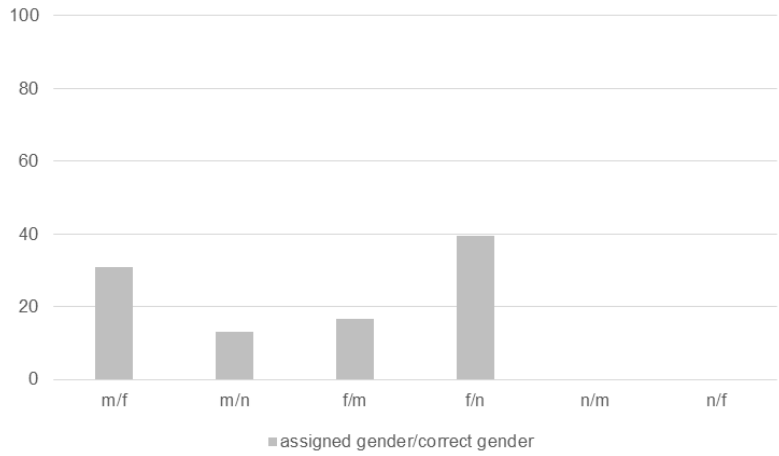

Figure 4.46: Error analyses in production. Noun-Copula Past-Adjective. Percentage of errors in gender categories. Heritage speakers

When transparency was analyzed, the highest number of errors was found in the opaque forms (as in the previous tasks) (as illustrated in Figure 4.47).

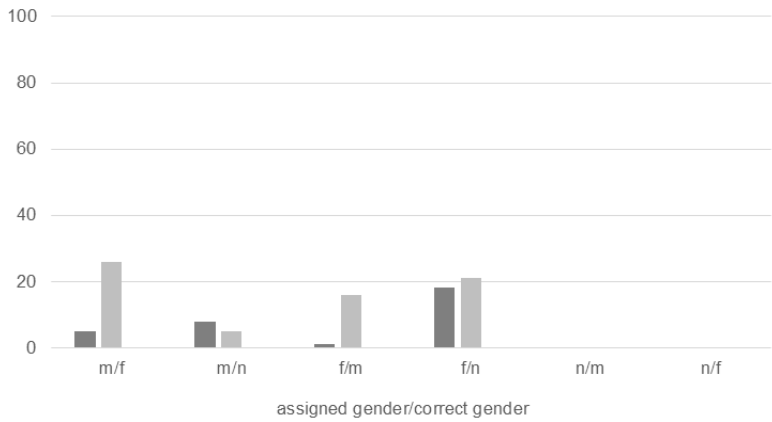

Figure 4.47: Error analyses in production. Noun-Copula Past-PP. Percentage of errors in transparent and opaque nouns. Heritage speakers

For instance, opaque feminine nouns were confused with masculine nouns (26%), as evidenced in the incorrect agreement forms (14):

(14) **kist´* *byl* *na stole*
brush-F was-M on table
Correct: *kist´*-F *byl.a*-F *na stole*
'The brush was on the table'

Sixteen per cent of opaque masculine nouns were confused with feminine ones as in example 15:

(15) **fonar´* *byla* *na stule*
flashlight-M was-F on table
Correct: *fonar´*-M *byl*-M *na stule*
'The flashlight was on the chair'

The heritage speakers also overused feminine forms with both transparent nouns (18% of all errors, example 16) and opaque neuter nouns (21% of errors, example 17).

(16) **pal´to byl-a na stule*
coat-N was-F on chair
Correct: *pal´to*-N *byl.o*-N *na stule*
'The coat was on the chair'

(17) **derevo byl-a na ulitse*
tree-N was-F at street
Correct: *derev.o*-N *byl.o*-N *na ulitse*
'The tree was at the street'

In contrast with the previous constructions, a relationship between gender and congruency was demonstrated statistically. In this construction, heritage speakers made more errors with incongruent nouns (in total, 65% of errors) than with congruent ones (35% of errors), as can be seen in Figure 4.48.

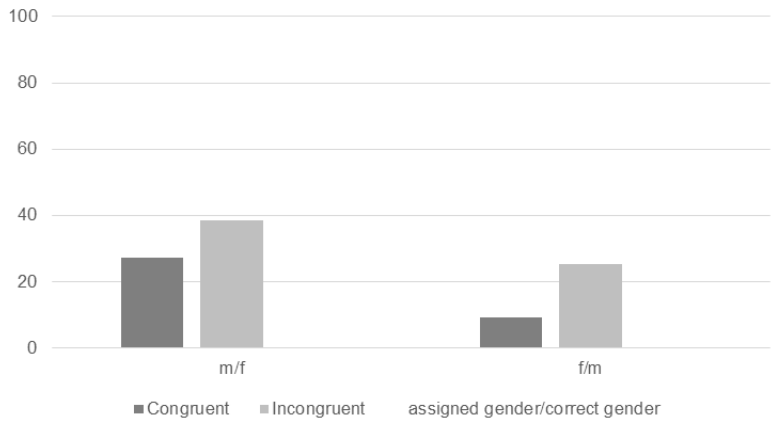

Figure 4.48: Error analyses in production. Noun-Copula Past-PP. Percentage of errors in cross-linguistically congruent and incongruent nouns. Heritage speakers

To sum up, the gender cues served to facilitate the production of agreement values with transparent nouns in all constructions, as evidenced in the type of errors. That is, fewer errors were made with transparent nouns than with opaque nouns. Additionally, in the Noun-Copula Past-PP construction, the heritage speakers made fewer errors with congruent than incongruent nouns (which is in line with the results in Section 4.5.2).

Finally, all errors can be subdivided into categories based on the gender and transparency of the noun gender markers (starting with the most numerous errors). The distribution across the error types is set out in Table 4.5.

1) change of feminine opaque nouns ending in a palatalized consonant

- to masculine (30% of errors), e.g., *tarelka*-F **belyj*-M instead

of *tarelka*-F *belaja*-F, ‘The plate is white’.
2) change of neuter opaque (stem-stressed) nouns ending in -o - to feminine (19% of errors), e.g., *derevo*-N **byla*-F *na ulice* instead of *derevo*-N *bylo*-N *na ulice* ‘The tree was on the street’.
3) change of neuter transparent (end-stressed) nouns ending in -o -to feminine (15% of errors), e.g., *okno*-N **golubaja*-F instead of *okno*-N *goluboe*-N ‘The window is light blue’.
4) change of masculine opaque nouns ending in a palatalized consonant - to feminine (11% of errors), e.g., *kamen´*-M **byla*-F *na stole* instead *kamen´*-M *byl*-M *na stole*, ‘The stone was on the table’.
5) change of neuter transparent (end-stressed) nouns ending in -o - to masculine (9% of errors) e.g, **goluboj*-M *koleso*-N instead of *goluboe*-N *koleso*-N ‘The light blue wheel’.
6) change of neuter opaque (stem-stressed) nouns ending in -o - to masculine (9% of errors) e.g, *mylo*-N **byl*- M **goluboj*-M instead of *mylo*-N *bylo*- N *goluboe*-N ‘The soup was light blue’.
7) change of feminine transparent nouns ending in -a - to masculine (6% of errors) e.g., *tarelka*-F **belyj*-M instead of *tarelka*-F *belaja*-F, ‘The plate is white’.
8) change of masculine transparent nouns ending in a consonant - to feminine (1% of errors) e.g., *utjug*-M **byla*-F **belaja*-F instead of *utjug*-M *byl*-M *belyj*-M, ‘The iron was white’.

Table 4.5: Error categories in Russian gender agreement in production

Having obtained the above findings for errors in production, it was decided to test a very plausible hypothesis that the less frequent

nouns would obtain higher error rates. As stated earlier, the nouns for the experiment were selected from the 5.000 most frequent nouns in the Russian National Corpus (Liashevskaya and Sharov, 2009); however, the frequency of their use was not the same. Thus, it might be suggested that the number of errors depends on the frequency of the nouns: the gender of less frequent nouns may be acquired or retrieved from memory with a delay. In order to test that assumption, a list of the nouns that have the highest number of errors across all agreement constructions and their frequency rate was compared. Frequency information was taken from StimulStat lexical database (Alexeeva, Slioussar, Chernova, 2018) which is based on adults' speech. Note that no frequency lists based on child-directed speech were available for Russian. Visual inspection of the first ten most erroneous nouns in Table 4.6, makes it clear that there is no relationship between frequency and the number of gender agreement errors made with these nouns.

Noun		% errors	Frequency (ipm)
1.	*jabloko* 'apple'	5.7	53
2.	*mylo* 'soap'	5.0	16.6
3.	*sol'* 'salt'	4.7	39.4
4.	*zerkalo* 'mirror'	4.7	70.5
5.	*morkov'* 'carrot'	4.5	8.8
6.	*kist'* 'brush'	4.5	26.1
7.	*koleso* 'wheel'	4.5	68.4
8.	*uho* 'ear'	4.5	139.3
9.	*lico* 'face'	4.5	878.0

10.	*kol'co* 'ring'	4.0	59.5

Table 4.6: Frequency of the most erroneous nouns in the production activity

Summary of section 4.6.3

In sum, the findings with regard to the production of incorrect gender values (on adjectives and verbs) with inanimate nouns by the heritage speakers were:

- Masculine values were assigned incorrectly in 54% of all errors.
- Feminine values were assigned incorrectly in 46% of all errors.

No neuter values were assigned to any of the nouns The replacement of feminine values by masculine values (especially with opaque forms) was the most frequent error (36%) followed by the replacement of neuter values with feminine values (34%).
Additionally, the frequency of use of the nouns did not have any facilitating effect on gender agreement production.

4.7 Discussion of the findings for the production experiment

This chapter discusses the results of the production experiment in the light of the above-discussed internal (gender values, noun form transparency, type of agreement construction) and external linguistic factors (crosslinguistic influence, language proficiency,

age of onset to L2 and the amount of exposure to the heritage language) relevant to this study. In this experiment, gender agreement with inanimate nouns at the nominal level (Adjective-Noun) and at the sentence level (Noun-Zero Copula Present-Adjective, Noun-Copula Past-Adjective, Noun-Copula Past-PP agreement constructions) were elicited. In other words, the four experimental tasks discussed above made a possible comparison between (a) agreement between the adjective and the target noun in tasks 1-3 and (b) agreement between the copula verb and the target noun in tasks 3-4. The construction in Task 3 manifested a 'double agreement' - both for a verb and an adjective with the target noun. The prediction that the Russian agreement (and gender) system, in general, is phonologically determined was held. The phonological cues made it easier for the participants to assign gender to the transparent nouns than to the opaque ones; the resemblance of the inflectional endings of transparent nouns, adjectives, and past tense verb forms also served to facilitate the assignment of gender. This was especially relevant for the feminine nouns since their opacity makes them sound like masculine ones. The gender congruency of nouns in Russian and in L2s was also accounted for as a predictor of greater accuracy in the agreement performance. The relevance of this measure showed that children make use of the grammatical information of both languages while speaking Russian, especially with regard to the Noun-Copula Past-PP agreement constructions. Below these findings will now be considered in the light of the specific hypotheses and predictions formulated in Section 4.1.4.

Gender values

Prediction 1: The main prediction regarding gender values is that the children will be more accurate in agreement with masculine nouns than with feminine or neuter, probably because, according to previous studies and findings on agreement, the masculine is viewed as the default gender. In the case of neuter agreements, errors were expected because of the lack of this gender in Spanish and Catalan grammars, meaning the children could not rely on L1 gender values. A further factor to take into account is that the neuter form is the weakest gender form in Russian and is acquired later than the feminine and masculine. The results for the feminine gender can vary and may depend on other factors (i.e., transparency of the noun form, congruency, agreement construction, etc.).

Since in the high proficiency group of heritage speakers, no significant differences were found between gender values in comparison with the native controls, the findings for the participants from the low proficiency group of the heritage speakers will now be considered. Generally, there was a high level of variability in the scores for gender agreement in language production of the heritage speaers (the accuracy scores ranged from 99% to 56%). The ranking of the accuracy scores followed the gender hierarchy proposed by Polinsky (2008) (see Chapter 2). Namely, the results reflected the ranking of the difficulty of the different gender values on a three-point scale (1 easiest - 3 most difficult): masculine (1) > feminine (2) > neuter (3). As observed, masculine gender forms were

produced more accurately than feminine ones and more accurately than neuter forms in all agreement constructions. Furthermore, masculine gender forms was the only category produced equally well by the low proficiency speakers and the monolingual controls. This finding is not surprising, as masculine is usually considered to be the default gender, since it is the most frequent, attracts most borrowings, and is associated with the default declension class (Corbett and Freser, 1999). The error analyses support this fact: the results showed an overuse of the masculine in non-masculine conditions (54% of all errors). The preference for the masculine in heritage Russian can also be reinforced by the crosslinguistic influence from Spanish and Catalan, both languages with a masculine default (for a detailed discussion of this, see Beatty-Martinez and Dussias, 2019). The outstanding role of the masculine was also demonstrated in Mitrofanova et al. (2018). In their study, two groups of bilinguals (age range 4-10) were compared. One group consisted of 28 children who come from families with Russian-speaking mothers and Norwegian-speaking fathers, and another group included 26 children who come from families where both parents are Russian speakers. All participants accomplished a naming task, in which adjectival agreement was elicited. The statistical analysis of the experiment revealed that both bilingual groups were as accurate as the monolingual group with regard to transparent and opaque masculine nouns. According to the researchers, the result was due to the crosslinguistic influence from Norwegian, in which the masculine is the morphologically default gender.

In line with the predictions made in this research, the neuter gender was the most challenging category for heritage speakers; the accuracy scores for production of neuter forms were the lowest, and, depending on the agreement construction, ranged between 78% and 56%. These scores on gender reflect considerable variation concerning knowledge of the neuter gender. Crucially, even though the lowest accuracy scores in the production experiment related to the production of neuter forms, there is no evidence of this category loss in the heritage speakers'; all participants from the low proficiency group produced neuter agreement forms (albeit with errors). By contrast, the low proficiency adult heritage speakers in Polinsky's study (2008) demonstrated almost a floor result for neuter gender. As the author suggested, the grammars of the low proficiency heritage speakers were restructured: the 3-gender system in Russian was simplified into a binary masculine vs. feminine system. However, the participants in this study differ from those in Polinsky's in various aspects. First, the participants from Polinsky's study were adult heritage speakers (average age 27) with no literacy skills in Russian, who reported: "speaking English all the time but understanding Russian when spoken to by family members". In contrast, in this study, the participants were young heritage speakers, aged 7-11, all with literacy skills in Russian, who were constantly addressed in Russian at home and received some formal Russian input on a regular basis. Taking into account the age difference between the participants of Polinsky's study and this one, it may be suggested that the heritage grammars of the young heritage speakers aged 7-11 are still in the developing stage and it

might be that the neuter gender value is still not fully acquired. Different studies in child language acquisition have demonstrated that various linguistic features are not acquired at the same speed from one language to another. For example, the gender of ambiguous nouns (nouns with opaque forms and hybrid nouns) in Russian is acquired relatively late by Russian-speaking children, after age 5-6 in the case of hybrid nouns (Rodina, 2008; Rodina and Westergaard, 2012) or by age 6-7 in the case of formally opaque nouns (Ceitlin, 2009; Gvozdev, 1961). It may take longer for the heritage speakers to acquire gender features than for their monolingual peers because the amount of exposure to Russian is not 100% as their exposure is to three languages: Russian, Spanish, and Catalan. Moreover, the participants of this study have not reached puberty - the time when the second critical period for language acquisition occurs (see Birdsong, 1999; Montrul, 2008, pp. 112-117 for a critical discussion of the effects of age on acquisition). Thus, their L1 linguistic ability might be still developing and gender distinctions may be fully acquired after the puberty period. Importantly, the participants from Polinsky's study had already overcome the critical period and reduced input and a lack of consistent and sustained exposure to Russian and literacy skills in this language may have resulted in L1 attrition. However, it is likely that some of the participants of the current study will not fully master the neuter gender value due to insufficient exposure to Russian (based on the sociolinguistic data from the questionnaire, some of the participants receive less than 20% of input in the heritage language), and hence this can be considered a case of

incomplete acquisition (Montrul, 2002; Polinsky, 2006). Curiously, and to add strength to the challenging nature of the neuter form, the tendency to reduce the use of the neuter gender is also visible in some Russian dialects. For instance, in the Doukhobor variety of Russian, neuter nouns undergo declension shifts to the feminine gender (Makarova, 2013, 2019). This shift (as evidenced in agreement) mostly affects the stem-stressed neuter nouns that are homophonic with feminine nouns ending with a vowel, e.g. *adná*-F *mésta*-F 'one place'. The end-stressed neuter nouns also undergo this shift (e.g., *malakó*-N *pateklá*-F) but partly because the stressed suffix largely blocks a full gender shift in agreement. The author explains the weak status of neuter by its very low frequency in Russian compared to the frequency of the feminine and masculine forms; neuter nouns comprise only 13% of nouns in Russian (Ahutina et al., 2001, p. 296; Comrie et al., 1996, p. 109). Also, the tendency to produce a feminine agreement with neuter nouns might be associated with the ways in which heritage speakers acquire the language. That is, heritage speakers typically grow up hearing the heritage language and generally depend on auditory inputs for gender learning because their exposure to the written register of the heritage language is limited (Benmamoun et al., 2013; Rothman, 2007). In a native language, learners are usually exposed to both auditory and orthographic input, which can facilitate the acquisition of the lexicon and some grammatical features (Ehri and Wilce, 1979; Rosenthal and Ehri, 2008). The difficulty of neuter gender acquisition lies in its phonological ambiguity. In addition to the fact that stem-stressed neuter nouns resemble feminine nouns, the

agreed elements (stem-stressed) with neuter nouns in the nominative singular (the case form relavant for this study) sound similar to the agreed elements with feminine nouns. Compare the transcription of stem-stressed nouns and stem-stressed adjectives in neuter and their written form in the example below:

-neuter agreement: *malen'k**əje***-F/N *óblak**ə***-N 'The little cloud'

-feminine agreement: *malen'k**əja***- F/N *krúžk**ə***-F 'The little cup'

However, the gender of these values can be unambiguisly recovered from the written forms, as exemplified below:

-neuter agreement: *malen'k**oe***-N *óblak**o***-N 'The little cloud'

-feminine agreement: *malen'k**aja***-F *krúžk**a***-F 'The little cup'

Thus, learning to write may affect the understanding of the distinction between neuter and feminine gender forms. In the way that exposure to a written register of Russian could be essential in mastering the neuter gender value, especially in the case of stem-stressed opaque nouns (and probably feminine opaque nouns, which are discussed further below). Even though the participants of the current study receive formal classes in Russian, their exposure to the written register may be insufficient to learn some properties of the language. A lack of formal school instruction and literacy may delay the acquisition of infrequent grammatical patterns (Peeters-Podgaevskaja, 2015). As Keijzer (2007) states, even in L1 acquisition, it takes at least 13 to 14 years (or even more) to achieve adult native levels of proficiency, and schooling plays an important role in morphosyntactic development.

Another reason for the low performance in agreement constructions with neuter nouns may be the influence of the L2 on heritage Russian. The absence of the neuter gender in one of the languages of the heritage speakers causes difficulties with the acquisition of this gender, as seen in Polinsky (2008) or Schwartz et al. (2014). For example, Laskowski (2009, cited in Janssen, 2016) examined the language skills in Polish of 5-15-year-old Polish-Swedish bilingual children. The Polish gender system is similar to Russian and includes three gender values (masculine, feminine, and neuter); in turn, Swedish has a two-gender system (like Spanish and Catalan). The author reported that the difficulties the Polish children had with neuter gender agreement were caused by the lack of the neuter gender in Swedish grammar. To sum up, the masculine gender was found to be largely unproblematic for the heritage speakers, probably due to its high frequency and its default nature in Russian. As expected, the neuter gender was the most problematic. It is difficult to say what the exact reason for this finding is. Most probably, a combination of factors including the infrequency of neuter nouns, low phonological saliency in the input and influence from L2 Spanish and Catalan may have delayed the acquisition of this category. The results for the production of feminine gender forms were in between those for the masculine and neuter forms and are discussed in detail in the next paragraph.

Noun form transparency

Prediction 2: Given that morphological form can facilitate knowledge of grammatical gender, it might be expected that nouns with transparent gender markers will not provoke many difficulties. In contrast, it was expected that producing agreement with morphologically opaque nouns in all gender values might be challenging for the heritage speakers.

In the low proficiency group, the transparency of gender cues played a significant role in the feminine condition (the high proficient heritage speakers performed equally well on both transparent and opaque feminine nouns). That is, the agreement forms with transparent feminine nouns were produced quantitatively and qualitatively more accurately than they were with opaque feminine nouns. No differences were found between transparent and opaque masculine and transparent and opaque neuter nouns. Thus, Prediction 2 regarding noun form transparency was partly true. The significant role of transparency, mainly for the feminine, can be attributed to two things. First, the distinction between transparent and opaque masculine nouns is likely to be masked by the masculine default strategy (as discussed above). This may be the reason why no difference was found between transparent and opaque masculine nouns and might also serve as an explanation of higher accuracy in the masculine condition when compared to the feminine and neuter. Secondly, the difference between transparent and opaque neuter nouns did not surface in the

case of the group of low proficiency heritage speakers because neuter nouns are generally a challenge for them (as observed in detail above). Thus, the prediction that only opaque nouns forms cause difficulties in the production of grammatical gender values has been proven, but only for feminine nouns for the reasons just stated. Additionally, the error analyses demonstrated that the heritage speakers were less target-like with opaque nouns (69% of all errors) than with transparent ones (31% of all errors). The marked difference between transparent and opaque feminine nouns may also be explained by phonological patterns, which can facilitate (in the case of transparent nouns) the acquisition of grammatical gender. For instance, the NP with the feminine noun ending in -a and the agreed adjective ending in –aja is easier to acquire than nominal agreement with opaque feminine nouns. In other words, the similarity between the inflectional endings of nouns and adjectives, and nouns and verbs, accordingly, can facilitate the acquisition of gender agreement patterns. Partly similar inflectional endings are acquired earlier as opposed to the contrasting ones. This kind of phonological "resemblance" of agreement forms explains the exclusive position of the feminine gender in the data from this study since only with feminine nouns does the contrast between transparent and opaque nouns serve to "switch on" the mechanism of phonological harmony in gender agreement acquisition. This will be discussed in detail in Chapter 6 (the final discussion). To sum up, the fact that the transparency of gender cues played a facilitating role in the production of feminine gender forms, may indicate that purely cue-based gender agreement occurs when no other strategy

can be applied: neither (a) the strategy of using a default gender (in the case of masculine nouns); or (b) a lack of knowledge of the gender (in the case of neuter). Additionally, this result may be attributed to phonological reasons, which can promote or impede the acquisition of agreement forms with feminine nouns.

Crosslinguistic congruency effects

Prediction 3: The results of previous research regarding crosslinguistic congruency effects are not homogeneous. Most studies on gender acquisition in an L2 reveal a congruency effect; in contrast, a crosslinguistic influence is not apparent in studies of heritage speakers and bilinguals. Therefore, it was expected that results for crosslinguistic influence would not be straightforward, and might be found in the vulnerable areas of knowledge of grammatical gender agreement (e.g., agreement forms with opaque nouns, in the low proficient group of heritage speakers).

If a child acquires two languages, a certain degree of interaction between those languages is to be expected. Thus, it was predicted that gender agreement in the heritage language would be easier if the gender of a noun in Russian (L1) coincided with the gender of the same noun in the L2s, i.e., Spanish and Catalan. In contrast, it would be more difficult to produce an agreement with the nouns in which gender differs between the L1 and L2 (see, e.g., Polinsky, 2008; Schwartz et al., 2014). In general, no great impact of

crosslinguistic congruency on gender knowledge in three of the four agreement constructions was found. The low proficiency heritage speakers demonstrated a congruency effect but only in relation to the Noun-Copula Past-PP construction. The interpretation of this issue is discussed further below and also in the discussion regarding Prediction 4.

The lack of a congruency effect in three of the four agreement constructions can be observed in the light of how grammatical gender selection mechanism operates during language production in bilinguals. Two options are possible: (a) the gender systems interact (see, e.g., Bordag and Pechmann, 2007; Lemhöfer, Spalek, and Schriefers, 2008; Paolieri et al., 2010); or (b) the gender systems are independent (Costa et al., 2003a). The results of this study regarding Adjective-Noun, Noun-Zero Copula Present-Adjective, and Noun-Copula Past-Adjective constructions are compatible with the later model. Lack of crosslinguistic interaction for information regarding grammatical-gender was shown by Costa et al. (2003a), who found that bilingual speakers of Croatian-Italian, Spanish-Catalan, and Catalan-Spanish demonstrated comparable levels of performance. In their study, the participants completed a series of picture-naming experiments. The picture names were gender-congruent vs. gender-incongruent in the bilinguals' two languages. The naming performance of the bilinguals was independent of the gender value of the words, as the authors described in The Language Autonomy View. They also suggested that the degree of language autonomy in both gender systems of a bilingual speaker

depends on the proficiency level in the bilinguals' languages: the lower the level of proficiency, the higher is the gender congruency effect. However, the results of this study did not confirm this: a congruency effect was found neither in the group of low proficiency nor in the group of high proficiency heritage speakers. Importantly, the results of the online comprehension experiment (Chapter 5) should provide more information regarding the congruency effect in these constructions.

In contrast to the above-mentioned agreement constructions, the congruency effect was demonstrated in the group of low proficiency heritage speakers but only in the Noun-Copula Past-PP construction. Specifically, verbal agreement with the opaque masculine and opaque feminine was produced significantly more accurately when the nouns were congruent than incongruent. This result may be attributed to a combination of various factors: (a) a lack of gender agreement on verbs at the abstract syntactic level in Spanish and Catalan; (b) the morphophonogically ambiguous form of nouns; and/or (c) low proficiency in Russian. Under these conditions, it is likely that the heritage speakers take advantage of their L2 language and transfer the congruent gender values from their L2 to Russian. In this case, a positive crosslinguistic influence occurs. However, this strategy does not work in the case of incongruent nouns. As a result, a negative crosslinguistic influence can take place and the children produce verbal agreement forms with incongruent nouns incorrectly. This finding resonates with the results reported for child Russian heritage speakers in Germany

(Lemmerth and Hopp, 2017). The authors found lower gender agreement accuracy for incongruent nouns than for congruent nouns in the Russian-German simultaneous bilinguals group, who were German dominant. In contrast, a null effect was reported in the Russian dominant successive bilingual group. As in this study, it might be that the crosslinguistic influence from German facilitated gender agreement with congruent nouns but in the case of incongruent nouns, the "stronger" language dominated and impeded gender assignment in the "weaker" Russian language. Curiously, no congruency effect was found in the other construction with gender marking on verbs, namely the Noun-Copula Past-Adjective construction. This was a rather unexpected result, which can be attributed to the fact that the presence of adjectives may have a priming effect on a verb and, thus, facilitate agreement production on verbs in this construction. This is explained in the next paragraph and a more detailed discussion on this issue is provided in Chapter 6. Finally, it can be added that the evidence in favour of no gender congruency effect is inconclusive: future research is needed to consider language production in all three languages of the participants of this study (Russian, Spanish, and Catalan)

Gender and agreement construction

Prediction 4: The performance of the heritage speakers across agreement constructions was assessed to see whether it varied. More specifically, knowledge of grammatical gender was assessed

on two levels of agreement: the nominal and the sentential. To this end, gender markings on adjectives in attribute and predicate position, which is shared between Russian and Spanish and Catalan, was compared with gender marking on verbs, which is unique to Russian. Based on these differences in the morphosyntactic realization of gender between Russian and Spanish and Catalan, it was expected that Russian heritage children would be less accurate regarding gender marking on verbs than gender marking on adjectives. It was also predicted that the constructions in which both copula verb and adjective agree with a noun (Noun-Copula Past-Adjective; Task 3) would cause more difficulties than the construction in which only the copula verb agrees with a noun (Noun-Copula Past-PP; Task 4) due to the supposed cognitive difficulty of processing the former agreement construction.

The comparison of the four agreement constructions revealed that the Noun-Copula Past-PP construction was the most problematic for the heritage speakers; a significant proportion of incorrect answers were given. One of the reasons why heritage speakers did not deploy gender morphology in this construction with the same accuracy as in other agreement constructions, particularly in the case of the Noun-Copula Past-Adjective construction, could be the possible negative influence from the L2 Spanish and Catalan on Russian, as mentioned previously. As well known, L2 effects in L1 heritage morphosyntax have been documented in different studies (for example, Albirini and Benmamoun, 2014; Gagarina, Armon-Lotem, and Gupol, 2007; Lemmerth and Hopp, 2017). On the one

hand, the L2 can facilitate L1 acquisition, especially when L1 and L2 share grammatical properties. On the other hand, if the L1 differs from the L2 in how it realizes a phenomenon or if the L1 does not have an L2 property at all, the L2 can exert a negative effect on L1 acquisition and L1 production. It is important to remember that verbs in Spanish and Catalan are not marked for gender whereas in Russian, gender agreement is realized on verbs in the past. This overlap between the two grammar systems probably leads to negative transference from Spanish and Catalan to Russian, evidenced in a significant proportion of incorrect answers in the Noun-Copula Past-PP construction. In sum, if an individual is bilingual in two languages, and the languages do not realize gender agreement syntactically similarly, then it might be expected that this negatively affects the ability to produce agreement.

Another possible explanation for the difficulty of gender agreement on verbs when compared with gender agreement on adjectives can be the incomplete and then inconsistent acquisition of the verbal agreement paradigm by the heritage speakers. In Russian, verbal forms are more complex than adjectival forms because they are marked for voice, mood, tense, person, number, and gender (in comparison, adjectives are marked only for case, gender, and number). Unfortunately, the area of verbal vs. adjectival gender agreement in bilingual production appears to have received little or no attention in the past. However, a few studies available have reported the weakening of verb morphology when compared to

other agreement constructions (Anderson, 1999, 2001; Fairclough, 2006). In this sense, this study adds little evidence to this area.

Besides this, it could be asked why the Noun-Copula Past-Adjective construction did not yield difficulties in comparison with the Noun-Copula Past-PP construction. It was predicted that this construction would be more difficult because of the 'double' agreement and the supposed cognitive difficulty in processing it. However, this prediction was not borne out. Concerning gender agreement in the Noun-Copula Past-Adjective construction, there are two possible explanations. First, the presence of an adjective in the agreement construction may facilitate the production of gender agreement on a verb. It has been pointed out that Russian, Spanish, and Catalan syntactically realize gender agreement on adjectives, and producing this agreement is not problematic for the heritage speakers (as the results for adjectival agreement in this study showed). Secondly, the agreement on the adjective can prime the production of the verb agreement. This will be further addressed in the next chapter, which is devoted to the comprehension of gender agreement and its processing. A more conclusive study with respect to the syntactic facilitation effects when producing gender agreement should be undertaken. Preferably, eye-tracking or other online methods should be used because these allow for a more direct assessment of the contribution of various sources of information during production. In sum, the prediction that the Noun-Copula Past-Adjective construction would generate the highest number of errors was not borne out. In contrast, the Noun-Copula Past-PP construction turned

out to be the most difficult, which can be partially explained in terms of crosslinguistic influence from Spanish and Catalan.

Heritage speakers vs. monolingual controls

Prediction 5: The studies on gender agreement have demonstrated that heritage speakers might show a delay in development; they nevertheless follow the same developmental steps as monolingual children and make the same types of errors as their monolingual counterparts. Thus, the monolinguals are expected to be more accurate than heritage speakers in producing agreement with opaque and incongruent noun that may cause difficulties for the heritage speakers. Additionally, the same errors made by the monolingual speakers with regard to grammatical gender production are expected (see Chapter 2 for more detail).

In general, the heritage speakers were less accurate than the monolinguals, yet not in all conditions, which is partly in line with Prediction 5. No difference was manifested in masculine transparent and masculine opaque forms or feminine transparent nouns between the three groups (the group of high proficiency heritage speakers, the group of low proficiency heritage speakers, and the monolingual controls). This finding is not surprising in light of the fact that masculine nouns are the most frequent in the nominal lexicon. This finding is also compatible with other studies in which accuracy scores relating to the masculine were the highest (Polinsky, 2008;

Schwartz et al, 2014; Mitrofanova et al., 2018). Additionally, the results demonstrated that the group of low proficiency heritage speakers lag behind the high proficiency group and the monolingual group with regard to feminine opaque, neuter opaque, and transparent nouns. No variation in these gender values was found between the high proficiency group and the monolingual group. As predicted, the results indicate that even if the heritage speakers are close to the monolingual baseline regarding the masculine gender, their performance still do not reach the native-like level of gender knowledge. As other studies on gender have demonstrated, heritage speakers are usually less accurate than age-matched monolinguals (see, e.g., Dieser, 2009; Montrul and Potowski, 2007; Polinsky, 2008; Schwartz et al., 2014). For instance, in Schwartz et al. (2014), the bilingual children aged 4–5 years performed quantitatively similar to the younger monolingual group (aged 3-4 years). In turn, the older monolingual group demonstrated better results than the younger monolingual group and the bilingual children. Thus, the authors suggested that bilingual children would compensate for a lack of knowledge of grammatical gender with age. Secondly, the results of the current study demonstrate that the higher the proficiency in the heritage language, the closer the heritage speakers are to the monolingual baseline. As in Polinsky's (2008) study of gender in the Russian heritage language, it was found that the high proficiency heritage speakers performed equally to the monolingual controls in the production task. Thus, it is concluded that the difficulties in the production of gender agreement can be eventually

overcome if proficiency in the heritage language is high, as assessed by the oral narrative task.

Gender and background factors

Prediction 6: In the study, the relationship between the heritage speakers' knowledge of gender and background variables such as language proficiency, amount of exposure to Russian, and age of onset to L2 are investigated. One hypothesis is that the heritage children with a higher proficiency level in Russian will (a) outperform low proficiency heritage speakers, and (b) perform similarly to the monolingual children. Moreover, two sociolinguistic factors that can potentially lead to mastery of grammatical gender are examined in the group of high proficient heritage speakers. Based on previous studies, it might be that both the amount of exposure to Russian and the age of onset to L2 will be good predictors of accuracy in the gender agreement production.

With respect to the background variables and the production of grammatical gender, the results showed that the best predictors of the children's performance on the gender tasks were proficiency and the amount of exposure to Russian. It was expected that the age of onset to L2 would be a factor that improved the command of gender in the sense that the later the children start acquiring L2s (Spanish and Catalan), the more time the Russian grammar system has had to establish itself. However, contrary to the prediction, the

age of onset to L2 was not demonstrated to be crucial regarding the command of the gender agreement of the heritage speakers in this study. This finding could be attributed to the small number of participants who started acquiring Spanish and Catalan relatively late: only six children moved to Spain at the ages of 3 to 7 years old. Another possible reason is that at the time of testing, the age of those children was from 7 to 11, and therefore all had substantial exposure to Spanish and Catalan. Additionally, Unsworth et al. (2011), as well as Unsworth et al. (2014) - based on a similar comparison of bilingual acquisition of Greek and Dutch gender - argue that the age of onset of bilingualism is not a determining factor in heritage/bilingual acquisition of the gender systems, but that the amount of input plays a role (similarly to our study). Additionally, language proficiency was shown to be important to the command of gender agreement of the heritage speakers. In previous studies, language proficiency levels have been demonstrated to be crucial for knowledge of the heritage language and the maintenance of target features of the language (Albirini, 2014; Montrul, 2004; Polinsky, 2000, 2006, 2008, among others).

Moreover, this study has demonstrated that the amount of exposure positively affects knowledge of morphology in the heritage language. This finding is consistent with previous literature (Gathercole and Thomas, 2009; Thordardottir, 2011; Unsworth, 2008, 2013). Concerning this matter, several studies have demonstrated that sufficient language exposure is beneficial for children's acquisition of vocabulary and grammar in both the

minority and majority languages of heritage speakers (see Cobo-Lewis, et al., 2002; Scheele, Leseman and Mayo, 2010, among others). The results of this study show that regular contact with the Russian language in a variety of contexts and environments (at home, at community school, in leisure pursuits, with friends, etc.) improves lexical and morpho-syntactic performance as well as basic narrative skills. In this study, the amount of exposure included the calculation of input to Russian at home and outside the home. However, the main source of exposure for the heritage speakers was the home environment (as the data from the questionnaire showed). The relevance of exposure to the heritage language at home is underlined in different studies (Mitrofanova et al., 2018; Rodina and Westergaard, 2017; Unsworth, 2015). In brief, language proficiency and amount of exposure, mainly at home, is demonstrated to have a great impact on heritage speakers' command of gender agreement morphology. Similar to the previous studies, these two factors are interrelated and have been shown to play an important role in the area of morphosyntax.

Summary of the chapter

The goal of this chapter was to present and discuss the experimental research undertaken in this study and to provide a deeper understanding of the production of gender agreement forms based on evidence from the Russian heritage speakers. The factors that have been investigated concerning this goal included the

morphological transparency of gender cues, the crosslinguistic overlap of noun genders between L1 and L2, the type of agreement construction, language proficiency, the amount of exposure participants had to the heritage language and the age of onset to L2. A group of multilinguals, 30 heritage speakers of Russian aged 7-11, participated in the study. The age-matched monolingual children from Russia acted as the control group. The production experiment consisted of an elicited task. Oral narratives were implemented as a measure of proficiency in order to test whether speaker proficiency plays a role in knowledge of gender agreement. Based on the results of the proficiency assessment, two groups were defined - the low proficiency group and the high proficiency group.

The results of the production experiment indicated that the agreement constructions with masculine nouns were produced at-ceiling across all the conditions. This finding is attributed to the default nature of the masculine in the Russian language. The production of agreement values with feminine nouns was constrained by the morphological ambiguity of the noun forms. This can be explained by the low phonological salience of agreement constructions with opaque feminine nouns, which hinder the acquisition of these forms. Hence, the findings suggest that formal gender marking plays a role with feminine nouns but not with other gender values. The neuter gender was found to be the most difficult category and, as suggested, could be the result of various factors, including the low number of neuter nouns in the input, the phonological ambiguity of agreement forms with neuter nouns and (or) L2 influence. In investigating the influence of L2s (Spanish and

Catalan) on Russian, a congruency effect was yielded in the agreement structure that is different in the L1 and L2 (the noun-verb gender agreement). No congruency effects were found in other agreement constructions. Before concluding, it is expected that the data from the comprehension experiment will shed light on this issue. The group of high proficiency heritage speakers was target-like in producing agreement in all conditions, which suggests that heritage speakers can attain monolingual performance levels. The findings also demonstrate a positive effect of the amount of exposure to heritage language on the development of knowledge of grammatical gender agreement in a child's speech production. No great impact of the age of onset was shown on the production of gender agreement forms. The evidence from the comprehension experiment should serve to illuminate the reasons for the finding.

5. COMPREHENSION EXPERIMENT TASK: DESIGN AND RESULTS

The previous chapter introduced the description, results, and discussion of the production experiment. The main purpose of this chapter is to present a specification of the methodology and results of the tasks (Task 5-7) in comprehension. The task utilized in the comprehension experiment was an oral grammaticality judgment task (GJT). The production and comprehension experiments consisted of the same participants and employed the same type of experimental materials but varied on the number of the agreement constructions attested. Namely, the Noun-Zero Copula Present-Adjective construction was excluded from the comprehension experiment (in Chapter 3 this issue is discussed in detail as well as the general design of the study).

This chapter is structured as follows: Section 5.3 summarizes the methodology of the comprehension experiment (for detailed information of the general experimental design of this study see Chapter 3, which includes: [5.1.1] brief description of materials and procedure, [5.1.2] timing of data collection, [5.1.3] explanation of data analyses, [5.1.4] predictions of the comprehension experiment). Taking into account that the materials and procedure vary slightly from task to task in comprehension, Sections 5.2-5.4, describe the materials and procedure, including the results of each experimental task individually. In Section 5.5.1, data on the

comparison between the agreement constructions are provided. Section 5.5.2 explores the relationship between gender knowledge in comprehension and background measures: language proficiency in Russian, the age of onset to L2, and the amount of exposure to Russian. Section 5.5.3 provides a brief analysis of errors in comprehension. Finally, Section 5.6 provides a discussion of the findings for the comprehension experiment.

5.1 General overview of the production experiment

5.1.1 Materials and procedure for the comprehension tasks

The data collection method in the comprehension experiment was an online grammaticality judgment task. The participants were asked to react to auditory recorded stimuli (grammatical and ungrammatical agreement constructions). Their correct or incorrect responses, together with reaction times, were recorded. The materials for the comprehension experiment consisted of the same noun sets (Set 1 and Set 2) as in the production experiment (see Appendix II and III). Recall that each set for the production experiment consisted of 32 nouns. For the comprehension experiment, the number of nouns was randomly reduced to 24 in each set. Reducing the number of stimuli in the comprehension experiment allowed the avoidance of fatigue among the children. The chosen nouns formed correct (grammatical) agreement constructions with adjectives and/or verbs. For each grammatical

construction, an incorrect (ungrammatical) agreement construction was added. The examples of grammatical (1a, 2a) and ungrammatical (1b, 2b) agreement constructions from Task 5, with the masculine and feminine nouns, are illustrated below.

(1a) *krasn-yj stol* (1b)**krasn-aja stol*
red-M table-M red-F table-M
'The red table'

(2a) *želt-aja kniga* (2b)**želt-yj kniga*
yellow-F book-F yellow-M book-F
'The yellow book'

Keep in mind, that neuter gender is absent in the Spanish and Catalan grammars. Additionally, from the previous literature, we know that bilingual and heritage speakers of Russian reanalyze neuter gender as masculine (by default) or as feminine (due to phonetical reasons). Thus, it was decided to add ungrammatical constructions with both masculine (3b) and feminine agreement (3c) and one grammatical construction with a noun in neuter gender (3a). The examples below from Task 5 illustrate this (3a-3c):

(3a) *golub-oe okno*
light blue-N window-N

(3b)**golub-oj okno*
light blue-M window-N

(3c)**golub-aja okno*

light blue-F window-N

'The light blue window'

Note that the number of the experimental trials varied depending on an agreement construction attested. Overall, there were three agreement constructions in the comprehension experiment. The constructions Adjective-Noun (Task 5) and Noun-Copula Past-PP (Task 7) were identical in number of experimental items and consisted of a total of 24 grammatical and 32 ungrammatical agreement constructions (see Table 5.3 for the trials in Adjective-Noun and Table 5.7 for the trials in Noun-Copula Past-PP). The subject noun in the Noun-Copula Past-Adjective (Task 6) construction triggers the 'double' gender agreement on the copular verb in the past and on the predicative adjective. Because of that, the number of trials in this construction increased to 24 grammatical and 64 ungrammatical trials (see Table 5.5 for a detailed explanation of how the trials were distributed across the conditions). The numerical distribution of grammatical and ungrammatical trials as well as a detailed description of each task is described in Sections 5.2-5.4 below.

The stimuli were presented auditorily (to avoid children's distraction, no visual stimuli were applied) by experimental software DMDX (Forster and Forster, 2003), version 3.3.0.2 running on a Lenovo Ideapad 100S with Intel Atom Z3735 processor and Windows 10 operating system. All experimental

trials were recorded at a moderate pace with neutral intonation by a female native speaker of Russian (the researcher) using PRAAT sound-editing software (Boersma, 2001). The clock started with the end of an auditory trial and terminated upon a response. The time between the end of a trial and the end of a response was recorded in milliseconds.[33] A trial followed after a response or automatically after a maximum of 2000 ms passed.

The participants were tested individually in a quiet room, seated on a chair. The researcher was seated behind the participants to control the experiment (recording absence of response, resolving questions and problems with the equipment). The laptop's keyboard was used for a response registration. The children had two keys on the laptop representing correct or incorrect responses. The keys were labeled mnemonically with a picture of a 'smiling face' for a 'good' trial and a 'sad face' for a 'bad' trial. The children were asked to put the finger of the right hand on the right key and the finger of the left hand on the left key. The facial images of the keys were changed with each task, e.g., Task 5 a child had a smiling face key on the right and a sad face on the left. While completing Task 6 the same child had a smiling face key on the left and a sad face on the right. The computer recorded responses for grammaticality judgments and reaction times of each participant. There were no pictures used in

[33] Due to the difficulty in noun selection given the stimuli constraints, nouns were not balanced for word length in syllables, or length in phonemes, or waveform duration in milliseconds; their duration differed from noun to noun. Thus, it was decided to record reaction times between the end of a trial and a participant's response.

this experiment. A solid white screen was displayed on the computer as illustrated in Figure 5.1.

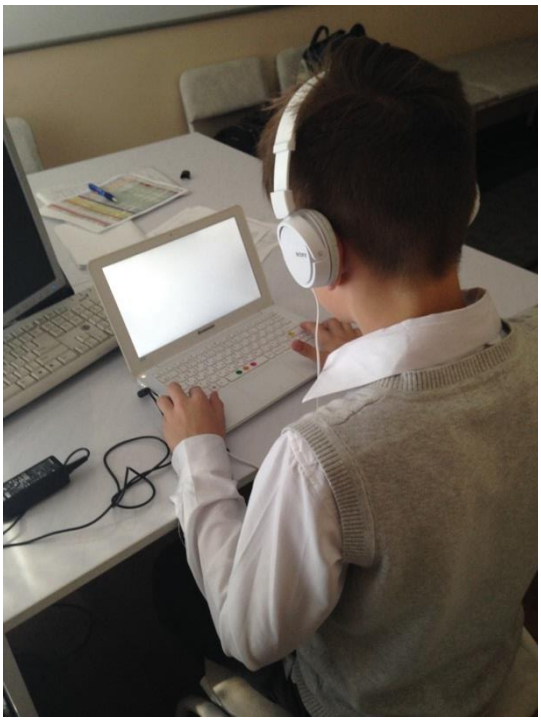

Figure 5.1: A participant completing the comprehension experiment

The audio stimuli were presented through two Sony MDR-ZX100 headsets that were simultaneously used by the researcher and the participants (via adapter). If the participant pressed an incorrect button and singled it, the researcher recorded the trial on paper and it was excluded from the future analyses. In order to motivate the participants to do the task, an element of a game was added. The children were explained that the girl that recorded the phrases did not speak Russian well. The children's task was to help her learn Russian. Thus, if they considered the phrase correct or "sounded good" they should press the smiling face button. If the phrase was

incorrect “sounded bad”, the sad face button should be pressed. They were emphasized the importance of both the speed and accuracy of their responses.

Each experimental session consisted of blocks: a pre-test block, an experimental block and a remuneration block. Each task started with a training pre-test block and any correcting feedback on the accuracy of the answers was given by the researcher. The trials were repeated until there were no errors. After finishing the pre-test block, the participants were asked if they were ready to start and if they had any questions. As soon as all the problems with the task were solved, the first experimental block was introduced. After completing the experimental block, the children were remunerated with a picture on the screen. The experimental trials were randomly distributed in each experimental block by the program. There were several experimental blocks in each task followed by the remuneration blocks. The exact number of the blocks is presented in upcoming sections for each task (Section 5.2.1, 5.3.1 and 5.4.1). At the end of each task, the children were remunerated with a present (regardless of the errors they had made).

5.1.2 Timing of the data collection

The participants finished the comprehension experiment in the four months from September to December 2016. Each task coincided with one experimental session, except for Task 6, which consisted

of two experimental sessions due to the higher number of trials. Each of the experimental sessions lasted approximately 20 minutes. The experimental sessions had a minimum of a 2-week pause between them, e.g. a child did Session 1 on January 15th, so Session 2 was conducted on February 7th. The heritage speakers completed Task 5 during September and October. Task 6 and Task 7 were accomplished in October, November, and December.[34] The monolingual participants completed the comprehension task during the researcher's visit to Moscow in December 2016. The distribution and timing of the comprehension experiment, sets of nouns (Set 1 or Set 2), agreement constructions, and examples can be found in Table 5.1.

Task	Noun sets	N of trials	Timing	Example of trials
Task 5 Adjective-Noun	Set 1 (24 nouns)	56	Sep-Oct, 2016	*krasnyj stol* 'The red table'
Task 6 (session 1) Noun-Copula Past-Adj	Set 1 (12 nouns)	44	Oct-Nov, 2016	*stol byl krasnyj* 'The table was red'

[34] Note that the researcher had an access to collect the data with the heritage speakers only on Saturdays.

Task 6 (session 2) Noun-Copula Past-Adj	Set 1 (12 nouns)	44	Nov-Dec, 2016	*stol byl krasnyj* 'The table was red'
Task 7 Noun-Copula Past-PP	Set 2 (24 nouns)	56	Nov-Dec, 2016	*stol byl v komnate* 'The table was in the room'

Table 5.1: Comprehension experiment. Tasks, sets of nouns, number of experimental trials, time of data collection in heritage speaker's group, and examples of trials

5.1.3 Data analyses

The quantitative analyses were conducted using the IBM SPSS Statistics 21 software package. The results were automatically recorded in a text file by the DMDX program and then analyzed in SPSS. Reaction time (in milliseconds) was calculated from the end of an auditory stimulus, that is, the last moment in the sentence where participants received relevant acoustic information. The time between the end of the auditory stimulus and the moment the response key was pressed was recorded in milliseconds.

The following trials were removed before analyses: error trials and trials with reaction times less than above and below the 2.5 SD limits around the mean of the general distribution by condition

(following data preparation procedures commonly used elsewhere [e.g., Lachaud and Renaud, 2011; Ratcliff, 1993]).

For the heritage speakers, 1.089 error trials were excluded, 9% of the original data; for the monolingual controls 36 error trials were removed, 0.72% of all data). After analysis of normality, we excluded 856 extremely fast trials (< 220 ms) and 842 extremely slow trials (> 2490 ms), which together corresponded to 12% of the data among the heritage speakers. In the monolingual group, we removed 602 trials (< 220 ms) and 112 trials (> 2490 ms) which together corresponded to 11% of the data. Additionally, the comprehension tasks were checked using an item-analysis and resulted in having good internal reliability (α=.678).

In order to test the research hypothesis (see Section 5.1.4), different statistical procedures were determined. The *p*-value was set at .05. Mean accuracy scores and mean reaction times were submitted to mixed ANOVAs for accuracy and reaction times separately. To test gender agreement comprehension, mixed factorial ANOVAs were performed with gender, transparency, and congruency as within-subject factors and with a group (heritage speakers vs. monolingual controls) as between-subject factors. In addition to the mentioned variables, we examined the grammaticality of agreement based on the adjective and/or verb (grammatical and ungrammatical). The variable "grammaticality" consisted of: (a) grammatical trials - agreement constructions in which the gender of a noun coincides with the gender of an agreed element(s); and (b) ungrammatical trials - agreement constructions in which the gender of a noun

differs to the gender of an agreed element(s). The detailed information on the grammaticality of the trials will be presented in subsequent sections (5.2-5.4). The previous studies (Bates et al., 1996; Montrul et al., 2014) have demonstrated that heritage speakers and monolinguals are affected by the grammaticality of the gender agreement in the stimuli, with higher accuracy scores and faster reaction times for grammatical than ungrammatical trials. Overall, across three tasks, the heritage speakers performed significantly more accurate on the grammatical trials than on ungrammatical ones. The accuracy scores in the monolingual group were unrevealing because of their at-ceiling performance. Additionally, the pattern of the accuracy results of the heritage speakers and monolingual controls in grammatical trials was identical to the ungrammatical ones. That is the reason why the accuracy data will be presented for both grammatical and ungrammatical trials together. The online reaction time data, however, revealed a different pattern of results for grammatical versus ungrammatical phrases. Thus, reaction times were analyzed for grammatical and ungrammatical trials separately.

We also performed additional ANOVAs with gender, transparency, and congruency as within-subject factors and with a group (low proficient vs. high proficient heritage speakers and monolingual controls) as between-subject factors. The relation between gender comprehension and background factors such as the age of onset and amount of exposure is examined in Section 5.5.2. As in the

production part, correlations and regression analysis were conducted. Each section has a summary of the results.

5.1.4 Predictions

The general predictions for this study have been presented in Chapter 2, below the predictions will be briefly overviewed once again, focusing specifically on the predictions for the comprehension task.

We start the section presenting the predictions related to offline accuracy in comprehension which are very similar to the predictions outlined for the production experiment (see Chapter 2 and Chapter 4, Section 4.1.4 on the predictions for the production experiment). The predictions on online data (reaction time) are presented separately. The predictions for both, accuracy and reaction time results are ordered in the following way: we start with the predictions on gender values, followed by the predictions related to noun form transparency, crosslinguistic congruency, type of agreement construction, and, finally, we present the predictions related to background factors and between-group analyses (heritage speakers vs. monolingual controls).

Predictions on offline data (accuracy scores)

Under a prediction regarding gender values, we may expect similar results in accuracy as in the production experiment. Namely, neuter gender being the most difficult, followed by feminine and masculine (the easiest category).

Under a prediction regarding noun form transparency, within-group differences are expected between transparent and opaque nouns for feminine and neuter gender (Taraban and Kempe, 1999; Alarcon, 2011), but not for masculine.

Several studies in L2 have demonstrated a congruency effect, but less consistent results have been found for bilingual and heritage speakers' population, especially with language pairs with asymmetrical gender systems (i.e., with an unequal number of gender values). Based on the recent study by Lemmerth and Hopp (2017), we predict the congruency effect in comprehension: gender agreement with congruent nouns being easier than gender agreement with incongruent nouns. This effect might be visible only in feminine and neuter gender values because both masculine congruent and incongruent nouns will not provoke any difficulty. Moreover, based on the assumption that children rely on morphological cues when acquiring gender (Karmiloff-Smith, 1979; Pérez-Pereira, 1991; Rodina and Westergaard, 2008; Voeikova, 2015), we predict that the agreement constructions with opaque and

incongruent nouns will result as being more difficult than the agreement constructions with transparent and incongruent forms.

The performance on the agreement constructions is expected to be influenced by L2s. Given that Spanish and Catalan lack gender agreement with verbs, we predict that the agreement with verbs in the sentential domain (Noun-Copula Past-Adjective and Noun-Copula Past-PP) will be more difficult for the heritage speakers than nominal agreement constructions (Adjective-Noun). Also, based on the results obtained in the production experiment, we expect the Noun-Copula Past-PP construction to be the least accurate.

In addition, regarding the sociolinguistic background factors, we hypothesize that language proficiency, age of onset to L2, and amount of exposure to Russian affect the children's ability to comprehend gender agreement constructions. Because proficiency plays an important role in language skills, we predict an overall advantage across all conditions for the heritage speakers from the high proficiency group.

Regarding the within-group differences, we predict that the heritage speakers from the low proficiency group will lag behind the heritage speakers from the high proficiency group and the monolingual controls in 'vulnerable' conditions. Namely, the low proficient heritage speakers will demonstrate lower performance compared to the other groups in trials with feminine and neuter nouns, trials with opaque nouns, and trials with incongruent nouns.

Barring the predictions above, we expect no differences between the heritage speakers from the high proficiency group and the monolingual baseline in comprehension accuracy.

Predictions on gender agreement processing (reaction time)

As for gender values and differences reflected in reaction times, we first predict that grammatical trials will be processed faster than ungrammatical for all genders. Second, within grammatical sentences, we expect the longest reaction in neuter trials followed by feminine and masculine being the easiest for processing. Third, within ungrammatical trials, we expect the agreement constructions with target nouns in masculine to require more processing than ungrammatical trials with feminine and neuter target nouns. Such finding was demonstrated in the previous literature (Akhutina et al., 2001; Slioussar, 2018).

If noun form transparency plays a role in gender agreement during processing, due to these nouns' morphophonological ambiguity, then we expect trials with opaque nouns to be processed slower than trials with transparent nouns in general, particularly in ungrammatical conditions and by the low proficient heritage speakers. We also assume, that in grammatical trials, there will be no differences between transparent and opaque masculine, as the masculine has been demonstrated to be a default gender independent of the noun form transparency. However,

ungrammatical trials with both transparent and opaque masculine nouns will cause a larger delay in reaction times compared to trials with feminine or neuter subjects (Akhutina et al., 2001; Slioussar, 2018).

Due to the contradictory results for crosslinguistic noun congruency, no specific predictions regarding this variable are made. However, it might be possible that negative L2 influence on gender agreement comprehension will arise in the case of language-specific differences between the languages, namely, on crosslinguistically incongruent nouns and constructions with a verbal agreement.

Moreover, we expect an interaction between transparency and congruency: transparent and congruent nouns will be processed faster than opaque and incongruent in all gender values. One of our predictions is that masculine congruent and transparent nouns will provoke longer reactions than masculine incongruent and opaque (again in line with Akhutina et al., 2001; Slioussar, 2018). Regarding the agreement constructions with feminine and neuter nouns, we expect faster reaction times for the trials with nouns that are congruent in grammatical gender between languages than incongruent.

As for agreement constructions in general, we expect the heritage speakers to obtain the longest reaction times for both grammatical and ungrammatical trials in Noun-Copula Past-

Adjective agreement construction, followed by Noun-Copula Past-PP. Different studies on gender processing have demonstrated a facilitating effect of a modifier when it precedes a target noun as in the case of Adjective-Noun agreement construction. Thus, we expect that the grammatical trials in the Adjective-Noun agreement construction will obtain faster reaction times compared to the other two agreement constructions. In contrast, the ungrammatical trials of the same construction type might result in more difficulty than the ungrammatical trials of the other two agreement constructions due to an inhibitory effect: the adjective in the ungrammatical form will inhibit the real gender agreement processing and it will slow down the time of response.

Regarding the within-group differences, we predict that it will take heritage speakers longer to process their Russian gender agreement compared to the monolingual baseline. As a result, we expect the monolingual advantage in all variables and constructions. Additionally, we expect more proficient heritage speakers to be faster in processing gender agreement than the low proficient heritage speakers. We also expect the former group to demonstrate native-like performance and be as fast as the monolingual baseline in grammatical and ungrammatical trials in all conditions (gender values, transparency, congruency and construction).

In the next section we present the procedure and results of three agreement constructions attested in the comprehension experiment.

5.2 Task 1: NP agreement: Adjective-Noun

The task was designed to evaluate the command of gender in nominal agreement constructions (4) via an online grammaticality judgment task. Also, we wanted to compare the results with production, in which the same agreement construction was attested (Section 4.2).

(4) Nominal agreement construction in Task 5 in comprehension.

želtyj *limon*

yellow-ADJ, M, SG, NOM lemon- M, SG, NOM

'The yellow lemon'.

5.2.1 Materials and procedure

Stimuli

The stimuli for the task were auditory noun phrases consisting of a prenominal adjective and a noun.[35] In total, 56 sentences (experimental trials) and 10 test trials were created. No distractors were added in order to avoid fatigue among the children. The experimental trials were rendered ungrammatical by creating incorrect gender agreement (adjectives in masculine were converted to feminine, adjectives in feminine were converted to masculine,

[35] To form agreement constructions the nouns from Set 1 were used (the same as in Task 1 in production). For more information on the stimuli selection procedure see Chapter 3, Section 3.2.

adjectives in neuter were converted to masculine and feminine). Finally, the experimental trials comprised 16 experimental trials with nouns in the masculine (8 grammatical, 8 ungrammatical), 16 experimental trials with nouns in the feminine (8 grammatical, 8 ungrammatical), and 24 experimental trials with nouns in neuter (8 grammatical, 16 ungrammatical). The trials (56) were distributed across the experimental conditions (gender, transparency, congruency, and grammaticality) as can be observed in Table 5.2.

Gender	Transparency	Congruency	Grammaticality	Number of trials	Example
M	T	C	G	2	*želtyj stakan* yellow-M glass-M
			U	2	**želtaja stakan* yellow-F glass-M 'The yellow glass'
		I	G	2	*zelenyj list* green-M leaf-M
			U	2	**zelenaja list* green-F leaf-M 'The green leaf'
	O	C	G	2	*zelenyj korabl'* green-M ship-M
			U	2	**zelenaja korabl'* green-F ship-M 'The green ship'
		I	G	2	*seryj ključ* grey-M key-M

			U	2	**seraja ključ* grey-F key-M 'The grey key'
F	T	C	G	2	*željtaja zvezda* yellow-F star-F
			U	2	**željtyj zvezda* yellow-M star-F 'The yellow star'
		I	G	2	*krasnaja kniga* red-F book-F
			U	2	**krasnyj kniga* red-M book-F 'The red book'
	O	C	G	2	*zelenaja cep'* green-F chain-F
			U	2	**zelenyj cep'* green-M chain-F 'The green chain'
		I	G	2	*željtaja kost'* yellow-F bone-F
			U	2	**željtaja kost'* yellow-M bone-F 'The yellow bone'
N	T	I (M in L2)	G	2	*goluboe kolco* light blue-N ring-N
			U (M)	2	**goluboj kolco* light blue-M ring-N
			U (F)	2	**golubaja kolco* light blue-F ring-N 'The light blue ring'
	O	I (M in L2)	G	2	*goluboe zerkalo* light blue-N mirror-N

			U (M)	2	**goluboj zerkalo* light blue-M mirror-N
			U (F)	2	**golubaja zerkalo* light blue-F mirror-N 'The light blue mirror'
	T	I (Fin L2)	G	2	*goluboe koleso* light blue-N wheel-N
			U (M)	2	**goluboj koleso* light blue-M wheel-N
			U (F)	2	**golubaja koleso* light blue-F wheel-N 'The light blue wheel'
	O	I (Fin L2)	G	2	*goluboe jabloko* light blue-N apple-N
			U (M)	2	**goluboj jabloko* light blue-M apple-N
			U (F)	2	**golubaja jabloko* light blue-F apple-N 'The light blue apple'
Total 56					

Table 5.2: Numerical distribution of experimental trials with examples across experimental conditions for Task 5 in comprehension
Note. M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent; G-grammatical, U-ungrammatical

Procedure

The procedure was the same for all comprehension tasks (as described in Chapter 3 and Section 5.1).

Each experimental session of Task 5 consisted of five blocks of trials that were automatically randomized each time a new experimental session started. The task started with a training pre-test block that included 10 test trials. First, the children did Experimental block 1 that consisted of 14 trials (see Table 5.3). After finishing this block, a picture of a kinder surprise appeared (Remuneration 1) and the children were explained that it was their prize. After a short pause (2 minutes) Experimental block 2 started. After the block was done, a picture of a kitten appeared on the computer screen (Remuneration 2). When the last block of trials (Experimental block 3) was done, the note in Russian appeared on the screen: '*Molodec! Poluči podarok-surpiz iz sumki!'* (Well done! Get a surprise present from the bag!). The researcher then took out a present from the bag (pen, pencil, sharpener, etc.). Note that even if the answers were incorrect the children received the present. It was done to motivate the participants.

Phases of the experiment	Number of trials	Description
Pre-test block	10 trials	Correcting feedback is given. The block is repeated until it is done without any errors.
Experimental block 1	14 trials	First block with target trials
Remuneration 1		Picture of a kinder surprise appears on the computer screen
Experimental block 2	14 trials	Second block with target trials
Remuneration 2		Picture of a kitten appears on

		the computer screen
Experimental block 3	14 trials	Third block with target trials
Remuneration 3		Picture of a ticket to the attraction park appears on the computer screen
Experimental block 4	14 trials	Fourth block with target trials.
Remuneration 4		On the computer screen, the note appeared 'Well done! Receive a surprise present from the bag!'. The participants were given a present from the bag.

Table 5.3: The detailed order of trial blocks in Task 5 in comprehension

5.2.2 Results

The results of the task are presented by the variables: gender values, transparency, and congruency. We follow this order for all tasks. First, we observe the results of accuracy and then present the results for reaction times. We also compare the results with monolingual children.

Gender values: heritage speakers

The ANOVA for accuracy revealed main effects for gender values ($F(2, 1678) = 33.382$, $p < .001$). *Post hoc* tests with Bonferroni

correction revealed that there was a significant difference between masculine (*M*=0.94, *SD* = 0.23) and feminine (*M*=0.87, *SD* = 0.34), *p* <.001, between feminine and neuter (*M*=0 .76, *SD* = 0.43), *p* <.001, and between masculine and neuter (*SD* = 0. 57), *p* <.001 (Figure 5.2).

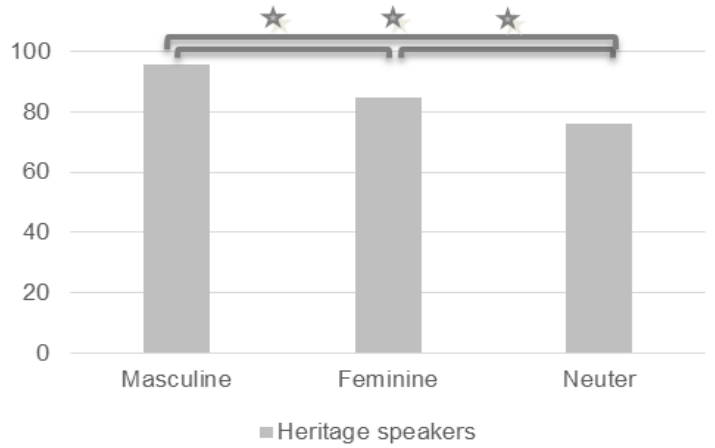

Figure 5.2: Accuracy in comprehension. Adjective-Noun. Gender categories. Heritage speakers

Gender values: heritage speakers vs. monolingual controls

A main effect of group was also found (F(2, 3023) = 24.258, *p* <.001). *Post hoc* tests indicated that there was a significant difference between the heritage speakers and the monolingual group in neuter (*p* <.001) and in the feminine (*p* <.001). No significant difference was found between the groups in the masculine (Figure 5.3).

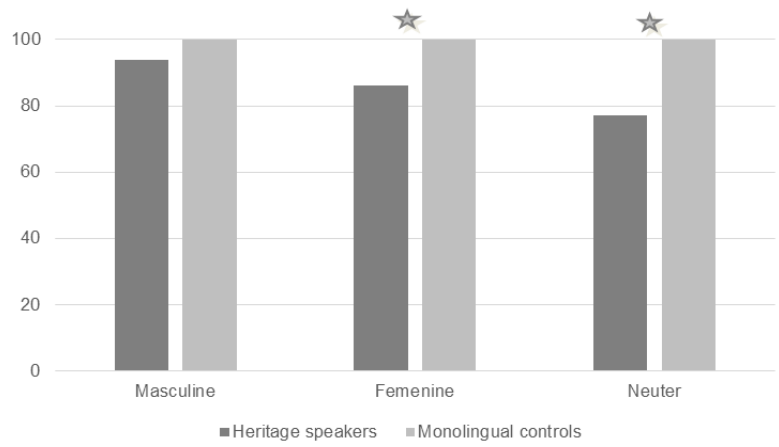

Figure 5.3: Accuracy in comprehension. Adjective-Noun. Gender categories. Heritage speakers vs. monolingual controls

Noun form transparency: heritage speakers

In addition to the effect of gender values, we found an effect of transparency F (1, 1678) = 29.590, p <.001. Also, there was gender by transparency interaction, F (2, 1678) = 8.464, p <.001. *Post hoc* tests showed that masculine and feminine were significantly easier than neuter when the word form was transparent (p <.001). But when the word form was opaque, feminine and neuter were significantly more difficult than masculine (p <.001 for all). Also, a significant difference was found between transparent and opaque feminine nouns (p <.001), transparent feminine nouns being produced significantly better than opaque feminine nouns (Figure 5.4).

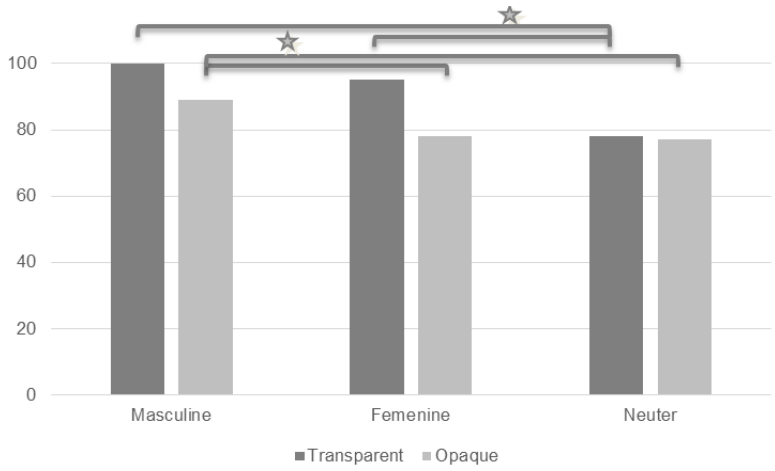

Figure 5.4: Accuracy in comprehension. Adjective-Noun. Transparent and opaque noun forms. Heritage speakers

Noun form transparency. Heritage speakers vs. monolinguals

In addition to the effect of group, gender and transparency, there was a three-way interaction of the group, gender and transparency, F(7, 3023) = 13.618, p <.001. *Post hoc* tests (Figure 5.5) demonstrated a significant difference in the trials with transparent neuter nouns between the two groups (p <.001). No differences were found between groups in transparent masculine and transparent feminine.

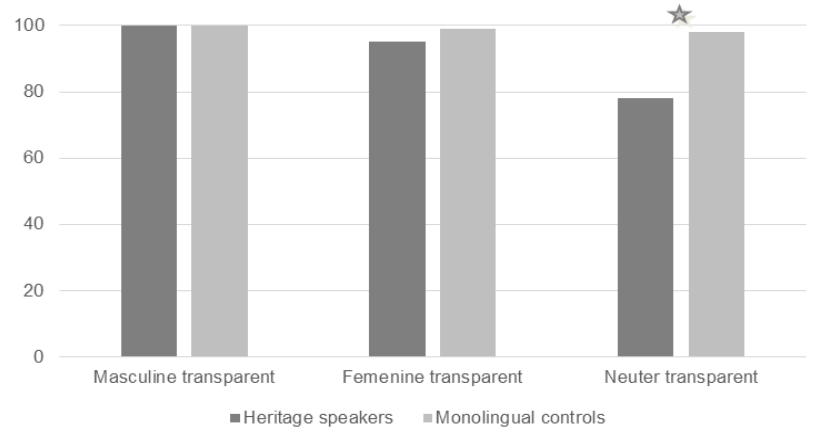

Figure 5.5: Accuracy in comprehension. Adjective-Noun. Transparent noun forms. Heritage speakers vs. monolingual controls

For opaque condition, *post hoc* tests demonstrated (Figure 5.6) differences between the heritage speakers and the monolingual controls in opaque feminine and opaque neuter (p <.001 for both).

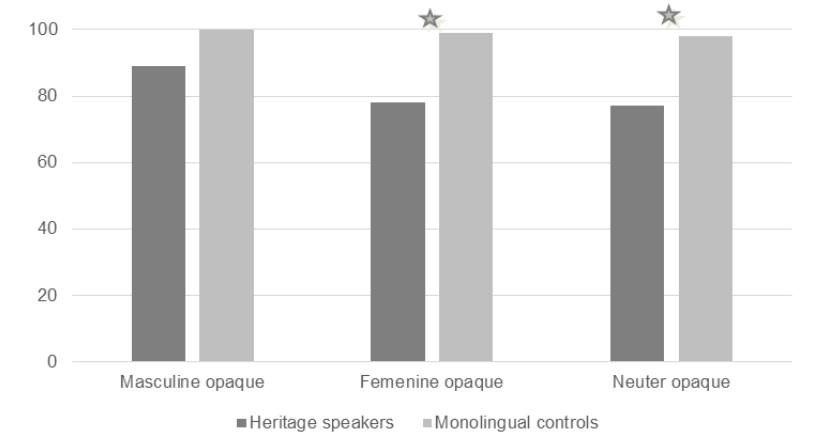

Figure 5.6: Accuracy in comprehension. Adjective-Noun. Opaque noun forms. Heritage speakers vs. monolingual controls

Crosslinguistic congruency effects: heritage speakers

An interaction between gender and congruency could not be demonstrated ($F(1, 1678) = 1.428$, $p = .23$).

Reaction time results

Collapsed across all cells of the design, the mean RT for both groups in Adjective-Noun construction was 783 ms (SD=468), which is compatible with values of normal listeners reported in grammaticality judgment studies (Blackwell and Bates, 1995).

Reaction time results. Heritage speakers

Judgment times for the heritage group were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) x2 (congruent vs. incongruent) analysis of variance. Grammatical and ungrammatical trials were analyzed separately. For grammatical trials in Adjective-Noun construction, the analysis failed to show any significant effects or interactions.[36] In contrast, for ungrammatical trials, the same analysis yielded a significant interaction of gender, transparency and congruency ($F(1, 628) = 7{,}869$, $p = .005$). This interaction reflects the longer reaction times

[36] Hereinafter we do not incorporate any figure if no significant effects or interactions were found in the analyses.

for opaque incongruent masculine nouns (*M*=967, *SD*=548) and opaque congruent feminine nouns (*M*=1030, *SD*=553) over other conditions, (all *ps* <.001) as Figure 5.7 illustrates. Reaction times between opaque incongruent masculine and opaque congruent feminine did not differ from each other.

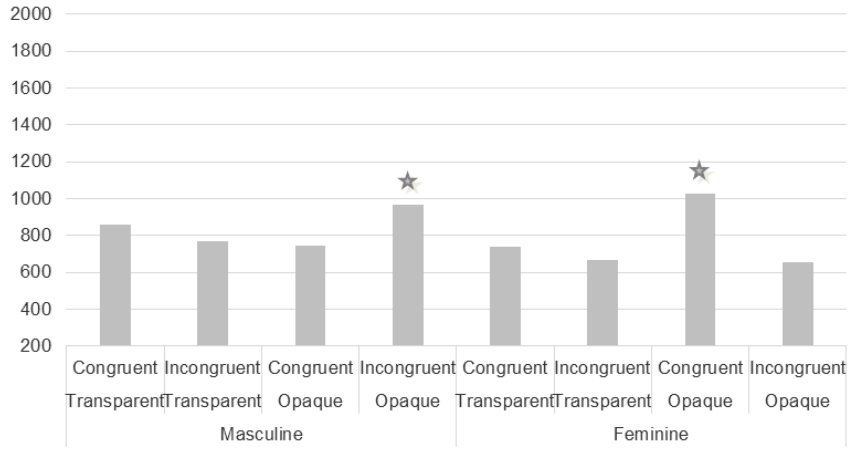

Figure 5.7: Reaction time in comprehension. Adjective-Noun. Ungrammatical trials. Means for gender, transparency and congruency. Heritage speakers

Reaction time results. Monolingual controls

Judgment times for the monolingual group were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) analysis of variance. In grammatical trials, the monolingual group did not show any significant main effects or interactions. As in the heritage speakers' group, the significant interactions were found only for the ungrammatical trials. We found a significant main effect of gender

(F(2, 713) = 5,885, *p* = .003) and transparency (F(1, 713) = 5,338, *p* = .021) which was qualified by a marginal interaction of gender and transparency (F(2, 713) = 3,250, *p* =.039). This interaction was due to opaque feminine nouns that were processed significantly slower (*M*=860, *SD*=420) than other categories (e.g., transparent and opaque masculine, transparent feminine, transparent and opaque neuter, all *ps* <.001) as shown in Figure 5.8.

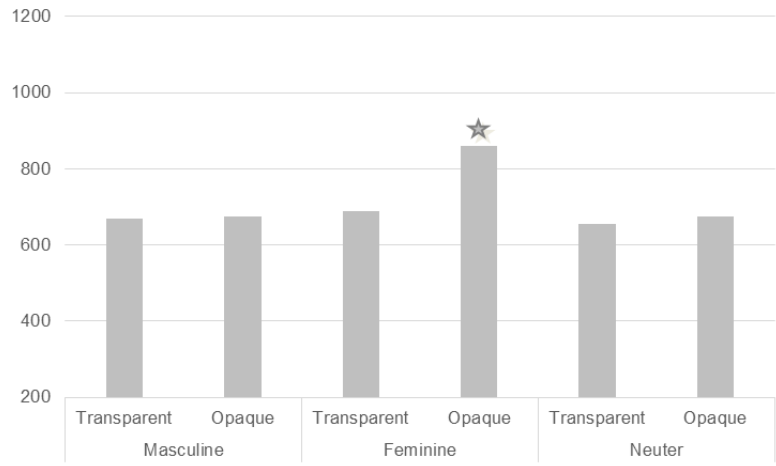

Figure 5.8: Reaction time in comprehension. Adjective-Noun. Ungrammatical trials. Means for gender and transparency. Monolingual controls

Reaction time results. Heritage speakers vs. monolinguals

To compare heritage speakers with monolingual controls, we conducted a 3 (masculine, feminine vs. neuter) x2 (transparent vs. opaque) x2 (heritage speaker vs. monolingual controls) analysis of variance. In grammatical trials we yielded a significant effect of

group (F(l, 1279) = 9.609, $p < .002$). No other effects or interactions were revealed. Two groups differed from each other significantly ($p < .001$), with the native speakers showing the fastest reaction times (M=769, SD=437) than the heritage speakers (M=769, SD=437).

As for ungrammatical trials ANOVA also demonstrated a significant effect of group (F(l, 1341) = 20.888, $p <.001$), as well as a significant interaction between gender and group (F(2, 1341) = 5.616, p =.004). The significant interaction between gender and group comes primarily from the difference between groups in masculine and neuter ($p <.001$ for both) but not in feminine (see Figure 5.9).

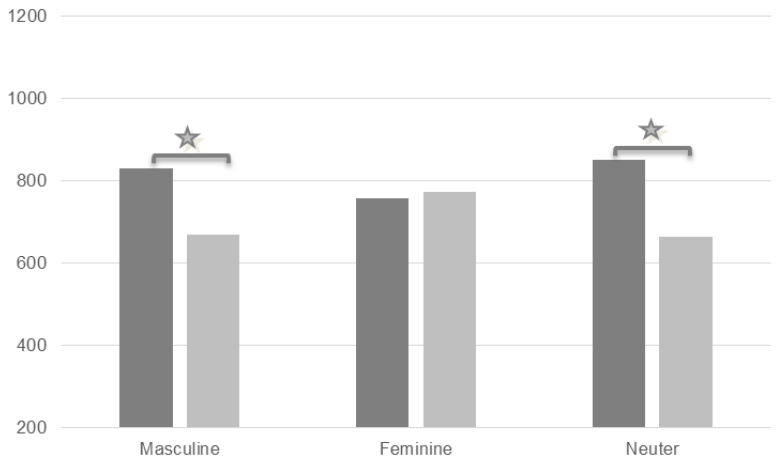

Figure 5.9: Reaction time in comprehension. Adjective-Noun. Ungrammatical trials. Means for gender and group. Heritage speakers vs. monolingual controls

Summary of section 5.2

The accuracy rates in Adjective-Noun revealed that the most unproblematic gender for heritage speakers was masculine. The analysis did not demonstrate any effect of congruency but the effect of transparency was found. Feminine gender resulted in being easy only when the noun form was transparent. Neuter appeared to be the most difficult gender value for the heritage speakers. In all conditions, the monolinguals behaved at-ceiling. The heritage speakers appeared to be a close match to the monolinguals in masculine and feminine transparent conditions. The reaction time analysis in the heritage speakers group showed results only for ungrammatical trials. There was a significant interaction between gender, transparency and congruency, coming from opaque incongruent masculine and opaque congruent feminine which were processed slower than other categories. The difference between the heritage and monolingual group was in masculine and neuter gender (the heritage speakers were significantly slower). But no difference between the groups was found in feminine nouns (both groups obtained similar reaction times). This result was due to a slow reaction to the trials with opaque feminine nouns as yielded in the monolingual group.

5.3 Task 6 Sentential agreement: Noun-Copula Past-Adjective

Task 6 was designed to check the command of gender agreement in the sentential domain in comprehension. The agreement construction attested in this task was the same as in Task 3 in production. In this construction, two components - a copula verb in the past tense and a predicative adjective - agreed with a noun in gender and number, for example:

(5) limon byl želtyj
lemon- M, SG, NOM was- COP VERB PST, M, SG yellow- ADJ, M, SG, NOM
'The lemon was yellow'

5.3.1 Materials and procedure

Materials

Grammaticality judgments of auditory stimuli for this task were recorded with the nouns from Set 1. Gender agreement was simultaneously expressed on the copula in the past tense and on the adjective. Thus, in this task, we had a larger number of ungrammatical trials than in Task 5. For instance, for one grammatical trial in the masculine (Example 6) two ungrammatical trials were tested: a trial with copula in the feminine but adjective in

the masculine (7) and a trial with copula and adjective in the feminine (8). It is impossible to test all potentially interesting combinations of copula and adjective in one experiment, so we did not select trials with ungrammatical agreement on adjectives and grammatical agreement on the copula verb for several reasons. First, we were mainly interested in gender agreement expressed on copular verbs because of the novelty in the research of this type of agreement. Secondly, adding the constructions with ungrammatical adjectives significantly increased the number of trials and required more time for accomplishing Task 6.

(6) a grammatical trial in masculine gender

stakan byl željtyj

glass-M was-M yellow-M

(7) an ungrammatical trial with copula in the feminine but adjective in masculine

*stakan *byla željtyj*

glass-M was-F yellow-M

(8) an ungrammatical trial with copula and adjective in the feminine

*stakan *byla *željtaja*

glass-M was-F yellow-F

'The glass was yellow'

For grammatical trials in feminine gender, the ungrammatical trials were in masculine gender (see Table 5.4).

The ungrammatical trials with neuter subject nouns consisted of copula and adjective in both masculine and feminine gender. This was made because masculine and feminine were both used as a suppletive form for neuter (e.g., Polinsky, 2008; Schwartz et al., 2014). For example, for the grammatical trial in neuter (9) *koleso bylo goluboe* (wheel-N was-N light blue-N) four ungrammatical trials were added: (a) copula in masculine but adjective in neuter (10), (b) both copula and adjective in the masculine (11), (c) copula in feminine but adjective in neuter (12), (d) both copula and adjective in feminine (13).

(9) a grammatical trial in the neuter gender

koleso bylo goluboe

wheel-N was-N light blue-N

(10) an ungrammatical trial with copula in masculine but adjective in the neuter

*koleso *byl goluboe*

wheel-N was-M light blue-N

(11) an ungrammatical trial with both copula and adjective in masculine

*koleso *byl *goluboj*

wheel-N was-M light blue-M

(12) ungrammatical trial with copula in the feminine but adjective in the neuter

*koleso *byla goluboe*
wheel-N was-F light blue-N

(13) ungrammatical trial with both copula and adjective in the feminine

*koleso *byla *golubaja*
wheel-N was-F light blue-F
'The wheel was light blue'

In total, Task 6 included 88 experimental trials. Also, 14 test trials were added. No distractors were used in order to not overextend the task. The experimental trials comprised 24 copular agreement constructions with nouns in the masculine (8 grammatical, 16 ungrammatical), 24 copular agreement constructions with nouns in the feminine (8 grammatical, 16 ungrammatical), and 40 copular agreement constructions with nouns in neuter (8 grammatical, 32 ungrammatical). The task trials were distributed across the experimental conditions (gender, transparency, congruency, and grammaticality) as can be observed in Table 5.4.

Gender	Transparency	Congruency	Grammaticality	Number of trials	Example
M	T	C	G	2	*stakan byl želtyj* glass-M was-M yellow-M
			U Cop F	2	*stakan *byla želtyj*

			U Cop Adj F	2	glass-M was-F yellow-M *stakan *byla * želtaja* glass-M was-F yellow-F ‘The glass was yellow’
		I	G	2	*utjug byl belyj* iron-M was-M white-M
			U Cop F U Cop Adj F	2 2	*utjug *byla belyj* iron-M was-F white-M *utjug *byla *belaja* iron-M was-F white-F ‘The iron was white’
	O	C	G	2	*remen’ byl černyj* belt-M was-M black-M
			U Cop F U Cop Adj F	2 2	*remen’ *byla černyj* belt-M was-F black-M *remen’ *byla * černaja* belt-M was-F black-F ‘The belt was black’
		I	G	2	*ključ byl seryj* key-M was-M grey-M
			U Cop F U Cop Adj F	2 2	*ključ *byla seryj* key-M was-F grey-M *ključ *byla *seraja* key-M was-F grey-F ‘The key was grey’
F	T	C	G	2	*zvezda byla želtaja* star-F was-F yellow-F
			U Cop M U Cop Adj M	2 2	*zvezda* byl želtaja* star-F was-M yellow-F *zvezda* byl želtyj* star-F was-M yellow-M ‘The star was yellow’
		I	G	2	*kniga byla krasnaja* book-F was-F red-F

			U Cop M U Cop Adj M	2 2	*kniga *byl krasnaja* book-F was-M red-F *kniga *byl *krasnyj* book-F was-M red-M 'The book was red'
	O	C	G	2	*zep' byla zelenaja* chain-F was-F green-F
			U Cop M U Cop Adj M	2 2	*zep' *byl zelenaja* chain-F was-M green-F *zep' *byl *zelenyj* chain-F was-M green-M 'The chain was green'
		I	G	2	*kost' byla želtaja* bone-F was- F yellow-F
			U Cop M U Cop Adj M	2 2	*kost' *byl želtaja* bone-F was- *M* yellow-F *kost' *byl *želtyj* bone-F was- M yellow-M 'The bone was yellow'
N	T	I (M in L2)	G	2	*kolco bylo goluboe* ring-N was-N light blue-N
			U Cop M U Cop Adj M U Cop F U Cop Adj F	2 2 2 2	*kolco *byl goluboe* ring-N was-M light blue-N *kolco *byl *goluboj* ring-N was-M light blue-M *kolco *byla goluboe* ring-N was-F light blue-N *kolco *byla *golubaja* ring-N was-F light blue-F 'The ring was light blue'
		I (F in L2)	G U Cop M	2 2	*koleso bylo goluboe* wheel-N was-N light blue-N *koleso *byl goluboe* wheel-N was-M light blue-N

			U Cop Adj M U Cop F U Cop Adj F	2 2 2	*koleso *byl *goluboj* wheel-N was-M light blue-M *koleso *byla goluboe* wheel-N was-F light blue-N *koleso *byla *golubaja* wheel-N was-F light blue-F 'The wheel was light blue'
	O O	I (M in L2)	G	2	*zerkalo bylo goluboe* mirror-N was-N light blue-N
			U Cop M U Cop Adj M U Cop F U Cop Adj F	2 2 2 2	*zerkalo* byl goluboe* mirror-N was-M light blue-N *zerkalo* byl *goluboj* mirror-N was-M light blue-M *zerkalo *byla goluboj* mirror-N was-F light blue-M *zerkalo *byla* golubaja* mirror-N was-F light blue-F 'The mirror was light blue'
		I (F in L2)	G U Cop M U Cop Adj M U Cop F U Cop Adj F	2 2 2 2 2	*jabloko bylo goluboe* apple-N was-N light blue-N *jabloko *byl goluboe* apple-N was-M light blue-N *jabloko *byl *goluboj* apple-N was-M light blue-M *jabloko *byla goluboe* apple-N was-F light blue-N *jabloko byla golubaja* apple-N was-F light blue-F 'The apple was light blue'
Total				88	

Table 5.4: Numerical distribution of experimental trials with examples across experimental conditions for Task 6 in comprehension

Note. M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent; G-grammatical, U-ungrammatical; Cop-copular verb, Adj-adjective

Moreover, due to the high number of experimental trials in Task 6, we decided to distribute the 88 trials between two experimental sessions. In this way, each child completed two experimental sessions in Task 6. One experimental session of Task 6 comprised of 12 agreement constructions with nouns in the masculine (4 grammatical, 8 ungrammatical), 12 agreement constructions with nouns in the feminine (8 grammatical, 8 ungrammatical), and 40 agreement constructions with nouns in neuter (4 grammatical, 16 ungrammatical). In total, each session had 44 trials. The distribution of trials among experimental conditions is presented in Table 5.5.

Gender	Transparency	Congruency	Grammaticality	№ trials Session 1	№ trials Session 2
M	T	C	G	1	1
			U Cop	1	1
			U Cop Adj	1	1
		I	G	1	1
			U Cop	1	1
			U Cop Adj	1	1
	O	C	G	1	1
			U Cop	1	1
			U Cop Adj	1	1

		I	G	1	1
			U Cop U Cop Adj	1 1	1 1
F	T	C	G	1	1
			U Cop U Cop Adj	1 1	1 1
		I	G	1	1
			U Cop U Cop Adj	1 1	1 1
	O	C	G	1	1
			U Cop U Cop Adj	1 1	1 1
		I	G	1	1
			U Cop U Cop Adj	1 1	1 1
N	T	I (M in L2)	G	1	1
			U Cop M U Cop Adj M U Cop F U Cop-Adj F	1 1 1 1	1 1 1 1
		I (F in L2)	G U Cop M U Cop Adj M U Cop F U Cop Adj F	1 1 1 1 1	1 1 1 1 1
	O	I (M in L2)	G	1	1
			U Cop M U Cop Adj M U Cop F U Cop Adj F	1 1 1 1	1 1 1 1

		I (F in L2)	G U Cop M U Cop Adj M U Cop F U Cop Adj F	1 1 1 1 1	1 1 1 1 1
Total				44	44

Table 5.5: Numerical distribution of experimental trials with examples across experimental conditions and experimental sessions for Task 6 in comprehension

Note. M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent; G-grammatical, U-ungrammatical; Cop-copular verb, Adj-adjective

Procedure

One experimental session of Task 6 consisted of five blocks of trials that were automatically randomized each time a new session started. The task started with a pre-test block (14 trials). Four experimental blocks (11 trials in each) followed the pre-test block. As in Task 5, a remuneration phase was introduced after each experimental block (but pictures were different from the ones in Task 5). Half of the participants did session 1 first and another half did session 2. Another half of the participants started with session 2 and then accomplished session 1 of Task 6.

The detailed order of trials in Task 6 in one experimental session in comprehension is illustrated in Table 5.6.

Phases of experiment	Number of trials	Description
Pre-test block	14 trials	Correcting feedback is given.

		The block is repeated until it is done without any errors.
Experimental block 1	11 trials	First block with target trials
Remuneration 1		Picture of a scooter (session 1) or bike (session 2) appears on the computer screen
Experimental block 2	11 trials	Second block with target trials
Remuneration 2		Picture of a puppy (session 1) or a hamster (session 2) appears on the computer screen
Experimental block 3	11 trials	Third block with target trials
Remuneration 3		Picture of a mobile phone (session 1) or a tablet (session 2) appears on the computer screen
Experimental block 4	11 trials	Forth block with target trials
Remuneration 4		On the computer screen, the note appeared ‘Well done! Receive a surprise present from the bag!’. The participants were given a present from the bag.

Table 5.6: The detailed order of trial blocks in Task 6 in comprehension

5.3.2 Results

Gender values: heritage speakers

Mean accuracy scores were submitted to a mixed ANOVA. There was a main effect of gender ($F(2, 3357) = 107.725$, $p < .001$). *Post hoc* tests with Bonferroni correction revealed (Figure 5.10) there was a significant difference between masculine ($M = 0.95$, $SD = 0.22$) and feminine ($M = 0.88$, $SD = 0.33$), $p < .001$, masculine and neuter ($M = 0.74$, $SD = 0.44$), $p < .001$ and between feminine and neuter, $p < .001$.

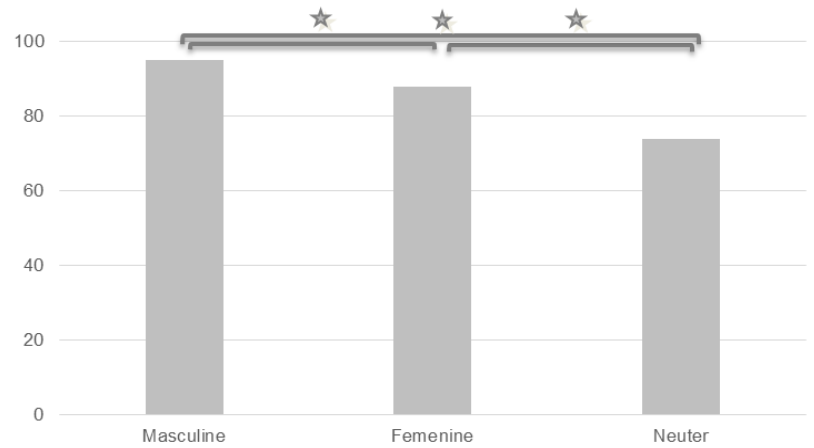

Figure 5.10: Accuracy in comprehension. Noun-Copula Past-Adjective. Gender categories. Heritage speakers

Gender values. Heritage speakers vs. monolinguals

The analyses also showed an effect of group (F(1, 5818) = 373.394, p <.001) and a two-way interaction between gender and group. (F(2, 5818) = 76.090, p <.001). A *post hoc* test revealed (Figure 5.11) that a significant difference between groups was in feminine and neuter (p <.001 for both) but not in masculine.

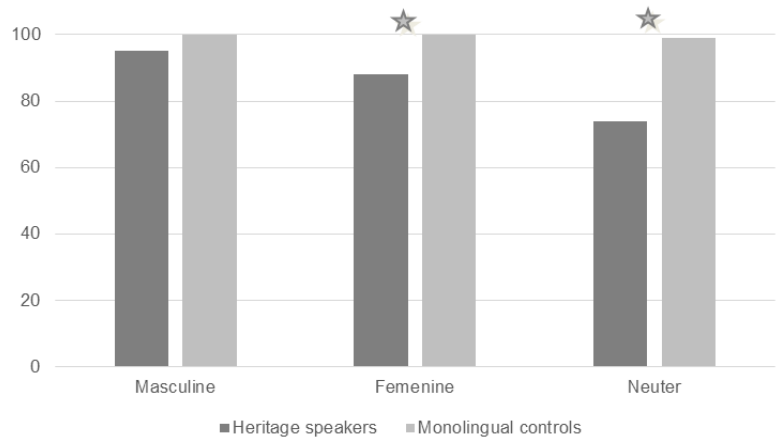

Figure 5.11: Accuracy in comprehension. Noun-Copula Past-Adjective. Gender categories. Heritage speakers vs. monolingual controls

Noun form transparency: heritage speakers

There was a main effect of transparency, F (1, 3357) = 46.436, p.< 001, as well as a statistically significant interaction between the effects of gender and transparency, F (2, 3357) = 18.075, p. < 001. *Post hoc* tests showed (Figure 5.12) that masculine and feminine gender was significantly easier than neuter when the word form was

transparent (p <.001). But when the word form was opaque there was a significant difference between masculine and feminine (p <.001) and masculine and neuter (p <.001). No difference was yielded between opaque feminine and opaque neuter nouns.

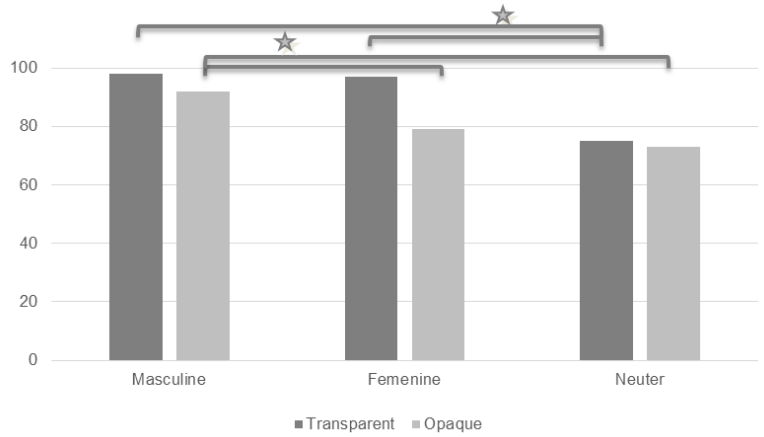

Figure 5.12: Accuracy in comprehension. Noun-Copula Past-Adjective. Transparent and opaque noun forms. Heritage speakers

Noun form transparency. Heritage speakers vs. monolinguals

In addition to the significant effects reported above, there was a three-way interaction between group, gender and transparency, F (5, 3357) = 17.654, p. < 001. When we followed up on the interactions, no significant difference was found in transparent nouns between heritage speakers and monolinguals. However, a significant difference between the two groups was found in transparent neuter nouns, the heritage speakers being less accurate than the monolingual controls (p <.001), as Figure 5.13 shows.

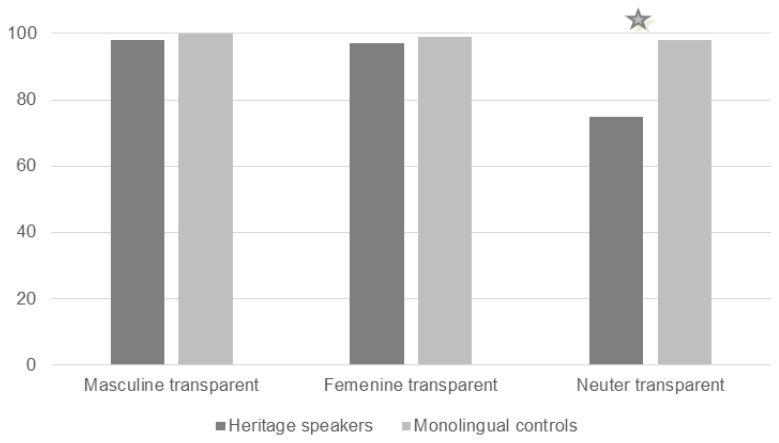

Figure 5.13. Accuracy in comprehension. Noun-Copula Past- Adjective. Transparent noun forms. Heritage speakers vs. monolingual controls

Also, *post hoc* tests demonstrated differences in opaque feminine and opaque neuter nouns between the two groups (Figure 5.14).

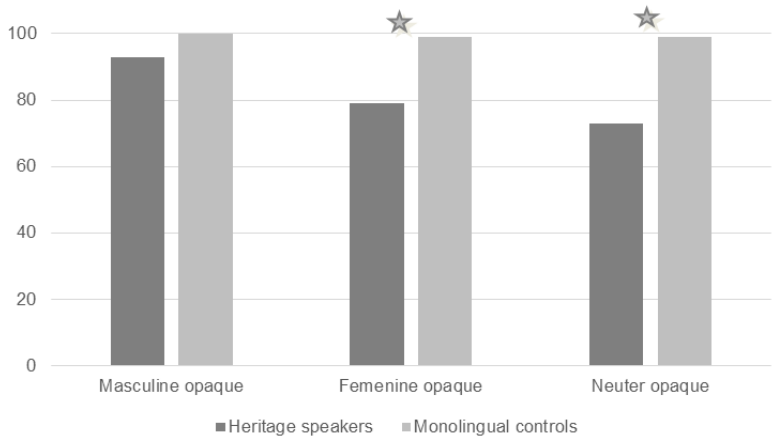

Figure 5.14: Accuracy in comprehension. Noun-Copula Past-Adjective. Opaque noun forms. Heritage speakers vs. monolingual controls

Crosslinguistic congruency effects: heritage speakers

An interaction between gender and congruency could not be demonstrated.

Analysis of the type of trial

In order to better understand the command of gender agreement in Noun-Copula Past-Adjective construction, we performed an additional analysis. Keep in mind that in this construction both copula and adjective trigger gender agreement. Thus, for the following analysis, three types of trials were compared:

Type 1. trials with a grammatical copula and a grammatical adjective, e.g., *stakan*-M *byl*-M *želtyj*-M 'The glass was yellow'.

Type 2. trials with an ungrammatical copula verb but a grammatical adjective, e.g., *stakan*-M **byla*-F *želtyj*-M 'The glass was yellow'.

Type 3. trials with an ungrammatical copula and an ungrammatical adjective, e.g., *stakan *byla *želtaja* 'The glass was yellow'.

We assumed, that if there were differences in verbal and adjectival agreement, the results of the analysis of the type of trial should reveal that. The accuracy results were calculated for three types of trials separately. We then computed ANOVA with the type of trial, gender, transparency and congruency as factors and with the

accuracy means as the dependent variable. There was a significant effect of type of trial (F(2; 3357)= 44,457), (p <.001). The effect was due to the heritage speakers scoring better in type 1 trials (M=91, SD=284) than in type 2 trials (M=83, SD=373), p <.001. They also scored better in type 1 trials than in type 3 trials (M=74, SD=439), p <.001. No differences between type 2 trials and type 3 trials were observed. No other effects or interactions were significant. The result indicates that the participants were affected by the grammaticality of the construction but not by the incorrectness of gender agreement. In other words, the accuracy scores were equivalent irrespective of an error on verb or errors on both verb and adjective.

Reaction time results

Collapsed across all cells of the design, the mean RT for both groups in Noun-Copula Past-Adjective construction was 737 ms (SD = 556), which is somewhat shorter than the mean RTs observed in the first construction (783 ms).

Reaction time results. Heritage speakers

Again reaction times for heritage group were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) x2 (congruent vs. incongruent) analysis of variance. Grammatical and

ungrammatical trials were analyzed separately. In both grammatical trials and ungrammatical trials, the analysis failed to show any significant effect for any of the variables or interactions.

Reaction time results. Monolingual controls

Judgment times for monolingual groups were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) analysis of variance. In this construction, the analysis yielded no effects or interactions, neither for grammatical nor for ungrammatical trials in the monolingual group (similarly to the heritage speakers' group).

Reaction time results. Heritage speakers vs. monolinguals

Results of the 3 (masculine, feminine vs. neuter) x2 (transparent vs. opaque) x2 (heritage speaker vs. monolingual controls). ANOVA yielded a significant main effect of group ($F(l, 2028) = 96.852$, $p < .001$) in grammatical trials of Noun-Copula Past-Adjective agreement construction. A *post hoc* test demonstrated that monolingual speakers obtained significantly shorter reaction times (M=610, SD=440) than heritage speakers (M=845, SD=623). As for ungrammatical trials ANOVA also demonstrated significant effects of group ($F(l, 1969) = 78.623$, $p < .001$). The heritage speakers were significantly slower than the monolingual controls. No other effects or interactions were yielded.

Analysis of type of trial

Similar to the analysis in the accuracy section, an ANOVA with a type of trial, gender, transparency and congruency as factors, and with the means of RT as the dependent variable, was conducted. No significant main effects or interactions were observed.

Summary of section 5.3

The results for accuracy were similar to the previous construction. They showed that masculine gender was the easiest gender for heritage speakers in Noun-Copula Past-Adjective construction. Feminine gender resulted in being relatively easy only in transparent conditions. The accuracy with neuter nouns was significantly lower than with masculine and feminine. Again, in all conditions, the monolinguals behaved at-ceiling. The heritage speakers performed similarly to the monolinguals in transparent masculine and feminine conditions. Additionally, the accuracy result showed that the heritage speakers were better in grammatical trials than ungrammatical. Also, no difference was found in trials with gender mismatch on copula verb or 'double' mismatch on copula verb and adjective.

As for the reaction times, the monolingual controls, overall, were faster in their responses than the heritage speakers in both grammatical and ungrammatical trials. No other significant patterns were revealed in this construction for reaction times.

5.4 Task 7. Sentential agreement: Noun-Copula Past-Prepositional Phrase

Task 7 was a replication of Task 4 but in comprehension. The gender agreement in Task 7 was expressed on copula verb *byt* 'be' in the past tense (example 14).

(14) limon byl na stole
lemon- NOUN, M, SG, NOM was- COP VERB PST, M, SG on-PREP table-NOUN
'The lemon was on the table'

5.4.1 Materials and procedure

Stimuli

The stimuli for the task were auditory phrases consisting of a noun, copula verb in the past and a prepositional phrase. In total, Task 7 included 56 experimental trials and 10 test items. No distractors were added. The experimental trials comprised of 16 agreement constructions with nouns in the masculine (8 grammatical, 8 ungrammatical), 16 agreement constructions with nouns in the feminine (8 grammatical, 8 ungrammatical), and 24 agreement constructions with nouns in neuter (8 grammatical, 16 ungrammatical). In order to focus the children's attention on gender agreement, we used only three prepositional phrases (see Chapter

3): (a) *na stole* ‘on the table’, (b) *na stule* ‘on the chair’, (c) *v dome* ‘in the house’. The prepositional phrases were equally distributed between trials, forming 19 trials with prepositional phrase *na stole* ‘on the table’, 19 trials with prepositional phrase *na stule* ‘on the chair’, and 18 trials with prepositional phrase *v dome* ‘in the house’. The trials in Task 7 were distributed across experimental conditions (gender, transparency, congruency, grammaticality) as presented in Table 5.7.

Gender	Transparency	Congruency	Grammaticality	Number	Example
M	T	C	G	2	*sok byl na stole* juice-M was-M on table
			U	2	**sok byla na stole* juice-M was-F on table ‘The juice was on the table’
		I	G	2	*kover byl v dome* carpet-M was-M in house
			U	2	**kover byla v dome* carpet-M was-F in house ‘The carpet was in the house’
	O	C	G	2	*rul’ byl na stule* steering wheel-M was-M on chair
			U	2	**rul’ byla na stule* steering wheel-M was-F on chair ‘The steering wheel was in the chair’
		I	G	2	*kamen’ byl v dome* stone-M was-M in house

			U	2	**kamen' byla v dome* stone-M was-F in house 'The stone was in the house'
F	T	C	G	2	*ložka byla na stole* spoon-F was-F on table
			U	2	**ložka byl na stole* spoon-F was-M on table 'The spoon was on the table'
		I	G	2	*tarelka byla na stule* plate-F was-F on chair
			U	2	**tarelka byl na stule* plate-F was-M on chair 'The plate was on the chair'
	O	C	G	2	*dver' byla v dome* door-F was-F in house
			U	2	**dver' byl v dome* door-F was-M in house 'The door was in the house'
		I	G	2	*stupen' byla v dome* step-F was-F in house
			U	2	**stupen' byl v dome* step-F was-M in house 'The step was in the house'
N	T	I (M in L2)	G	2	*vedro bylo na stule* bucket-N was-N on chair
			U (M)	2	**vedro byl na stule* bucket-N was-M on chair
			U (F)	2	**vedro byla na stule* bucket-N was-F on chair 'The bucket was on the chair'
	O	I (M in L2)	G	2	*derevo bylo v dome* tree-N was-N in house

			U (M)	2	**derevo byl v dome* tree-N was-M in house
			U (F)	2	**derevo byla v dome* tree-N was-F in house 'The tree was in the house'
	T	I (Fin L2)	G	2	*okno bylo v dome* window-N was-N in house
			U (M)	2	**okno byl v dome* window-N was-M in house
			U (F)	2	**okno byla v dome* window-N was-F in house 'The window was in the house'
	O	I (Fin L2)	G	2	*kreslo bylo v dome* armchair-N was-N in house
			U (M)	2	**kresol byl v dome* armchair-N was-M in house
			U (F)	2	**kreslo byla v dome* armchair-N was-F in house 'The armchair was in the house'
Total				56	

Table 5.7: Numerical distribution of experimental trials with examples across experimental conditions for Task 7 in comprehension
Note. M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent; G-grammatical, U-ungrammatical

Procedure

In this task, we followed the same procedure as in Task 5 and 6. The trials for Task 7 were run in five blocks and included a pre-test block with 10 trials and four experimental blocks with the target trials (14 trials in one block). After each experimental block, a

picture appeared on the screen in order to motivate the participants (remuneration phase). At the end of the experimental session, the children received a small gift from the researcher. The detailed order of trials is illustrated below in Table 5.8.

Phases of experiment	Number of trials	Description
Pre-test block	10 trials	Correcting feedback is given. The block is repeated until it is done without any errors.
Experimental block 1	14 trials	First block with target trials
Remuneration 1		Picture of a box of sweets appears on the computer screen
Experimental block 2	14 trials	Second block with target trials
Remuneration 2		Picture of an iPad appears on the computer screen
Experimental block 3	14 trials	Third block with target trials
Remuneration 3		Picture of roller skates appears on the computer screen
Experimental block 4	14 trials	Fourth block with target trials
Remuneration 4		On the computer screen, the note appeared ‘Well done! Receive a

		surprise present from the bag!'. The participants were given a present from the bag.

Table 5.8: The detailed order of trial blocks in Task 6 in comprehension

5.4.2 Results

Gender values: heritage speakers

Mean accuracy scores were submitted to a mixed ANOVA. There was a main effect of gender ($F(2, 1621) = 3.549$, $p < .001$) by which responses on the trials with masculine nouns (M=0.93, SD = 0.25) were more accurate than on feminine nouns (M=0.85, SD = 0.35), $p < .001$. Also, a difference was found between masculine and neuter (M=0.77, SD = 0.42), $p < .001$, and between feminine and neuter, $p < .001$ (Figure 5.15).

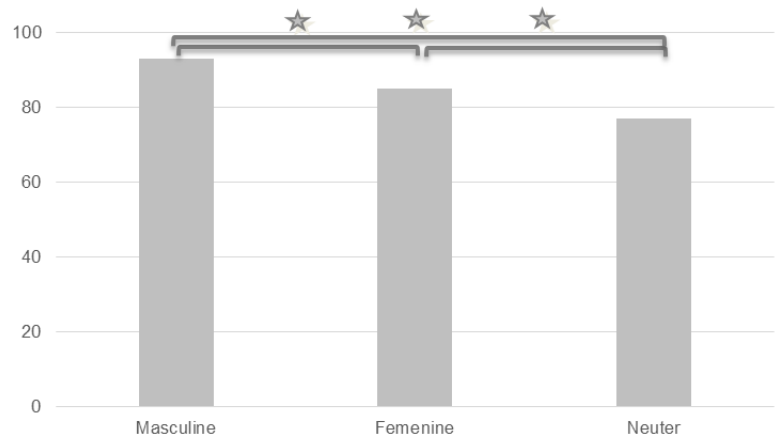

Figure 5.15: Accuracy in comprehension. Noun-Copula Past-PP. Gender categories. Heritage speakers

Gender values: heritage speakers vs. monolinguals

The analysis also showed an effect of group (F(1, 2799) = 138.539, *p* <.001) and a two-way interaction between gender and group (F(2, 2799) = 16.833, *p* <.001).

A *post hoc* test revealed there was a significant difference between the heritage speakers and the monolingual controls at feminine and neuter (*p* <. 001 for both) but not in the masculine as Figure 5.16 shows.

Figure 5.16. Accuracy in comprehension. Noun-Copula Past-PP. Gender categories. Heritage speakers vs. monolingual controls

Noun form transparency: heritage speakers

There was a main effect of transparency, F (1, 1621) = 7.208, *p*.< 007 including a statistically significant interaction between the

effects of gender and transparency, F (2, 1621) = 11.853, p <.001. *Post hoc* tests with Bonferroni correction revealed that the trials with masculine and feminine nouns were significantly easier than neuter when the word form was transparent (p <.001 for both). But when the word form was opaque, feminine and neuter were significantly more difficult than masculine (p <.001). No difference was found between opaque feminine and neuter gender (Figure 5.17).

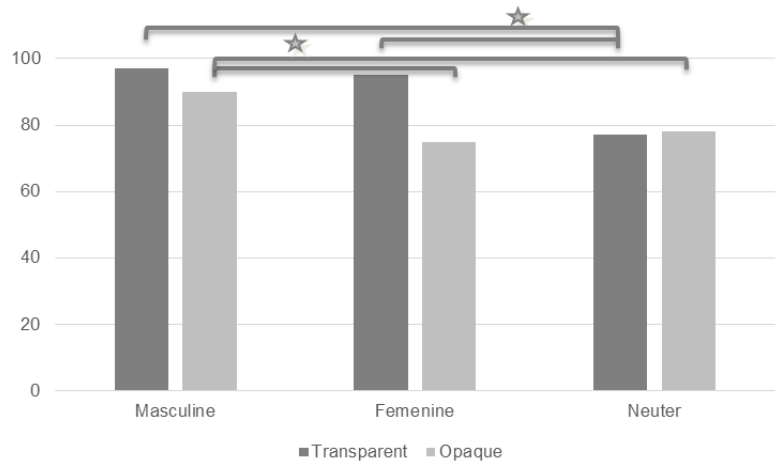

Figure 5.17: Accuracy in comprehension. Noun-Copula Past-PP. Transparent and opaque noun forms. Heritage speakers

Noun form transparency: heritage speakers vs. monolinguals

In addition to the significant effects reported above, there was a three-way interaction between group, gender and transparency, F (2, 2799) = 6.964, p <.001) by which the difference between heritage and the monolingual group was in transparent neuter (p <.001) but not in transparent masculine and transparent feminine (Figure 5.18).

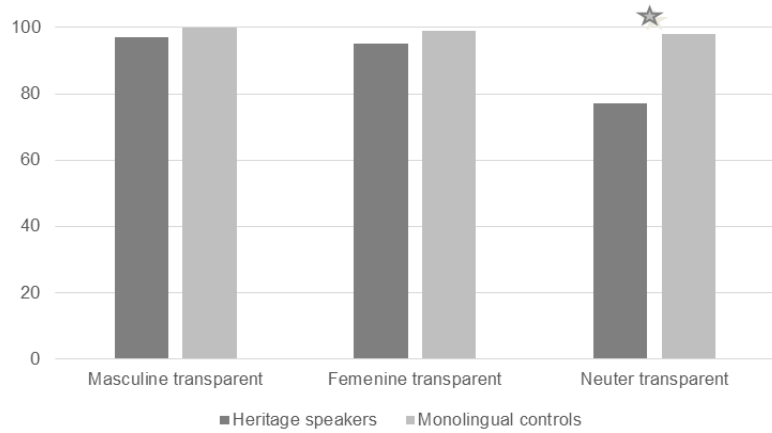

Figure 5.18: Accuracy in comprehension. Noun-Copula Past-PP. Transparent noun forms. Heritage speakers vs. monolingual controls

Additionally, *post hoc* tests revealed (Figure 5.19) that the monolingual children produced opaque feminine and opaque neuter nouns significantly better than the heritage speakers (p <.001 for all). No difference between the groups was found in opaque masculine nouns.

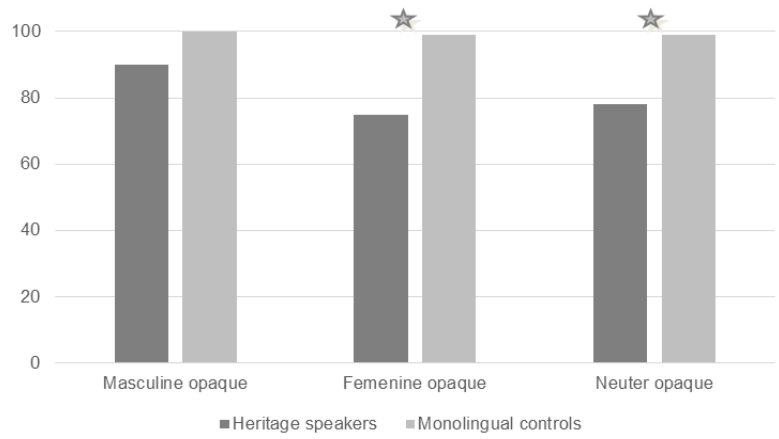

Figure 5.19: Accuracy in comprehension. Noun-Copula Past-PP. Opaque noun forms. Heritage speakers vs. monolingual controls

Crosslinguistic congruency effects: heritage speakers

No effects or interactions for congruency could be demonstrated.

Reaction time results

Collapsed across all cells of the design, the mean RT for both groups in Noun-Copula Past-PP construction was 843 ms (*SD* = 601), which is longer than in the two previous agreement constructions (783 ms and 737 ms, respectively).

Reaction time results. Heritage speakers

Mean reaction times were submitted to mixed ANOVAs: one for grammatical trials, one for ungrammatical trials. Gender (masculine, feminine, and neuter), transparency (transparent and opaque nouns), and congruency (congruent and incongruent nouns) were the within-subjects variables. The analyses in grammatical trials yielded an interaction between gender and transparency that was marginally significant (F(1, 426) = 4.311, *p* =.030). *Post hoc* analysis showed significantly slower reaction times for transparent masculine (*M*=988; *SD*=667) and transparent neuter (*M*=1020; *SD*=734) than in other conditions (all *ps* <.001) as illustrated in Figure 5.20.

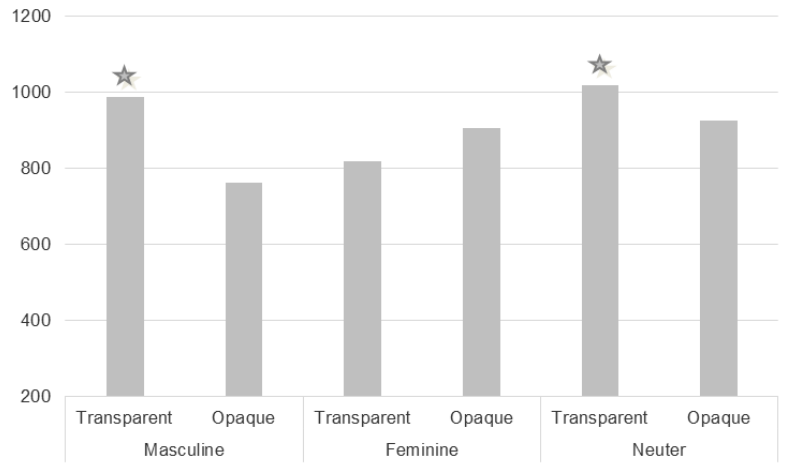

Figure 5.20: Reaction time in comprehension. Noun-Copula Past-PP. Grammatical trials. Means for gender and transparency. Heritage speakers

The analysis of ungrammatical trials yielded a significant main effect of noun gender F(1, 479) = 10,182, $p < .002$). *Post hoc* tests with Bonferroni corrections revealed (Figure 5.21) that reaction times were the fastest on feminines (M=856, SD=598)), followed by neuters (M=959, SD=648), and lastly the trials with masculine nouns (M=1100, SD= 674 ($p < .001$ between each gender value). No other main effects or interactions reached significance.

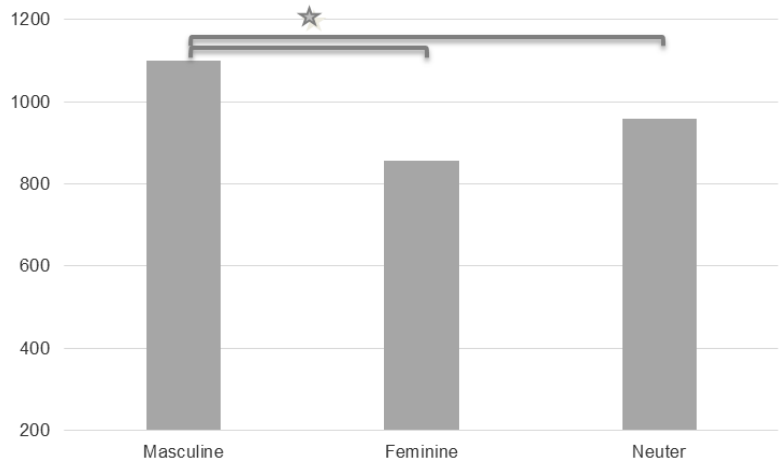

Figure 5.21: Reaction time in comprehension. Noun-Copula Past-PP. Ungrammatical trials. Means for gender. Heritage speakers

Reaction time results. Monolingual controls

Judgment times for monolingual groups were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) analysis of variance. In grammatical trials, the analysis yielded no significant effects or interactions. In contrast, analysis of ungrammatical trials in the monolingual group yielded a significant

main effect of gender (F(2, 378) = 6.224, p <.001), as well as a significant interaction between gender and transparency (F(2, 378) = 3.821, p = .022). *Post hoc* analysis showed that the significant interaction between gender and transparency came primarily from the transparent masculine nouns (M=1032, SD=668) which were processed significantly slower (Figure 5.22) than other categories (p <.001 between masculine and other conditions).

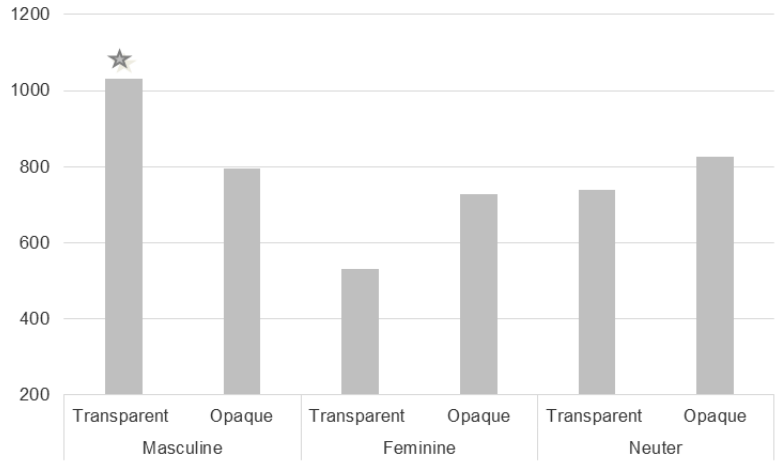

Figure 5.22: Reaction time in comprehension. Noun-Copula Past-PP. Ungrammatical trials. Means for gender and transparency. Monolingual controls

Reaction time results. Heritage speakers vs. monolinguals

Results of the 3 (masculine, feminine vs. neuter) x2 (transparent vs.opaque) x2 (heritage speaker vs. monolingual controls) ANOVA yielded a significant main effect of group (F(l, 1135) = 39.685, p <.001) in grammatical trials of Noun-Copula Past-PP agreement

construction. *Post hoc* tests demonstrated that monolingual speakers obtained significantly shorter reaction times (*M*=733, *SD*=1042) than heritage speakers (*M*=1302, *SD*=1787).

As for ungrammatical trials, ANOVA also demonstrated significant main effects of group (F(l, 857) = 37.503, *p* <.001). Heritage speakers were significantly slower (*M*=762, *SD*=965) than monolingual controls (*M*=1361, *SD*=2095). No other interactions were found.

Summary of section 5.4

The results for accuracy were similar to the previous two constructions. Namely, the heritage speakers demonstrated nearly 100% accuracy rates for the masculine gender. Trials with feminine nouns resulted in being easy only when the noun form was transparent. No effect of congruency was found. For neuter gender, heritage speakers showed the lowest accuracy rates. Again, in all conditions, the monolinguals behaved at-ceiling. The performance of the heritage speakers was identical to the monolinguals only for transparent masculine nouns. Noun-Copula Past-PP was the only construction in which a gender by transparency interaction was yielded in grammatical trials. The reaction time results demonstrated that the heritage speakers had the slowest reaction time in grammatical trials in transparent masculine and transparent neuter nouns. Additionally, the monolingual controls demonstrated the slowest reaction times for transparent masculine nouns in

ungrammatical trials. In general, the monolingual controls, overall, were faster in their responses than the heritage speakers in grammatical and ungrammatical trials.

5.5 Other results

5.5.1 Gender and agreement constructions

Aiming to compare the three agreement constructions tested in comprehension (similarly to production, see Section 4.6.1), the accuracy scores and reaction times were entered into a mixed ANOVA for the heritage speakers. The three within-subjects factors were gender, transparency, and congruency, and the between-subjects factor was construction (Adjective-Noun, Noun-Copula Past-Adjective, Noun-Copula Past-PP). For the monolingual controls, only reaction times were analyzed (they performed at-ceiling in accuracy). Mean reaction times were submitted to mixed ANOVAs with gender and transparency as the within-subjects variables while the between-subjects variable was construction. Again, reaction times for grammatical and ungrammatical trials were analyzed separately.

The results did not show any differences in any of the categories between the agreement constructions in accuracy, neither in the group of heritage speakers nor in the monolingual group.

No differences in reaction times were found in the monolingual group, neither in the grammatical, nor ungrammatical trials, that is, all three constructions were processed similarly. Similarly to the monolingual controls, in the heritage speaker's group, there were no significant main effects found for grammatical trials in reaction time results. However, in the ungrammatical trials there was a significant main effect of construction in general ($F(2, 2129) = 11.473$, $p < .001$) reflecting substantially slower reaction times for Noun-Copula Past-PP construction (M=969, SD=647) than in Noun-Copula Past-Adjective (M=825, SD=608, $p < .001$) and the least in Adjective-Noun (M=822, SD=507, $p < .001$).

5.5.2 Gender and background factors

In this section, we investigated the association between background factors - language proficiency, age of onset to L2, the amount of exposure and gender knowledge in comprehension. In order to do so, we conducted different analyses.

First, we will make a similar analysis as presented for sections 4.1-4.5, but this time the heritage speakers will be split up into two proficiency groups. Recall, based on the oral narrative task, the heritage speakers were divided into the two (low and high) proficiency groups. Also, the results of each proficiency group will be compared to the results of the monolingual baseline. Mean accuracy scores and reaction times for the analysis in this section

were each submitted to a mixed ANOVA with gender (masculine, feminine, neuter), transparency (opaque and transparent) and congruency (congruent and incongruent, only valid for the heritage speakers) as within-subjects variables, and group (monolingual controls, low and high proficient heritage speakers) as a between-subjects variable in the by-subjects analysis. As in the previous analysis, we present the results in reaction times separately for grammatical and ungrammatical trials. No separation is made for accuracy scores because the pattern of the results between grammatical and ungrammatical trials is identical. A figure is provided in case of any significant result (unless stated otherwise).

Secondly, in order to track any connections across the background measures (age of onset to L2 and amount of exposure) and grammatical gender knowledge, the following analysis will be presented. The gender knowledge in comprehension was treated as a continuous variable. A percentage of correct answers in all tasks was calculated for each participant based on the accuracy scores. The age of onset and amount of exposure to Russian was calculated based on the questionnaire. Finally, to check to what extent the accuracy in comprehension could be predicted by the background measures, Pearson correlations and multiple linear regression analyses were carried out.

Gender and proficiency

NP agreement: Adjective-Noun

Accuracy scores for Adjective-Noun constructions were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) x2 (congruent vs. incongruent) x3 (heritage speakers low proficiency group vs. heritage speakers high proficiency group vs. monolingual group) analysis of variance. The analyses yielded a significant effect for group ($F(1, 3023) = 185.083$, $p < .001$), gender ($F(5, 3023) = 11.154$, $p < .001$) and transparency ($F(1, 3023) = 25.541$, $p < .001$) which was qualified by an interaction of group, gender and transparency ($F(6, 3023) = 8.007$, $p < .001$). The three-way interaction revealed (Figure 5.23) that the low proficiency heritage speakers significantly differ from the high proficiency heritage speakers and monolinguals in opaque feminine, transparent neuter, and opaque neuter nouns (all $p_s < .001$). In other conditions (transparent masculine, opaque masculine and transparent feminine) no difference was found between groups. The results of the high proficient heritage speakers matched the monolingual group, whose performance was at-ceiling.

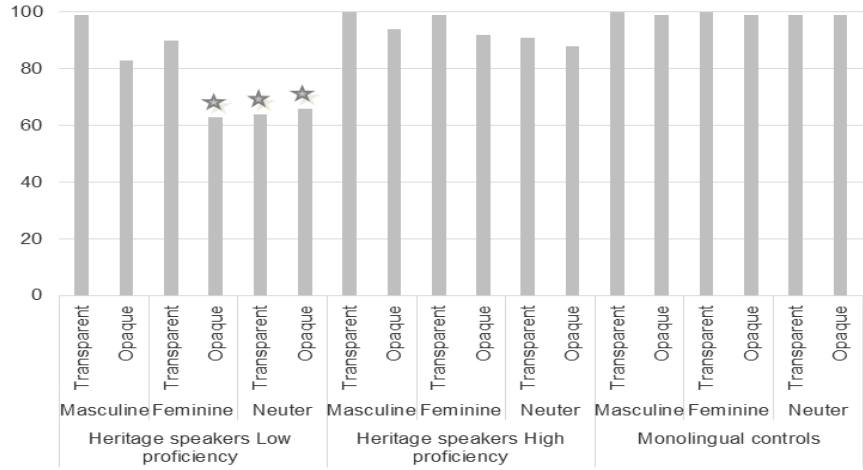

Figure 5.23: Accuracy in comprehension. Adjective-Noun. Gender and proficiency. Means for group, gender and transparency. Heritage speakers vs. monolinguals

Keep in mind that in heritage speakers (collapsed together) for ungrammatical trials, a significant interaction of gender, transparency and congruency was reported (Section 5.2). To investigate that issue with a focus on language proficiency, we performed similar analysis but with two groups (the low proficiency heritage speakers and high proficiency heritage speakers). We also added the results of the monolingual group for comparison reasons (though no congruency effect could be reported for them). The analysis revealed a significant main effect of group ($F(1, 1341) = 17.060$, $p < .001$), as well as a significant interaction between gender and group ($F(4, 1341) = 4.806$, $p < .001$). All groups differed from each other significantly in neuter gender (all *ps* <.001), with the native speakers showing the fastest reaction times (M = 665), following with the high proficient heritage speakers (*M*=745,

SD=439), while the heritage speakers from the low proficiency group were the slowest (*M*=1020, *SD*=628). Also, the two groups of the heritage speakers were slower than monolinguals in masculine condition (all *ps* <.001). In addition to the main effects, there was a three two-way interaction (in the heritage speakers' groups) of gender, transparency and congruency (F(3, 628) = 4.116, *p* =.007). Firstly, *post hoc* pairwise comparisons of the groups within conditions revealed that in all conditions the low proficiency heritage speakers were significantly slower than high proficiency heritage speakers (all *ps* <.001). Secondly, *post hocs* comparisons of the conditions within groups revealed that the result obtained in Section 5.2 was due to both groups of the heritage speakers. Namely, the trials with opaque incongruent masculine nouns and opaque congruent feminine nouns were processed significantly (as Figure 5.24 shows). Additionally, the opaque neuter nouns were processed significantly slower than transparent neuter nouns in the low proficiency group of the heritage speakers (*ps* <.001). In the monolingual group, the opaque feminine nouns obtained the longest reaction times within this group (all *ps* <.001), as illustrated in Figure 5.24.

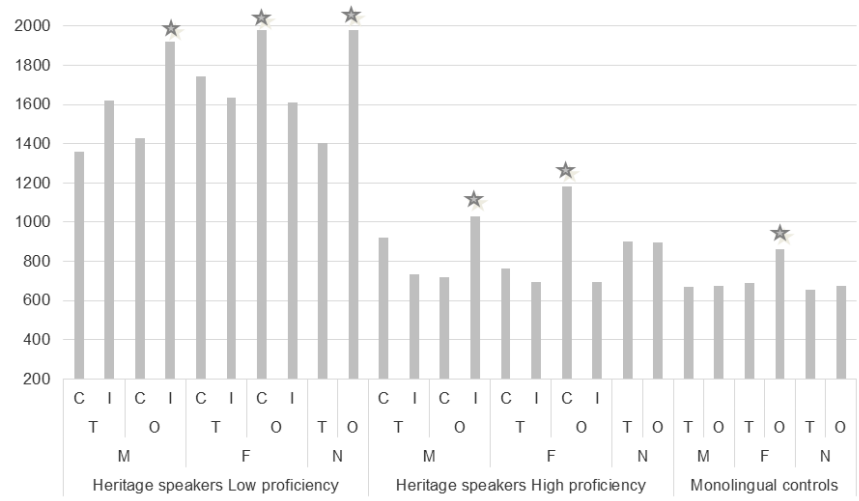

Figure 5.24: Reaction time in comprehension. Adjective-Noun. Ungrammatical trials. Gender and proficiency. Means for group, gender, transparency, and congruency. Heritage speakers vs. monolinguals

Sentential agreement: Noun- Copula Past-Adjective

Accuracy scores in the construction were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) x2 (congruent vs. incongruent) x3 (heritage speakers low proficiency group vs. heritage speakers high proficiency group vs. monolingual group) analysis of variance. The analyses yielded a significant effect for group ($F(2, 5818) = 333.985$, $p < .001$), gender ($F(2, 5818) = 152.605$, $p < .001$) and transparency ($F(1, 5818) = 65.035$, $p < .001$) which was qualified by an interaction of group, gender and transparency ($F(6, 5818) = 15.277$, $p < .001$). As in the previous construction, *post hoc* pairwise comparisons (Figure 5.25) revealed that the difference between groups was due to the low proficiency group of the heritage speakers who were significantly less accurate

in opaque feminine, transparent neuter and opaque neuter nouns than the high proficiency heritage speakers and the monolingual controls (all *ps* <.001). In other conditions (transparent masculine, opaque masculine and transparent feminine) no difference was found between groups. The results of the high proficiency heritage speakers matched the monolingual group, whose performance was at-ceiling.

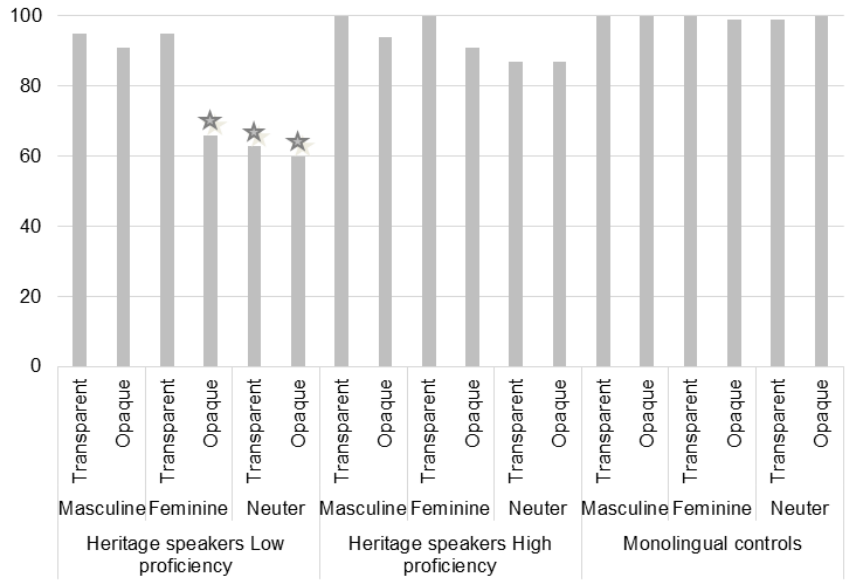

Figure 5.25: Accuracy in comprehension. Noun-Copula Past-Adjective. Gender and proficiency. Means for group, gender, and transparency. Heritage speakers vs. monolinguals

In line with the results in Section 5.3, the analysis of the reaction times with three groups as covariates did not demonstrate any significant results. For this reason, we do not include the corresponding figure.

Sentential agreement: Noun-Copula Past-Prepositional Phrase

Accuracy scores for this construction were subjected to a 3 (masculine, feminine, neuter) x3 (transparent vs. opaque) x2 (congruent vs. incongruent) x3 (heritage speakers low proficiency group vs. heritage speakers high proficiency group vs. monolingual group) analysis of variance. The analyses yielded a significant effect for group ($F(2, 2799) = 108.741$, $p < .001$), gender ($F(2, 2799) = 37.266$, $p < .001$) and transparency ($F(1, 2799) = 29.208$, $p < .001$) which was qualified by an interaction of group, gender and transparency ($F(6, 2799) = 9.777$, $p < .001$). As in the previous constructions, *post hoc* pairwise comparisons (Figure 5.26) revealed that the difference between groups was due to the low proficiency group of the heritage speakers who were significantly less accurate in opaque feminine, transparent neuter and opaque neuter nouns than the high proficiency heritage speakers and the monolingual controls (all *ps* <.001). In other conditions (transparent masculine, opaque masculine and transparent feminine) no difference was found between groups. The results of the high proficiency heritage speakers matched the monolingual group in masculine and feminine conditions but not in neuter (differently from the previous constructions). For trials with neuter nouns the high proficient heritage speakers were slower than monolingual children ($p < .001$).

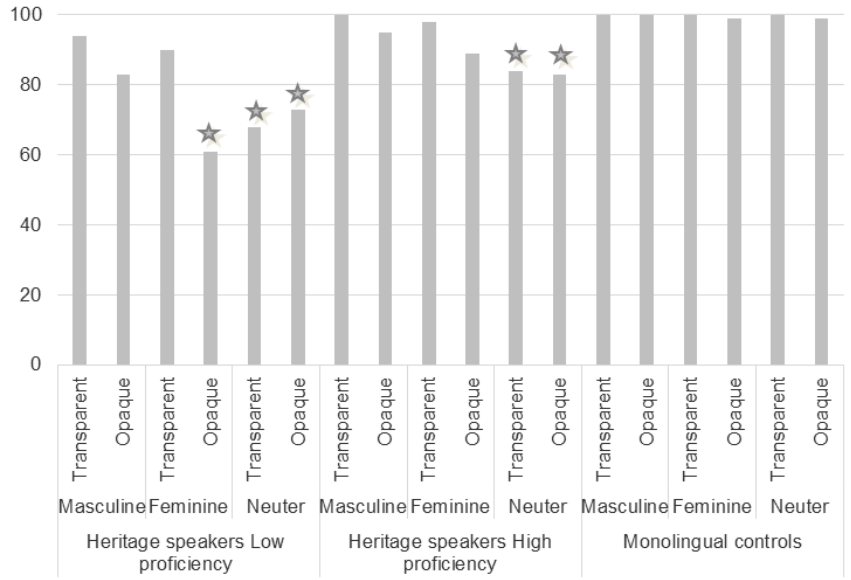

Figure 5.26: Accuracy in comprehension. Noun-Copula Past-PP. Gender and proficiency. Means for group, gender and transparency. Heritage speakers vs. monolinguals

Keep in mind that the reaction time results for this construction for grammatical trials (see Section 5.4.2) demonstrated significantly slower reaction times for the transparent masculine nouns and the transparent neuter nouns. To attest whether this result emerged in both proficiency groups or was due to the weight of one of the two subgroups, the reaction times for this construction were subjected to a 3 (masculine, feminine, neuter) x2 (transparent vs. opaque) x3 (heritage speakers low proficiency group vs. heritage speakers high proficiency group vs. monolingual group) analysis of variance. The inferential analyses of grammatical trials demonstrated a significant effect of group ($F(2, 1135) = 22.390$, $p < .001$), with low proficiency heritage speakers being slower than the other two groups ($p < .001$)

in all conditions. Also, a significant interaction of the group, gender, and transparency (F(1, 740) = 1.588, p =.02) was yielded. *Post hoc* pairwise comparisons within groups revealed no difference between conditions in the low proficiency group (Figure 5.27). However, the high proficiency heritage speakers were significantly slower in transparent masculine nouns and opaque neuter nouns than in other conditions (p <.001 for all). The monolingual children had the slowest reaction times in the transparent masculine condition when compared with the other conditions within the group (all *ps* <.001).

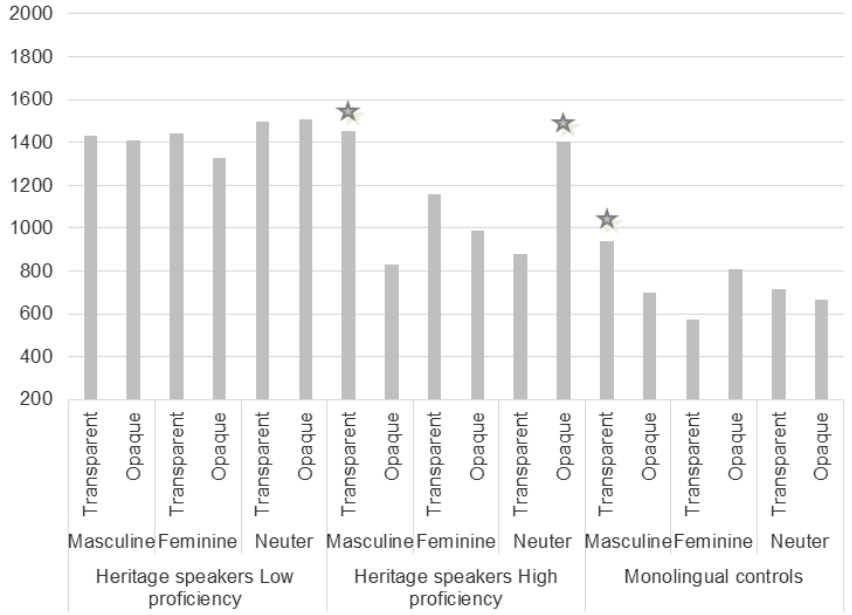

Figure 5.27: Reaction time in comprehension. Noun-Copula Past-PP. Grammatical trials. Gender and proficiency. Means for group, gender, transparency. Heritage speakers vs. monolinguals

Additionally, the effect of gender was found in ungrammatical trials in analyses presented in Section 5.4.2. To attest this result in two

proficiency groups of the heritage speakers, the reaction times in ungrammatical trials were subjected to a 3 (masculine, feminine, neuter) x3 (heritage speakers low proficiency group vs. heritage speakers high proficiency group vs. monolingual group) analysis of variance. The analysis revealed a main effect of group ($F(2, 857) = 13.217$, $p < .001$ and an effect of gender ($F(2, 857) = 10.955$, $p < .001$. *Post hoc* tests with Bonferroni corrections revealed that there was a significant difference between gender values in all three groups ($p < .001$ for all). Namely, in both proficiency groups as well as in the monolingual group the masculine nouns obtained the slower reaction times, the feminine nouns obtained the faster reaction times, with neuters falling in between (Figure 5.28).

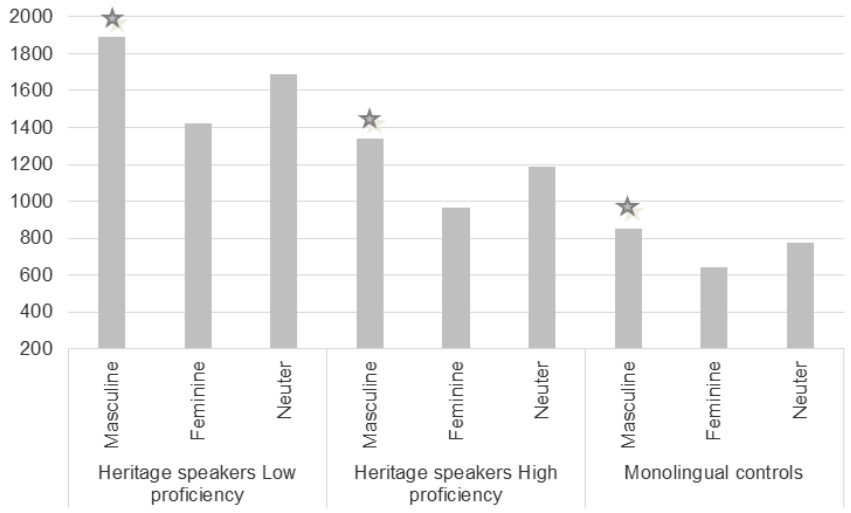

Figure 5.28: Reaction time in comprehension. Noun-Copula Past-PP. Ungrammatical trials. Gender and proficiency. Means for group and gender. Heritage speakers vs. monolinguals

Gender and age of onset vs. amount of exposure

In this section, we examine to what degree age of onset to L2 and amount of exposure influence Russian gender knowledge in comprehension. For that aim, Pearson correlations and Multiple regression analysis were performed. Similarly to production (see Section 4.6.2), the analysis included the following variables. For each participant, the average score per gender knowledge in comprehension (percentage of correct responses) was calculated. In this way, gender knowledge in comprehension was treated as a continuous variable. Overall, the percentage of gender knowledge in comprehension ranged between 68% and 100% (*M*=84%). Based on the language background questionnaire, we calculated the relative amount of exposure to Russian for heritage speakers, which ranged between 10% and 58% (*M*=29%). The background questionnaire also provided information about the age of onset to L2, it ranged between 0 and 84 months (*M*=15).

Firstly, the correlation analysis revealed a positive correlation between age of onset to L2 and gender knowledge in comprehension, which was statistically significant ($p < .025$). Also, a significant correlation was found between amount of exposure to Russian and gender knowledge in comprehension ($p < .001$). Secondly, Multiple regression analysis yielded a statistical significance of the model ($F(2, 28) = 21.640$; $p < .001$). However, the coefficients indicated that only amount of exposure significantly

affects knowledge of gender in comprehension (β=.674, t=2.754, *p* = .017 as depicted in Table 5.9).

Variable	b	SE b	β	t	*p*
Constant	69.118	3.304		20.921	.000
Age of onset	.183	.053	.251	1.450	.078
Amount of exposure	.478	.174	.668	3.699	.004

Table 5.9: Multiple regressions on language proficiency

Summary of section 5.5.2

In this section, we probed the degree to which the two (low and high) proficiency groups of the heritage speakers would differ in the comprehension of gender agreement and compared the results with the monolingual baseline. We also presented the analysis of the background factors (age of onset to L2 and amount of exposure) that may influence knowledge of gender in comprehension in the group of heritage speakers. Overall, the accuracy results in all three constructions were parallel. First, all groups performed at-ceiling on the masculine gender. The high proficiency heritage speakers performed at-ceiling on masculine and feminine, but not on neuter (that was especially significant for the Noun-Copula Past-PP construction). The low proficient heritage speakers were less

accurate on opaque feminine as well as on neuter (both transparent and opaque). The monolingual children performed at-ceiling in all conditions. These results are very similar to the ones obtained in production.

The findings for the comprehension experiment, which examined the time of reaction on auditory stimuli revealed mixed results. Overall, across all tasks, the low proficiency heritage speakers obtained longer reaction times than the other two groups. As predicted, in terms of processing gender in a native-like way, there were no differences between the heritage speakers from the high proficiency group and the monolingual children. All groups were sensitive to the gender grammaticality effect, where ungrammatical trials were processed slower than grammatical. Next, we will present the results for grammatical and ungrammatical trials by each construction.

In ungrammatical trials in Adjective-Noun agreement: (a) both low and high proficiency heritage speakers obtained longer reaction times on opaque incongruent masculine nouns and opaque congruent feminine nouns; (b) low proficiency heritage speakers obtained longer reaction times on opaque neuter; (c) the monolingual controls obtained longer reaction times on opaque feminine nouns.

In ungrammatical trials in Noun-Copula Past-Adjective construction (a) the low proficiency heritage speakers obtained

longer reaction times on opaque incongruent masculine; (b) the high proficiency heritage speakers obtained longer reaction times on transparent and opaque neuter nouns.

In grammatical trials in Noun-Copula Past-PP construction (a) the high proficiency heritage speakers obtained longer reaction times on transparent masculine nouns and opaque neuter nouns. In ungrammatical trials in Noun-Copula Past-PP construction (b) the monolingual controls obtained longer reaction times on transparent masculine; (c) the low and high proficiency heritage speakers and the monolingual children obtained the slowest reaction times for masculine. No other differences were significant. To sum up, all the groups were affected by the grammaticality of the trials and transparency of noun endings in gender agreement processing. Additionally, the low proficiency heritage speakers were sensitive to the congruency of nouns but only in ungrammatical trials with opaque nouns.

As for the two background measures, similar to the results in production, only the amount of exposure to Russian was shown to contribute to the heritage speaker's gender mastery in comprehension.

5.5.3 Error analyses in comprehension

In this section, we briefly present the relevant aspects of the error analysis in comprehension. The analyses allow us to compare the errors in comprehension with the errors in production and also to deepen our knowledge about gender in heritage Russian. We also used the data on errors to confirm or reject our hypothesis when discussing the results (Section 5.6). The raw data for all tasks (5-7) in comprehension were computed to yield percentages of incorrectly rejected grammatical trials and incorrectly accepted ungrammatical trials. The following variables were included in the analysis: (a) gender values (masculine, feminine, neuter), (b) transparency of noun form (transparent, opaque), and (c) grammaticality of the trials (grammatical, ungrammatical). We did not include the congruency variable because no effect of congruency (in comprehension accuracy) was demonstrated in the previous analyses.

Figure 5.29 shows the percentages of the errors in the masculine category for the following experimental conditions (a) grammatical agreement with transparent masculine nouns, e.g., *stakan byl želtyj* (glass-M was-M yellow-M), (b) grammatical agreement with opaque masculine nouns, e.g., *ključ byl seryj* (key-M was-M grey-M), (c) ungrammatical agreement with transparent masculine nouns (adjective and/or verb was in the feminine), e.g., *utjug *byla *belaja* (iron-M was-F white-F), (d) ungrammatical agreement with opaque masculine nouns (adjective and/or verb was in the feminine), e.g., *remen' *byla * černaja* (belt-M was-F black-F).

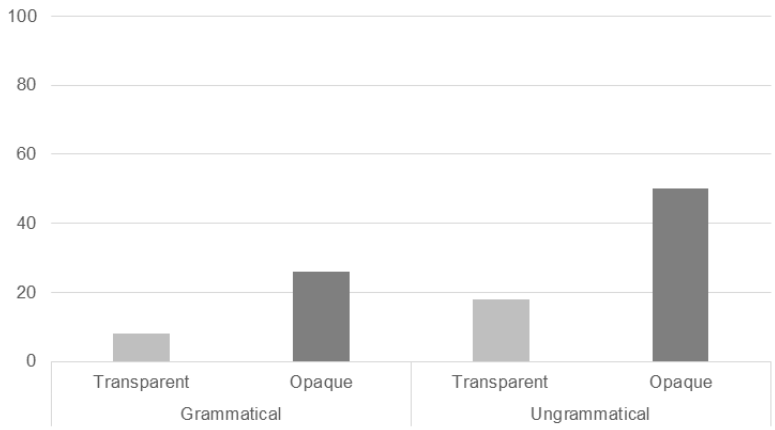

Figure 5.29: Error analyses in comprehension. All constructions. Percentage of errors in masculine. Heritage speakers

The results showed that the heritage speakers made more errors in ungrammatical trials with masculine nouns (68%) than grammatical (32%), with most errors being found in opaque conditions (50%).

Figure 5.30 shows the percentages of the errors in feminine category for the following experimental conditions: (a) grammatical agreement with transparent feminine nouns, e.g., *želtltaja zvezda* (yellow-F star-F), (b) grammatical agreement with opaque feminine nouns, e.g., *zelenaja cep'*(green-F chain-F), (c) ungrammatical agreement with transparent feminine nouns (adjective and/or verb was in masculine), e.g., **želtyj zvezda* (yellow-M star-F), and (d) ungrammatical agreement with opaque feminine nouns (adjective and/or verb was in the masculine), e.g., **želtyj kost'* (yellow-M bone-F).

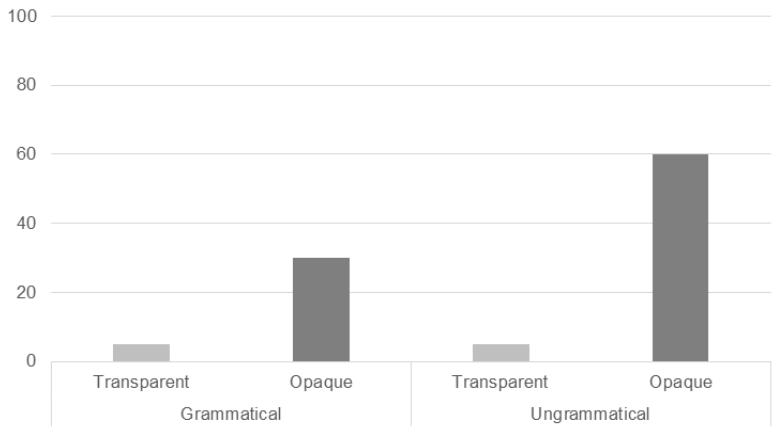

Figure 5.30: Error analyses in comprehension. All constructions. Percentage of errors in feminine. Heritage speakers

A similar error pattern was found for the trials with feminine nouns. The heritage speakers made more errors in ungrammatical feminine trials (65%) than in grammatical (35%). The participants made the highest number of errors in ungrammatical and opaque trials with feminine nouns (60%).

As we did not observe any effect of transparency for the neuter gender value (both transparent and opaque neuter nouns obtained similar scores), we did not add this variable into the analysis of neuter nouns. Thus, Figure 5.31 shows the percentages of the errors in neuter category for the following experimental conditions: (a) grammatical agreement with neuter nouns, e.g., *goluboe kolco* (light blue-N ring-N), (b) ungrammatical agreement with neuter nouns and adjective and/or verb in the masculine, e.g., **goluboj kolco* (light blue-M ring-N), and (c) ungrammatical agreement with neuter

nouns and adjective and/or verb in feminine, e.g., **golubaja kolco* (light blue-F ring-N).

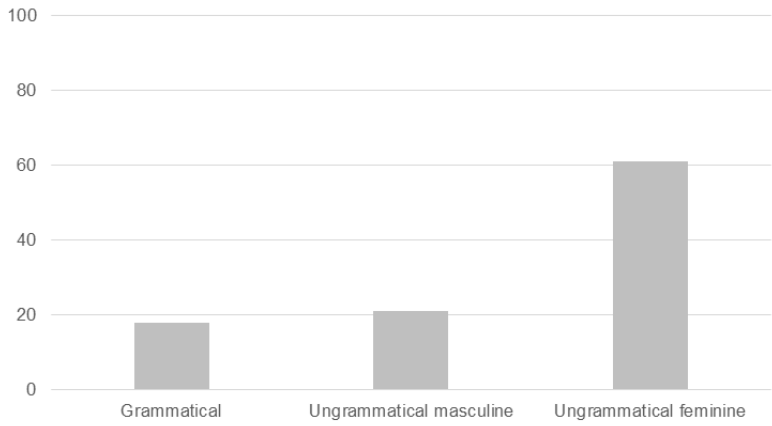

Figure 5.31: Error analyses in comprehension. All constructions. Percentage of errors in neuter. Heritage speakers

Similar to the previous gender values, the heritage speakers made more errors in the ungrammatical condition (82%) than grammatical (18%). The majority of the errors found in ungrammatical trials were with an adjective and/or verb in the feminine form (61%).

Summarizing, the error analysis in comprehension supports the pattern found in the production experiment. Namely, the opaque noun forms being more difficult than the transparent forms: the tendency to overgeneralize opaque masculine as feminine, opaque feminine as masculine and transparent, and opaque neuter as feminine.

5.6 Discussion of the findings for the comprehension experiment

This chapter aims to discuss the offline and online results of the comprehension experiment. Same to the production experiment, we analyzed the various factors that can influence gender knowledge, including language-internal factors (gender values, noun form transparency, type of agreement construction), child-internal factors (crosslinguistic congruency and Russian language proficiency) and child-external factors (age of onset to L2 and amount of exposure to Russian). First, the results for accuracy in comprehension will be briefly discussed, followed by a focus on the results for the reaction times which revealed a more complex pattern. Finally, In Chapter 6, the results of the comparisons found in production vs. comprehension for the tasks as a whole, which was the main aim of this study, will be reviewed.

Accuracy results

Regarding the gender values, the following results in accuracy were obtained. First, the results of the grammatical judgment task confirmed that masculine is the least problematic category (as we predicted) for the child heritage speakers. The high accuracy for masculine is persistent even at low levels of proficiency in all agreement constructions and independently of its form (transparent

or opaque), crosslinguistic influence (congruent or incongruent) or agreement construction (at a nominal or sentence level, on adjectives or verbs). This result is consistent with the prior findings in comprehension (Akhutina et al., 2001, for Russian native speakers; Polinsky, 2008, for heritage speakers) which showed that speakers' performance on masculine nouns is usually at-ceiling.

Secondly, for agreement constructions with feminine nouns, the high proficiency heritage speakers demonstrated target-like performance independently of feminine noun form, crosslinguistic influence or agreement construction. In contrast, the low proficiency heritage speakers obtained very low scores on feminine opaque nouns. The error analysis in comprehension demonstrated that 65% of errors with feminine nouns were because the heritage speakers erroneously accepted ungrammatical agreement forms with feminine target nouns and adjectives and/or verbs in the masculine. That fact can provide additional evidence for both the default nature of masculine, and feminine nouns ending in a palatalized consonant which are overgeneralized as masculine. Similarly to the production data, the performance on the trials with transparent feminine nouns was at-ceiling in the low proficiency group of the heritage speakers. Such a result may be explained by the facilitating effect of phonologically unambiguous gender marking of agreement paradigm in case of feminine nouns ending in –a (transparent). We will return to this finding and discuss it in detail in Chapter 6.

Third, the data in comprehension revealed that not only opaque but transparent neuter nouns are problematic for low proficiency heritage speakers (equally to the result in production). Again, high proficiency heritage speakers performed closely to the monolingual controls, though not at-ceiling for neuter in the Noun-Copula Past-PP construction. Although it is interesting to note that receptive tasks, specifically grammaticality judgment tasks, are often easier than production tasks because the pressure placed on the participant is minimized (Prévost and White, 2000; Montrul, 2004). Moreover, the heritage speakers may receive sufficient input in Russian but do not have enough possibilities to practice the heritage language, i.e., have insufficient output. Thus, it could be expected that comprehension skills are more developed in heritage speakers than their production skills. However, the agreement constructions with neuter nouns were the most difficult, even in the comprehension task, and even among the high proficiency heritage speakers (but only in Noun-Copula Past-PP). That fact makes us suggest various explanations. First, the neuter gender probably has not been fully acquired by the heritage speakers, especially by the heritage speakers from the low proficiency group. A closer look at their sociolinguistic data can show that the children with amount of exposure to Russian less than 35% also have lower accuracy in the comprehension tasks (Appendix IV). Recall from Chapter 1, neuter gender is infrequent in Russian lexicon and, additionally, if amount of exposure to the L1 is not sufficient, the chances to acquire this grammar feature reduce significantly. In Section 5.5.2, the influence of amount of exposure on the gender agreement knowledge in

comprehension was demonstrated. However, the question of how much exposure in the heritage language is sufficient for successful grammar acquisition is still open. For instance, Hoff et al. (2012) stated that children (aged 1;10 to 2;6.) who received 70% or more of their heritage language at home performed similarly to the monolingual controls in all measures of language development (vocabulary and grammar). The children with language exposure at home between 50% and 60% were close to the monolingual baseline. The children for whom the percent of the language used at home was 30% or less demonstrated a significant delay in heritage language acquisition when compared to monolinguals and other bilingual groups. In sum, the size of the difference in the results between the monolingual group and the bilingual groups was always less when the exposure to the heritage language at home was higher. In the study by Pearson et al. (1997), the threshold of 20% was discussed: if children receive less than 20% of input in one language they are often reluctant to speak that language. Thus, future research can be conducted on figuring out the minimum amount of exposure needed for successful gender agreement mastery, and in particular the acquisition of neuter gender that is extremely infrequent in the Russian lexicon.

Furthermore, the reduced amount of phonological clarity of agreement paradigms with neuter nouns can increase the time of figuring out neuter nouns from the auditory input. Consider an example of a nominal phrase in nominative *bolsh**o**e oblako* ‘big cloud’, in which the stress in the adjective falls on the -o vowel (in

bold), therefore signaling for neuter gender. However, Russian is characterized by the low frequency of the end-stressed forms (Janssen, 2016), thus, reducing the chances of neuter to be acquired rapidly. Notice that the masculine and neuter agreement patterns with adjectives (if the noun they modify is inanimate) are identical except for the nominative and accusative cases. Thus, the whole declension paradigms for masculine, feminine and neuter should be acquired to successfully produce and comprehend neuter and other gender values in Russian (Polinsky, 2008; Rodina and Westergaard, 2017). In future studies, agreement forms in other cases could be tested to obtain a full picture of the acquisition of gender in heritage Russian. As a conclusion, we can say that the non-target like performance for neuter gender can be a product of various factors, including the insufficient amount of exposure to Russian, combined with the low frequency of neuter and low phonological saliency of agreement constructions with neuter nouns.

The interaction of the group, gender and transparency showed a facilitative effect of noun form transparency among the low proficiency group, particularly in feminine nouns, so that agreement constructions with transparent feminine nouns were easier to recognize than with opaque feminine ones. This is partly in line with our prediction that the heritage speakers rely on morphophonological information in determining gender. The explanation of why all agreement constructions with transparent feminine nouns obtained higher scores than with opaque probably lies in phonological similarity across the adjective, noun and verb

inflections. For example, in the agreement construction with the transparent feminine noun, all the agreed elements have the homophonic inflection endings (marked in bold), e.g., *krysh**a** byl**a** krasn**aja*** ‘roof was red’. In turn, in the agreement constructions with feminine opaque nouns, the inflection ending paradigm is changed, e.g., *tetrad’ byl**a** želт**aja*** ‘notebook was yellow’. The error analysis of feminine nouns demonstrated that 30% of errors were made in grammatical trials with feminine opaque target nouns (judged as incorrect) and 60% in ungrammatical trials with feminine opaque target nouns (judged as correct). An interesting observation could be that ungrammatical trials with feminine opaque target nouns (*tetrad’*-F *byl*-M *želт**yj***-M ‘notebook was yellow’) resembled grammatical constructions with masculine opaque nouns (*korabl’*-F *byl*-M *želт**yj***-M ‘ship was yellow’). So, one can suggest that feminine opaque nouns are interpreted as masculine by the low proficiency bilinguals because of its phonological similarity to masculine nouns. Summarizing, similarly to the results in the production experiment, the transparency of gender cues resulted in being crucial for the comprehension of feminine gender for the low proficiency heritage speakers. This result will be discussed in further detail in Chapter 6.

In the comprehension task, no congruency effect in any of the agreement constructions was yielded, in contrast to production, in which the congruency effect was found in the Noun-Copula Past-PP construction. Neither did we find any differences in accuracy across the three tasks, i.e., agreement constructions. These findings

are probably attributed to the task type and show that comprehension is easier than production (Prévost and White, 2000; Montrul, 2004); also, we must be aware that in the production task the child has to provide an answer among different possibilities (the wrong gender category, the wrong form within the correct category, etc), whereas in the comprehension experiment only one answer, correct or incorrect, is possible.

We also investigated to what extent age of onset to the L2 and amount of exposure influenced the heritage speakers' comprehension of gender in different agreement constructions. An interesting finding (replicating one from the production task) is that gender knowledge in comprehension was correlated with the amount of exposure to Russian. In other words, the heritage speakers who obtained high scores in comprehension also had received more exposure to Russian. Having obtained such a result, we explored the sociolinguistic information from the profiles of the heritage speakers. Interestingly, those heritage speakers who have a higher percentage of exposure to Russian come from Russian-speaking families, in which both parents speak Russian. We have not attested to the type of family as a variable that affects gender proficiency in our study. However, it seems logical that the amount of exposure to Russian is higher in the families where both parents are Russian-speaking. The previous studies confirmed this fact. For instance, in the studies by Mitrofanova el al. (2018) and Rodina and Westergaard (2017), the best predictor of accuracy on grammatical gender tasks was the amount of exposure in Russian, which in turn

was higher in Russian-speaking families than in Russian-Norwegian-speaking families.

To summarize, the accuracy results in the comprehension experiment replicated the findings reported in the production experiment. Namely, based on the gender results, the ranking of degree of difficulty with gender values can be established (1 easiest - 3 most difficult): masculine (1) > feminine (2) > neuter (3). This result is similar to the other studies (Polinsky, 2008; Schwartz et al., 2014; Mitrofanova et al., 2018; Rodina and Westergaard, 2017) and probably attributes to the default or unmarked nature of masculine gender. We also observed a gender transparency effect for feminine gender and proposed several explanations: (a) the opaque noun forms are confounded with masculine gender which in turn, is a default gender in heritage Russian and (b) from the acquisition perspective, the agreement paradigm with opaque feminine nouns is more difficult to acquire due to its phonological opacity. Additionally, our results showed that the amount of exposure to Russian is the most important predictor of heritage speakers' knowledge of grammatical gender in Russian. This finding demonstrated that the gender mastery in comprehension could be attained if enough exposure to heritage language is provided (in line with the previous studies, e.g., De Houwer, 2007; Gathercole and Thomas, 2009; Lu and Koda, 2011; Mitrofanova et al., 2018; Rodina and Westergaard, 2017). In the final chapter (Chapter 6), we will summarize the results of the production and comprehension

experiments. Now we turn to the discussion of the online results from the comprehension data.

Gender in online processing

One of the aims of the comprehension experiment was to explore gender knowledge of the heritage speakers with the help of the online (timed) grammaticality judgment task. The participants were presented with the auditory stimuli and their task was to judge the correct (grammatical) and incorrect (ungrammatical) trials. The correct answer in the ungrammatical condition was no, while the correct answer in the grammatical condition was yes. We include the grammatical/ungrammatical comparison as a factor in our analysis to determine whether response profiles differ across the three genders for correct acceptances (yes) and correct rejections (no). Also, the same variables used in the accuracy analysis were included in the statistical analysis, such as gender value, transparency of the noun form, crosslinguistic congruency, etc. We will start with our observations of the results on gender separately, first for grammatical trials, followed by ungrammatical trials. Within the scope of ungrammatical trials, we present the results for three agreement constructions attested, namely, Adjective-Noun, Noun-Copula Past-Adjective and Noun-Copula Past-PP.

To begin with, noun gender was included as a factor due to the possibility that the three types of nouns would behave differently. This possibility was based on the offline results obtained in this

study which demonstrated a hierarchy of genders, masculine being the easiest gender value, neuter the most difficult, and feminine in between the two. However, for grammatical trials, this hypothesis was not borne out. Masculine, feminine and neuter nouns had a similar reaction time in the comprehension experiment in all agreement constructions attested, thus, it is safe to suggest that the differences in genders are not important in processing when gender between the elements involved matches. Our findings failed to demonstrate the main effect of noun gender in grammatical trials as seen in the studies on Russian gender processing in Russian monolingual adults by Akhutina et al., (1999), Akhutina et al. (2001) and Taraban and Kempe (1999). Hence, young heritage speakers do not have problems processing agreement across different gender categories in grammatical conditions. However, for ungrammatical condition the result pattern was different. Below I discuss it in more detail.

First, we found a triple interaction of gender, transparency and congruency in two of three constructions (Adjective-Noun and Noun-Copula Past-Adjective). In both constructions, the interaction involved ungrammatical trials with opaque incongruent masculine nouns. Thus, masculine nouns resulted in being costlier for processing than feminine and neuter. This finding can be seen as unexpected when compared with the offline results in which the masculine value is the easiest one, however, in our opinion, this effect can be explained in the following way: first, recall from the literature review, the masculine gender is the unmarked value in

Russian (as in many other languages) and is often used by "default". It is also numerically the largest class of nouns in Russian, and it is the one in which most of the words in the nominative case have a zero suffix (both transparent and opaque nouns end on a consonant), i.e, belonging to the I declension. For the phonologically transparent and opaque masculine nouns that we have used here, the effects of a correct gender-marked element in all agreement constructions appear to be minimal: there was no evidence for gender facilitation in case of grammatical construction (as we discussed in the first paragraph no differences between gender values arise). But in the case of ungrammatical trials, we observe an inhibitory effect of the feminine gender-marked element with nouns in the masculine. These results are to be expected if listeners start each new trial with the assumption that the next noun they hear will belong to the default class, i.e., masculine. However, their expectations are violated when an adjective (or an adjective and/or a verb in Noun-Copula Past-Adjective) is feminine and a noun is masculine. Hence, the time required to recognize and judge an agreement construction with masculine noun increases in ungrammatical constructions.

Taking into account the unmarked or default nature of masculine gender outlined above, we now turn to the detailed illustration of how the markedness effect and the attested variables (grammaticality, gender, transparency and congruency) affect the processing in each of the constructions involved (Adjective-Noun and Noun-Copula Past-Adjective). No interaction of these variables was found in Noun-Copula Past-PP.

First, the heritage speakers of all proficiency levels obtained longer reaction times on opaque incongruent masculine nouns in the Adjective-Noun construction, e.g., **belaja fonar'* (white flashlight). In this construction, the gender is marked on the adjective in the attributive position. In ungrammatical trials, the adjective is marked for feminine gender, whether the target noun is masculine. Moreover, the gender of the noun is incongruent with Spanish and Catalan, meaning that the noun *fonar'* (flashlight) is feminine in Spanish and Catalan but masculine in Russian. Thus, after hearing the stimuli **belaja fonar'* 'white-F flashlight-M', the following gender retrieval process most likely occurs: (a) the adjective is feminine, thus, an upcoming feminine noun is expected, and (b) the noun is masculine because it ends on a consonant. At this point, when the agreement error is detected, the rechecking is initiated. During the rechecking process, the heritage speakers also access the gender of the Russian noun *fonar'* 'flashlight' in their L2s. When the gender of this noun in Spanish and Catalan does not coincide with the gender in Russian (i.e., incongruent), it slows down the gender retrieval process and causes increased reaction times. However, our task was not directly aimed to understand the processing of gender agreement among speakers' who are trilingual, so we can only speculate about the process of gender access and retrieval in this population.

Additionally, in the Adjective-Noun construction, both the heritage speakers (of all proficiency levels) and monolingual controls

obtained slower reaction times on ungrammatical trials with opaque feminine nouns, e.g. *zelenyj zep'* (green-M chain-F). The fact that all the groups had difficulty with opaque feminine nouns is in line with the markedness effect discussed above. The opaque feminine nouns ending in a palatalized consonant resemble masculine nouns. Therefore, when the children first hear the adjective marked for masculine gender, they expect to hear the following noun in the masculine gender. Phonologically the feminine noun resembles masculine, that's why it takes the children time to detect the error. In contrast, the ungrammatical trials with masculine nouns, which were processed longer due to their incongruent nature, feminine nouns were crosslinguistically congruent. A possible explanation of longer processing of congruent feminine can be that when hearing the noun, the speakers automatically retrieve the gender from their L2s. If the gender of the noun is congruent between the L1 and L2s, i.e., both being feminine, it provides an additional cue that the agreed adjective will be feminine too. However, on detecting the agreement mismatch (the adjective is in masculine), the children are surprised and start the rechecking from the beginning (i.e., adjective), and this process takes time. To find a more plausible explanation for this congruency/incongruency mismatch between masculine and feminine nouns, other experiments should be conducted, starting with measuring the reading times of different agreement constructions.

Similarly to the Adjective-Noun construction, a triple interaction of gender, transparency, and congruency was found in ungrammatical

trials in Noun-Copula Past-Adjective constructions. The low proficiency heritage speakers obtained longer reaction times on opaque incongruent masculine nouns which formed the following ungrammatical trials with masculine nouns: (a) *fonar' byla belaja* 'flashlight-M was-F white-F' and (b) *fonar' byla belyj* 'flashlight-M was-F white-M'. The essential difference from the NP agreement (the Adjective-Noun construction) is that the ungrammatically marked for gender adjectives and verbs postponed the noun. Thus, in this construction, the speakers first hear the noun unambiguously marked for a masculine gender (ending in a consonant) and then generate expectations about the upcoming verb and predicate in the masculine. However, when these expectations are violated, the reaction times increase. It does not happen with feminine and neuter nouns because the expectations are more robust for masculine subjects, so violating them is more disruptive. In addition, it appears that the gender of the nouns is accessed in the L2s, and when incongruency occurs between Russian vs. Spanish and Catalan, difficulty with a response increases.

At this point, we have only discussed the results that were obtained for ungrammatical trials in the Adjective-Noun and Noun-Copula Past-Adjective constructions. Now, we will discuss the results for Noun-Copula Past-PP constructions that were found in both grammatical and ungrammatical trials.

First, within the group of the low proficient heritage speakers, no differences in the processing of grammatical trials in this

construction were demonstrated. Evidence from offline results shows that this construction was extremely difficult for low proficiency heritage speakers. In contrast, the high proficiency heritage speakers obtained longer reaction times on transparent masculine and transparent neuter nouns but not in other categories. To understand this finding, it is important to mention that the monolingual speakers were also significantly slower with masculine trials but in ungrammatical conditions. The processing of the grammatical and ungrammatical trials with masculine nouns by the high proficiency heritage speakers and by the monolingual children may be constrained by the unmarked nature of this gender value as discussed above for the Adjective-Noun and Noun-Copula Past-Adjective constructions. This finding is in line with our predictions based on the online results in Russian monolingual populations as observed in the studies by Akhutina et al. (2001) and Slioussar (2018). We also suggest that the slow processing of grammatical trials with opaque neuter nouns may be constrained by the phonological ambiguity of the noun form. For example, hearing the trial with opaque neuter noun *mylo bylo v dome* 'soap was at home', the high proficiency heritage speakers compute an agreement relation between the gender-marked copula verb (e.g., *bylo* 'was') and the noun (e.g., *mylo* 'the soap'). Since the neuter ending on the noun resembles the feminine ending because it is an opaque form, a verb marked with the feminine is expected. As a consequence, the opacity of the neuter morpheme causes slower processing due to a phonological confound. In sum, these findings suggest that the high proficiency heritage speakers have difficulties with gender

processing when (a) the agreement construction is absent in their L2 and/or (b) when the form of a noun is opaque. Similar findings between the high proficiency heritage speakers and the monolingual children in Noun-Copula Past-PP indicate that despite differences between the groups, the online gender agreement processing in heritage speakers resembles (or may be equal) to the monolingual. The exact nature of this similitude could not be concluded from this study, but it does motivate future research into the differences and similarities between heritage and monolingual speakers.

Based on the data presented, it could be suggested that in real-time processing of gender agreement, two components are involved: (a) on word level-transparency and congruency of the nouns and (b) at a sentence level-agreement construction (type and its morphological grammaticality). Thus, this finding demonstrates that both lexical gender assignment and gender agreement are closely bounded in gender processing in the L1 and are affected by crosslinguistic influence from the L2. The previous studies demonstrated crosslinguistic influences in gender processing at the lexical and the syntactic level in bilinguals (Lemmerth and Hopp, 2017) and in proficient L2 learners (Foucart and Frenck-Mestre, 2011; Sabourin and Stowe, 2008). For instance, Foucart and Frenck-Mestre (2011) examined grammatical gender processing in German native speakers who were advanced learners of French comparing them to native French speakers. The gender agreement was attested in three agreement constructions: (a) determiner and the noun, (b) the postposed adjective and the noun and (c) the preposed adjective and

the noun. Similarly to our study, German and French both have grammatical gender systems, but the systems differ in respect to the number of genders and types of agreement constructions, adjective positions relative to the noun and agreement of elements within the DP. French (as in Spanish and Catalan) has a two-gender system (i.e., masculine and feminine); in contrast, German (as in Russian) has a three-gender system (i.e., masculine, feminine and neuter). Regarding the adjective position, two-word orders exist in French. Namely, attributive adjectives must agree in gender with the noun, independent of position, e.g., preposed *le petit ballon* 'the small ball' or postposed *le ballon vert* 'the green ball'. Whereas in German the adjectives appear only in a preposition, e.g., *der kleine Tisch* 'the small table'. The results showed that all groups (native speakers and L2 learners) were sensitive to gender violations between the definite article and the noun. However, L2 learners did not show any effect between adjectival agreement constructions. The authors claimed that the differences across German and French for a canonical adjective position within the NP may have caused a general difficulty in acquiring adjectival agreement in L2 French for German learners. Thus, making a comparison with our study, we can assume that the processing of the construction absent in the L1 grammar of heritage speakers is more difficult to process than the processing of gender agreement in constructions that are present only in the target language. If the command of gender agreement in constructions is, to some extent, shared or similar between languages, the speaker can take advantage of the agreement pattern of the other language, therefore reinforcing the pattern of the target

language. Being that there is no data from L2 speakers in our study, no direct comparison between the heritage speakers and L2 learners could be made. That being said, we may add this group in future follow-up studies.

As for the role of gender, we saw that agreement errors with masculine subjects cause a larger delay in reaction times compared to errors with feminine and neuter nouns, i.e., were costlier for processing. This is in line with the previous findings on gender agreement in comprehension as reported in the literature (Akhutina et al., 2001; Romanova and Gor, 2017; Slioussar, 2018). We have discussed this finding before in other two constructions from the position of the markedness effect. Masculine is assumed to be the unmarked gender value and the results are attributed to the fact that agreement with the most unmarked gender value is more disruptive. Moreover, the results were found to not be parallel in all agreement constructions. We found the gender effects mainly in Adjective-Noun and Noun-Copula Past-Adjective constructions in ungrammatical trials. Only in Noun-Copula Past-PP, the reaction time results were obtained in both grammatical and ungrammatical trials. Consequently, the online results have tapped into the knowledge of gender among high proficiency heritage speakers who demonstrated a target–like performance for gender agreement knowledge in elicited production and offline comprehension. However, in online production, the high proficiency heritage speakers demonstrated variability in their results. This finding is most likely attributed to the task type: the online measures can

reveal subtle differences that offline comprehension and elicited production studies fail to detect (Grüter, Lew-Williams and Fernald, 2012; Hopp, 2013; Lemmerth and Hopp, 2017). In addition, this result from the high proficiency heritage speakers is in line with previous studies, suggesting that near-native gender processing can be attained, but that it depends on proficiency (Hahne and Friederici, 2001; Lemmerth and Hopp, 2017).

Summary of the chapter

This experiment was a mirror version of the production experiment presented in Chapter 4. With the general question in mind, what factors affect gender agreement knowledge in heritage Russian of trilingual children, as within the production experiment, we evaluated similar variables in the comprehension experiment. We conducted an auditory grammaticality judgment task evaluating sensitivity to the agreement (mis)matches in three constructions, including Adjective-Noun, Noun-Copula Past-Adjective and Noun-Copula Past-PP. Both, accuracy and reaction times were recorded. All in all, for accuracy, a similar pattern as seen in the production experiment emerged. That is the agreement constructions with masculine were generally unproblematic across all experimental conditions. We also found the facilitatory role of gender marking in agreement forms with feminine nouns. And, finally, the heritage speakers were least accurate with constructions with neuter nouns. Again, the proficiency level in Russian and amount of exposure (but

not age of onset) were the background factors that positively affect gender agreement knowledge of the heritage speakers. The reaction time results have revealed a complex interaction of factors (grammaticality, gender, transparency and congruency) but have pointed to one conclusion: gender agreement in Russian is processed in interaction with other gender systems. In the next chapter, we provide the results for both experiments and their potential explanations in detail.

6. FINAL DISCUSSION

In the previous two chapters, we examined the grammatical gender knowledge of Russian inanimate nouns by young heritage speakers living in Spain. The gender knowledge was attested in production via offline elicited naming tasks (Tasks 1, 2, 3, 4) and in offline and online comprehension via grammaticality judgment tasks (Tasks 5, 6, 7). All experimental tasks evaluated the following factors that potentially affect gender knowledge:

1. Russian language-internal factors
- Gender values (masculine, feminine and neuter)
- Noun form transparency (transparent and opaque nouns)
- Agreement constructions (in nominal level: Adjective-Noun; in sentence-level: Noun-Zero Copula Present-Adjective, Noun-Copula Past-Adjective, Noun-Copula Past-PP)

2. Child-internal factors
- Gender congruency between the L1 and L2 nouns (congruent and incongruent)
- Russian language proficiency (assessed via an oral narrative task)

3. Child-external factors
- Age of onset to the L2
- Amount of exposure to Russian

We compared the results of thirty heritage speakers of Russian, aged 7 to 11, to that of 24 native Russian monolingual controls, as a baseline reference. In Chapter 4 and Chapter 5, we discussed the results for the production and comprehension online and offline data separately. In the present chapter, we further comment on the results of both production and comprehension while discussing what we can confer from the research questions originally presented in Chapter 3.

Gender values

As in the previous chapters, we begin our discussion answering the questions related to gender values in Russian. More specifically, our first research question regarding gender, in general, was the following:

RQ1 Do heritage speakers gain full mastery of grammatical gender both in production and comprehension?

In turn, the question regarding the masculine gender value was the following:

RQ1.1 Is masculine the easiest gender value for the heritage speakers in both production and comprehension? Can it be suggested that the masculine is used as a "default" gender in heritage Russian?

In line with the predictions, the data from our study has demonstrated that masculine gender was found to be largely

unproblematic in the heritage speakers' production and comprehension. This finding is not surprising, taking into account that masculine is usually considered to be a default or unmarked gender since it is the most frequent, attracts most borrowings and is associated with the default declension class when compared to feminine and neuter (Corbett, 1991; Corbett and Freser, 1999; Rice, 2005). The results of the previous studies support the idea of masculine being the unmarked gender in different heritage languages. For instance, L1 English-L2 Spanish bilinguals were reported to select/use masculine as default in both production and comprehension (Liceras, Fernández Fuertes, Perales, & Spradlin, 2008; Liceras, Fernández-Fuertes and Klassen, 2016). In Klassen (2016), the examination of L1 Spanish-L2 German bilinguals found that there is considerable defaulting to masculine in the gender use in L2 German. Returning to the results in heritage Russian, Laleko's study (2018) demonstrated that hybrid nouns (nouns characterized by variable agreement behavior, e.g., *slastena* 'sweet-tooth) were treated as generic masculine forms by both monolingual and heritage Russian speakers. In the spontaneous production data of young heritage speakers in America, Chirsheva (2009) found that when a child does not know which gender to assign, he or she uses masculine as the default gender. Moreover, numerous studies on gender acquisition in Russian heritage language demonstrated that masculine gender is the least difficult category in both gender production and comprehension (e.g., Polinsky, 2008; Rodina and Westergaard, 2017; Schwartz et al., 2014). Finally, in light of the studies observed in the previous chapters and the results from our

study, we argue that the masculine gender in the heritage speakers' grammar has a special role that differs from other gender values. Below we summarize the findings from our study which point to the default nature of masculine gender:

1. In line with Polinsky (2008), in both production and comprehension, the performance for masculine gender by the heritage speakers, regardless of their competence level, matched the performance of the monolingual baseline.
2. Moreover, the heritage speakers displayed equally high ratings for sentences with transparent masculine and opaque masculine nouns, meaning the transparency of gender cues did not have any effect on masculine gender knowledge, or from a complementary perspective, masculine opaque gender cues do not cause special difficulties for our heritage children. Similar findings for masculine gender was observed in Mitrofanova et al. (2018), Rodina and Westergaard (2017) and Schwartz et al. (2014).
3. The heritage speakers did not show any difference between the congruent and incongruent masculine nouns. That is, no crosslinguistic influence was observed from L2 Spanish and Catalan on masculine nouns. It can be suggested that when children face the easiest gender value, i.e., masculine, the corresponding elements of the languages not in use seem to not compete, neither in comprehension nor in production.
4. In both domains (nominal and sentential), and with agreement constructions, results for masculine nouns were at-ceiling. In line with Laleko (2018), the heritage speakers

displayed equally high ratings for sentences with nouns in the masculine, in both adjective and verb agreement contexts.

5. The analysis of error types in production showed an overextension of masculine to non-masculine conditions (54% of all errors).
6. The online results in comprehension demonstrated that the ungrammatical trials with masculine nouns were more costly in processing for the heritage speakers as well as the monolingual children. This result was an unexpected one but we suggest that it could be due to children's expectations being violated. In turn, the expectations for masculine gender are more robust than feminine and neuter as masculine is the most unmarked gender category in Russian (we will discuss this further in RQ7).

In sum, the masculine gender can be considered the unmarked (or default) gender value in heritage Russian, being that it is less complex morphologically and is more frequent in the Russian lexicon than feminine and neuter. Thus, the heritage speakers did not display any difficulties with this gender value, neither at the level of production nor at the level of comprehension and processing.

Continuing with feminine gender, we proposed the following research question:

RQ1.2 Do heritage speakers have any difficulties with feminine gender? If yes, what are they and what underlies the pattern?

As predicted, feminine gender was more problematic than masculine. This difficulty was a consequence of feminine noun form opacity (no difficulties were found with transparent feminine nouns) and low language proficiency of the heritage speakers (the high proficiency speakers behaved at-ceiling). Recall that feminine nouns ending in -a were referred to as transparent, e.g., *noga* 'leg', while feminine nouns ending in a consonant were referred to as opaque, e.g., *ten´* 'shadow' (because of their phonological similarity to masculine nouns). For the low and high proficiency heritage speakers, the transparent feminine nouns were unproblematic, and their performance at this category was at-ceiling, while the opaque feminine nouns posed the most difficulty. This finding, that opaque feminine nouns are problematic, corresponds to what Rodina and Westergaard (2017) and Schwartz et al. (2014) have observed in bilinguals who have Russian as their L1 in a minority language situation when in contact with different languages (English, Hebrew, German and Norwegian). In turn, the performance on both transparent and opaque feminine nouns in high proficiency heritage speakers matched the monolingual controls. This discrepancy in the results between two proficiency groups is most likely attributed to the acquisition outcomes, i.e., insufficient exposure to Russian and low transparency of the morphological agreement paradigm of feminine nouns which will be discussed below.

First, recall from the literature review that feminine nouns comprise 34% of the Russian lexicon, which is slightly less than masculine nouns which comprise 47% (Slioussar and Samoilova, 2015). However, when the distribution of transparent and opaque nouns is taken into account, the opaque feminine nouns correspond to only 5% of all nouns in the Russian lexicon (Slioussar and Samoilova, 2015). Thus, due to their low frequency, opaque feminine nouns can be problematic for L1 and L2 acquisition as previous studies have demonstrated, e.g., Janssen, 2016; Rodina and Westergaard, 2012; Schwartz et al., 2014.

Secondly, in explaining the difference between the results of low and high proficiency heritage speakers, the question of how children learn the complex morphology of Russian should be addressed. Recall that heritage speakers typically depend on auditory input for language learning (Benmamoun, et al, 2013; Rothman, 2007). Thus, it can be suggested that the phonological input may be the only source of information that provides the heritage speakers' with an initial foothold into morphology. The learning process through the analysis of acoustic information has been referred to in the literature as the phonological bootstrapping hypothesis (Ambridge and Lieven, 2011; Höhle, 2009; Weissenborn and Höhle, 2001). Here we address how this hypothesis is applied to Russian morphology, in particular, on the agreement paradigm with feminine nouns. As we have briefly observed in the discussion for the production data (Chapter 4, Section 4.6) monolingual children may use the phonological similarity of cues as a learning strategy for the

acquisition of syntactic constructions such as noun phrases containing an attributive adjective (Voeikova, 2011, 2015; Tribushinina et al., 2015). For instance, the phonological similarity between some suffixes of nouns and adjectives provides the children with a cue that helps in learning the inflectional systems. There are four possible patterns of "rhyme agreement" (i.e., agreement that is characterized by phonological similarity) between adjectives and nouns (based on Voeikova, 2011, 2015):

(1) Classification of nominal agreement paradigms based on the phonological similarity of inflection endings:

1. adjective and noun have similar inflection endings *malen´k-oj kružk-oj* 'little-F.INS.SG cup-F.INS.SG'
2. adjective and noun have partly similar inflection endings: *malen´k-imi mašink-ami* 'little-INS.PL cars-INS.PL'
3. adjective and noun have reduplicative inflection endings *malen´k-aja kružk-a* 'little-F.NOM.SG cup-F.NOM.SG', or *malen´k-uju kružk -u* 'little- F.ACC.SG cup-F.ACC.SG'
4. adjective and noun have contrastive inflection endings *malen´k-oj kružk-e* 'little-F.DAT.SG cup-F.DAT.SG'

A phonological correspondence between phonologically similar pairs (1-3) favors the acquisition of adjectival agreement. In turn, the contrastive combinations as in pair 4 are acquired later than pairs 1-3. The use of phonological overgeneralizations in the monolingual child's speech supports this assumption. The children often show a clear preference for adjectives with endings which are reduplicative and similar or partially similar to the endings of the

nouns. To illustrate this, consider the following example in the spontaneous speech of a 2-year-old boy (Voeikova, 2015, p. 274). On his mother's question *'Kashu mannuju budesh' varit'? Kakuju kashu budesh' varit'?* 'Will you make cream of wheat porridge? What porridge will you make?'. The boy answered **manu* instead of *mannuju* 'cream of wheat' - the word pronounced by his mother. In the example, the child reduced the inflectional paradigms of the adjective, making the adjective *mannuju* phonologically similar to the declension of the noun *kashu*. At an early stage of monolingual language development, a similar strategy was reported in Finnish (Laalo, 2005) and Lithuanian (Kamandulyté-Merfeldiené, 2015), both languages with rich inflectional morphology. For instance, Finnish children sometimes enhance the similarity between the elements in a noun phrase by adding the same suffix to an adjective and a noun. For example, in plural partitive, children may say **piene-j-ä talo-j-a* instead of *pien-i-ä talo-j-a* 'little-GEN house-GEN', adding the suffix elements *-j-a* to the adjective. Turning to the results of this study, all heritage speakers (both from low and high proficiency groups) demonstrated target-like score rates in all four agreement constructions with transparent feminine nouns. Following Voeikova's classification, such agreement forms (the feminine nouns with transparent gender cues and in the nominative singular) belong to type 3 (reduplicative), which is characterized by a high degree of homophony and phonological harmony. For example, in NP, *bel-aja kružk-a* 'white cup', the ending of the adjective contains a reduplication of the vowel –a,. The same explanation is also plausible for the other constructions attested in

our study at the sentence level, e.g., in Noun-Zero Copula Present-Adjective *kružk-a bel-aja* ‘cup is white’, in Noun-Copula Past-Adjective *kružk-a byl-a bel-aja* ‘cup was white’ and in Noun-Copula Past-PP *kružk-a byl-a v dome* ‘cup was in house’. In all three constructions, the endings of the adjectives and/or verbs that agree with the target noun are phonologically similar. In turn, the agreement constructions with opaque feminine nouns (i.e., ending in a consonant) resulted in being difficult for the low proficiency heritage speakers. Such agreement constructions were: Adjective-Noun *bel-aja sol´ø* ‘white salt’, Noun-Zero Copula Present *sol´ø bel-aja* ‘salt is white’, Noun-Copula Past-Adjective *sol´ø byl-a bel-aja* ‘salt was white’ and Noun-Copula Past- PP *sol´ø byl-a in dome* ‘salt was in house’. In the case of an opaque feminine ending there is no phonological similarity between noun and adjective inflectional endings (no morphophonological harmony, in other words). On the contrary, in the case of transparent feminine, this morphophonological harmony helps the children to produce and comprehend the agreement forms with the transparent feminine nouns. This holds for the masculine as well: all inanimate masculine nouns provide the phonological similarity with adjectives regarding their inflectional endings. Neuter nouns with unstressed endings sound like transparent feminine nouns and it is not accidental that adjectives referring to such nouns get feminine endings.

Summarizing, the low proficiency heritage speakers rely on (phonological) form, as a basic initial strategy for constructing and understanding agreement forms with feminine nouns. The

acquisition of the agreement paradigm with opaque feminine nouns might be constrained by the phonological dissimilarity between the agreed elements with the nouns. It leads to the later acquisition of these agreement patterns in comparison to those with transparent feminine nouns. However, one should not disregard the possibility that the children from the low proficiency group will master the agreement paradigm with opaque feminine nouns under favorable conditions (e.g., with the sufficient exposure to Russian).

Finally, our research question regarding the neuter gender was the following:
RQ1.3 Is the neuter category the most problematic? If so, are neuter nouns treated as feminine or are there any other patterns beneath?

In production and comprehension, neuter gender was the most vulnerable category but again, likewise in feminine, only among low proficiency heritage speakers. Thus, our prediction was partly borne out. To explain this finding, it can be suggested that the grammar of young heritage speakers is still in the developing stage, as the neuter gender value may not be not fully acquired. Several factors support that claim. First, the neuter gender is significantly less frequent than other gender values. Only 18% of nouns are neuter in the Russian lexicon (Slioussar and Samoilova, 2015). Secondly, a special phonological context is required to distinguish neuter nouns from the feminine ones in the auditory input (which we know is the main source for language acquisition for heritage speakers). For instance, based on a Russian corpus, Janssen (2016)

reported that neuter nouns with end-stressed endings (which are phonologically transparent for gender) are extremely rare in child-directed speech: they make up only 0.5% of the total number of tokens in the analyzed corpus. The remaining neuter nouns have stem stress and therefore are opaque for gender. Additionally, to signal for gender, the agreed elements with neuter nouns should have the stress at the end syllable (in the nominative and accusative singular), e.g., *bolsh**o**e oblakə* 'big cloud'. However, in the majority of cases, the agreed elements with neuter nouns are also stem-stressed and resemble feminine due to the phonological reduction of the vowels, e.g., *m**a**len'kəja oblakə*-N 'little cloud' vs. *m**a**len'kəja kružkə*-F 'little cup'. This observation has an interesting implication for heritage language learning. Some morphological cues are phonologically ambiguous, and speakers have to deduce the features implicitly from the auditory input they receive. Therefore, the formal instruction centered on literacy development and grammatical knowledge is crucial for successful mastery of the heritage language. Thus, the low frequency of transparent (end-stressed) neuter nouns in the Russian lexicon, along with the existence of homophony between neuter and feminine agreement forms, may potentially slow down the neuter gender acquisition.

And, finally, we should not discard the possible influence from L2 Spanish and Catalan. Spanish and Catalan have masculine and feminine gender values but lack neuter gender. This fact can hamper the acquisition of Russian gender agreement. The previous studies confirmed the negative role of the distance between the L1

and L2 on grammar development among bilinguals and heritage speakers (Paradis, 2005; Schwartz et al., 2014). However, to obtain more information on this, a large-scale and crosslinguistic study comparing the results of the heritage speakers with different language combinations is needed.

To summarize, it can be said that the non-target like performance for neuter gender in the low proficiency group of the heritage speakers can be a product of various factors, including the infrequency and low phonological salience of the agreement paradigms with neuter gender in the Russian lexicon as well as crosslinguistic influence from L2 Spanish and Catalan. Further research focusing on heritage speakers is necessary to investigate whether they will conform to the target in neuter gender at a later stage of development.

Noun form transparency

The next question we present involves the influence of noun form on gender knowledge. We have partly addressed this issue when discussing the results for feminine gender (RQ1.2). Below we will summarize the findings and focus on RQ2.2.

RQ2.1 Does transparency of gender cues influence gender knowledge? If yes, in what way?

RQ2.2 What patterns of errors do occur?

In line with our prediction, the transparency of gender cues played a role in gender agreement production and comprehension. The transparency resulted in being particularly important for feminine gender knowledge by the low proficiency heritage group. As discussed previously, the robust difference between transparent and opaque feminine nouns is most likely due to the phonological factors that facilitate the acquisition of the agreement with transparent nouns but delay it with opaque ones (see the discussion for RQ1.2). One can probably ask why no difference between transparent and opaque forms was found in other gender values? We suggest that the difference between transparent and opaque masculine nouns was masked by the masculine default strategy. Also, the difference between transparent and opaque neuters did not surface, as neuter nouns are generally a challenge for heritage speakers, most likely due to its infrequency, phonological ambiguity and negative crosslinguistic influence from L2s which lack neuter gender.

Due to the fact that the transparency issue in feminine nouns was discussed in RQ1.2, we will now focus on discussing the main findings regarding RQ2.1. In line with the previous data of Rodina and Westergaard (2017) and Schwartz et al. (2014), concerning the role of transparency on gender value in Russian, qualitative similarities were found between the participants from our research and the participants from these two studies. These similarities were evident in the following main types of errors: (a) overgeneralizing of opaque (and transparent) neuter nouns to feminine gender; (b)

overgeneralizing of opaque feminine nouns to masculine gender; (c) overgeneralizing of opaque masculine nouns to the feminine gender. However, we did not find any overgeneralization of masculine and feminine nouns to neuter as reported in Schwartz et al. (2014). Additionally, contrary to our results, the Russian-Norwegian bilinguals in Rodina and Westergaard (2017) were reported using the masculine agreement predominantly across all noun classes. However, in our study, the heritage speakers were prone to overgeneralizations with masculine and feminine. That is, errors found in Russian heritage speakers with low proficiency are typical of younger monolinguals (as discussed in detail in Chapter 1, Section 1.3) and can be attributed to the delay in achieving full mastery of the morphological system (in the case of opaque feminine as well as opaque neuter). In sum, the fact that transparency of gender cues played a facilitating role on gender production only for feminine gender, may indicate that purely cue-based gender agreement occurs when no other strategy can be applied: (a) the strategy of using a default gender (the case of masculine nouns) or (b) lack of knowledge of the gender (the case of neuter nouns).

Crosslinguistic congruency effects

The next question deals with possible crosslinguistic influence from L2 Spanish and Catalan. It was attested to the word level, namely, we manipulated the nouns that are congruent (i.e., have the same

gender value) and incongruent (have different gender values) between the L1 and L2s. As proposed in the research question:
RQ3.1 Is there any crosslinguistic congruency effect on gender agreement production and comprehension in heritage Russian? If the answer is yes, can the crosslinguistic influence be accounted for any of the internal (e.g., language proficiency) and external linguistic factors (e.g., amount of exposure)?

In line with our prediction, the results show that the congruency effects are dependent on several factors. Namely, the influence of L2(s) emerges in unfavorable conditions, i.e., when the syntactic configurations are distant between the languages involved or when, at the morphophonological level, the gender cues are ambiguous for gender. The congruency effect also appears to be more dramatic at low proficiency levels. When these conditions coincide, it results in more difficulty in producing the correct gender agreement and the heritage speakers take advantage of their L2 language. Therefore, crosslinguistic influence from Spanish and Catalan facilitates in producing verbal gender agreement with congruent nouns but not with incongruent nouns. In the latter case, a negative crosslinguistic influence takes place and the low proficiency heritage speakers produce a verbal agreement with incongruent (and opaque) nouns incorrectly. Our results partly resonate with Lemmerth and Hopp's (2017) findings for simultaneous bilingual Russian-German speakers who demonstrated a congruency effect in the less dominant (Russian) language. Foucart and Frenck-Mestre (2010) have examined grammatical gender processing in German native

speakers (L2 advanced learners) who demonstrated difficulties in agreement constructions that were different between German and French (similarly to the current study).

Additionally, in contrast to the offline production, in online comprehension, gender congruency effects surfaced in both proficiency groups of the heritage speakers and two agreement constructions (out of three). It can be suggested that the difference may be attributed to the task type. Specifically, the production data may not be sufficiently sensitive in detecting crosslinguistic interactions when the proficiency in heritage language is high. In online language comprehension, the listeners should react more rapidly so that the effects of gender congruency can become easily detectable (Grüter et al., 2012; Hopp, 2013; Hopp and Lemmerth 2017). Interestingly, the crosslinguistic congruency effect was detected in the most demanding contexts (ungrammatical trials with opaque nouns). Thus, it seems that when the learner is facing challenging tasks, namely, when there are different options in a competition (including the solutions of the language not in use), more visible croslinguistic outcomes surface. In other words, available strategies in production tasks can mask the competition and the corresponding effect of the other language. Consequently, our results corroborate findings that confirmed the interaction of bilingual grammar systems (e.g., Bordag and Pechmann, 2007; Lemhöfer et al., 2008; Paolieri et al., 2010). However, it must be said that the evidence in favor of the gender congruency effect is inconclusive and further research addressing all three languages of

the participants of this study (Russian, Spanish and Catalan) is required.

Gender and agreement constructions

In our study, we probed the degree to which the knowledge of gender would differ depending on the type of agreement construction. We proposed the following research question:
RQ4.1 Does a type of agreement construction affect gender production and comprehension?

Stating our predictions in Chapter 2, we suggested that according to the results, four agreement constructions will be ranked on a scale of complexity. The difficulty of agreement construction will increase from left to right: Adjective-Noun= Noun-Zero Copula Present-Adjective>Noun-Copula Past-PP>Noun-Copula Past-Adjective

However, this hypothesis was not borne out as the scale of complexity resulted as the following: Adjective-Noun= Noun-Zero Copula Present-Adjective ≥Noun-Copula Past-Adjective>Noun-Copula Past-PP. The comparison of adjectival agreement in two constructions, namely Adjective-Noun and Noun-Copula Present-Adjective, leads to the assumption that the type of agreement level (nominal vs. sentential) and the order of agreed elements (the formal difference between these two constructions) was irrelevant

in both speech production and comprehension. This finding is in line with Kupisch et al. (2013) in which no differences between adjectival agreements in attributive vs. predicative placement were yielded. Moreover, Noun-Copula Past-PP was the only construction that diverged considerably from the other agreement constructions. Recall that heritage speakers are influenced by the socially dominant language (Spanish and Catalan in our study), therefore it is reasonable to expect that the possible influence from the L2 underlies this result. As previously mentioned, in Russian, the subject-verb agreement involves gender, person and number features while in Spanish and Catalan only person and number are implicated. The discrepancy between the languages on the agreement realization of verbs can lead to the interference with Spanish and Catalan - the dominant languages - which have no gender marking on verbs. The interference from dominant language has been found in several studies on heritage communities, particularly in the domain of grammar and syntax (e.g., Albirini et al., 2011; Montrul, 2010; Rothman, 2007).

Contrary to our expectations, based on the Derivational Complexity Hypothesis (see Chapter 2), the Noun-Copula Past-Adjective construction did not pose any difficulties in production nor in comprehension as reflected in overall accuracy. This was a rather unexpected finding, especially taking into account the fact that the similar construction with the verbal agreement (Noun-Copula Past-PP) was largely problematic for the heritage speakers. Considering that the gender agreement on copula verbs in the Noun-Copula Past-

PP construction is more difficult for the heritage speakers than on adjectives (as the results in Adjective-Noun and Noun-Zero Copula Present-Adjective showed), we attribute this as the facilitating effect of a predicative adjective, which may act as a prime for the emerging of the corresponding marking on the verb. Many previous studies have reported better performance on nouns if they are previously primed with the gender of the target word (Akhutina et al., 1999; Gurjanov et al., 1985). In our study, we most likely are dealing with a similar effect. Namely, the presence of a predicative adjective (occurring later in a sentence) could facilitate gender agreement production and processing of gender agreement on the verb. Even though we did not find any studies that examine this effect and this type of the agreement construction in detail, Taraban and Kempe's (1999) study indirectly supports our hypothesis and provides additional evidence that a gender agreement marking on adjectives would facilitate the processing of the main verb. The stimuli in their study consisted of sentences with transparent and opaque nouns, verbs in past and adjectives marked for gender. e.g., *daže obyčnaja muka teper´ izčezla iz magazinov* ('even ordinary-F.ADJ flour-F now vanished-F.V from the stores'). The adjectives before the subject nouns were optional. Using a moving-window technic they found that Russian native speakers were faster in choosing the correct gender form of the past tense verb when there was an adjective modifying the subject noun.

To our knowledge, no research to date has compared gender agreement in the nominal and sentential domain (and within the

sentential domain, in three different configurations) in Russian heritage language, thus, this is the first study to compare gender knowledge on different agreement constructions. It is also the first study to show gender-related syntactic facilitation on verb when a predicative adjective is present in the sentence. In sum, if an individual is bilingual in two languages, and the languages do not realize gender agreement syntactically similar, then crosslinguistic influence from the L2 affects L1 gender agreement production and comprehension. Moreover, the negative crosslinguistic influence from L2 seems to operate at lower levels of proficiency and in linking with the gender cues opacity.

Background factors and gender knowledge

The RQ5.1 and RQ7.1 will be discussed together as they are both related to background factors and the results are interconnected. Here, the research questions regarding these issues are repeated:
RQ5.1 What is the role of the background factors (language proficiency, age of onset to L2, amount of exposure) on grammatical gender knowledge?
RQ7.1 Do heritage speakers of the different proficiency levels differ from the monolingual controls and in what way?

In this study, we investigated how the child-internal (language proficiency) and child-external factors (age of onset to L2 and amount of exposure) that have been claimed to affect heritage

language skills influence the gender knowledge in production and comprehension. Partly in line with our prediction, two of three factors resulted in being important for the mastery of gender. First, the Russian language proficiency (based on grammatical and lexical measures collected from oral Russian narratives) was crucial for attaining the native-like knowledge of gender agreement. In line with our expectations, the high proficiency heritage speakers overperformed the low proficiency group. Additionally, their offline and online results were similar to those in the monolingual group (just slightly lower in some conditions as we predicted). Based on this finding, we assume that high-proficiency heritage speakers perform on par with native speakers concerning gender agreement (as several previous studies have demonstrated, e.g., Alarcón, 2011; Montrul et al., 2013; 2014; Polinsky, 2008).

In turn, the low proficiency heritage speakers were less accurate and demonstrated longer latencies than both the high proficiency heritage speakers and the monolingual controls. For the low proficiency heritage speakers in this study, it is possible to draw parallels with L2 learners. Different studies have raised a question of how heritage speakers differ from L2 learners in their linguistic abilities, and what these two groups have in common. The developmental path of L2 learners and heritage speakers often coincides. Their exposure to the language is limited and often restricted to particular contexts: home for heritage speakers and the classroom for L2 learners (Montrul, 2008). Moreover, previous studies demonstrated that aspects of inflectional morphology,

including grammatical gender agreement, seem to be particularly difficult for L2 learners to acquire (Montrul, 2004; Montrul et al., 2008; White et al., 2004). Even for learners at advanced levels of proficiency, errors in gender agreement appear to persist (Dewaele and Veronique, 2001; Franceschina, 2005). For instance, Stöhr, at al. (2009) demonstrated that the results for gender knowledge in the less dominant language of bilinguals are similar to the gender knowledge of high proficiency L2 learners. The authors explored mastery of grammatical gender in German as a weaker and dominant language by Italian-German adult bilingual speakers, as well as highly proficient L2 learners of German (with L1 Italian). Similar to our study, participants completed a grammaticality judgment task and an elicited production task. The stimuli formed agreement combinations with both attributive predicative adjectives. The results demonstrated that gender knowledge was affected in the weaker language of the bilinguals and the results were similar to the L2 learners. By contrast, the bilinguals with German as their stronger language overperformed the other two groups in all tasks. In addition, Montrul et al. (2008), compared gender agreement in heritage speakers and L2 learners of Spanish. Both groups made more errors than the monolingual controls and their performance differed according to the type of task: heritage learners outperformed L2 learners in the oral task (90% vs. 72%), while L2 learners performed better in the comprehension-based written tasks. Even though we did not have a control group of Russian L2 learners, the outcomes of the above-discussed studies lead us to suggest that the results of the low proficiency heritage

speakers are compatible with (though not identical to) to the proficient L2 speakers. To confirm (or not) that assumption, future research on how gender agreement is processed by heritage and L2 speakers is still warranted. One of the limitations of our study is the absence of a younger monolingual control group (e.g., as in Schwartz et al., 2014) or proficiency-matched L2 learners of Russian (e.g., as in Montrul et al., 2008). The comparison with these two groups in future research can contribute to the understanding of gender phenomenon in heritage populations.

Secondly, the analysis revealed that the amount of exposure to Russian was a better predictor of gender knowledge in both production and comprehension than age of onset to the L2. The low effect of age of onset on gender knowledge can be attributed to the small size of participants who started L2 acquisition relatively late. For instance, Bar-Shalom and Zaretsky (2008) investigated error rates in the narratives and grammaticality judgment task performance of 10 Russian–English children (aged 4–13) with age of onset ranging from zero to six years and 10 adults (aged 19–53) with age of onset ranging from four to 37 years. The authors reported that older ages of onset predicted fewer errors in both groups, besides the child group, the effect of L1 exposure was more pronounced. Nevertheless, an additional study should be made in order to pinpoint the influence of age of onset on heritage language development.

According to our results, the amount of exposure positively affects gender knowledge. As several studies have demonstrated, sufficient language exposure is beneficial for children's acquisition of vocabulary and grammar in both the minority and majority languages of heritage speakers (Cobo-Lewis et al., 2002; Scheele at al., 2010, Gathercole and Thomas, 2009; Thordardottir, 2011; Unsworth, 2008, 2013 among others). The results of our study show that regular contact with the Russian language in a variety of contexts and environments (at community school, at leisure, with friends, etc.) improves morpho-syntactic performance (i.e., gender agreement) as well as basic narrative skills. Secondly, a look at sociolinguistic data of the heritage speakers from the high proficiency group demonstrates that almost all of them have two Russian-speaking parents. While the heritage speakers from the low proficiency group grew up with one Russian and one Spanish and/or Catalan-speaking parent. Having both parents who are native speakers of the heritage language increases the amount of exposure, that in turn, often results in higher proficiency in the heritage language (Mitrofanova et al., 2018; Rodina and Westergaard, 2017; Unsworth, 2015). Further research on the characteristics of quantity and quality input that a Russian heritage speaker receives in a trilingual environment is essential.

Summarizing, our findings indicate that such factors as proficiency in heritage language measured by the means of oral narratives and amount of exposure to heritage language are positively correlated with gender agreement knowledge.

Gender in online processing

Accordingly, we now turn to the broader discussion of online results in order to shed light on gender processing in heritage speakers. Previous tasks on gender knowledge in Russian mainly used offline methodology. These studies focused on quantitative and qualitative analyses of gender acquisition outcomes in production or untimed comprehension. In our study, we used an online grammaticality judgment task in order to broaden our knowledge of how heritage speakers process grammatical gender in real-time. We asked the following research questions regarding this issue:

RQ6.1 Do heritage speakers process gender agreement similarly as their monolingual counterparts? Are there differences regarding the set of linguistic factors analyzed?

RQ6.2 To what properties (e.g., gender values, gender transparency, agreement construction) are heritage speakers more sensitive when processing gender agreement??

As presented earlier, different factors may affect the gender knowledge of heritage speakers, including (a) grammatical gender per se (masculine, feminine and neuter), (b) transparency of the noun form, (c) crosslinguistic gender congruency of nouns and (d) grammaticality of gender agreement construction. To test between these variables, we designed the experiment in which both accuracy and time of response was measured. To our knowledge, the previous research has analyzed three of four variables. For example,

grammaticality, gender values and noun form transparency were investigated in Grosjean et al. (1994), Akhutina et al. (1999, 2001), Taraban and Kempe (1999). In turn, Lemmerth and Hopp (2017) focused on studying grammaticality, gender values and crosslinguistic congruency. Thus, the present study makes an important contribution as it addresses a higher number of factors that can be activated during the gender agreement processing.

As for reaction time results, a rather consistent finding was that both low and high proficiency heritage speakers were slower on the ungrammatical trials with the opaque incongruent masculine nouns. This result was yielded in two agreement constructions: Adjective-Noun and Noun-Copula Past-Adjective. This fact deserves a detailed explanation. First, our finding is in line with the previous online studies that demonstrated that the processing of ungrammatically marked for gender words were slower than by those with grammatical gender markers (Schiller and Costa, 2006 for German; Schriefers, 1993 for Dutch; Akhutina et al., 1999 for Russian). For instance, Akhutina et al. (1999) studied nominative nouns that were preceded by possessive pronouns (e.g., *moj* 'my') which always agreed or disagreed in gender with a noun. Reaction time results were faster when the gender of the prime (the pronoun) matched the gender of the noun (*moj urok* 'my.M lesson.M') than when there was a mismatch (*moja urok* 'my.F lesson.M'). Another component of the finding is morphophonological transparency and opacity of the gender cues. Similarly to our result, the online studies indicated that ambiguous gender markers slow down the

gender assignment and agreement in both non-native speakers and heritage speakers (Taraban and Kempe, 1999, for Russian; Taraban and Roark, 1996, for French; Sagarra and Herschensohn, 2011, for Spanish). For instance, Taraban and Kempe (1999) reported that when the masculine or feminine subject noun was ambiguously marked for gender (i.e., was opaque), the reading latencies and choice times of the verb increased. In turn, the null effect for the transparency among the monolingual group in our study is consistent with the previous literature (Corbett, 1991; Taraban and Kempe, 1999) and is most likely explained by the fact that the native speakers access grammatical gender through an abstract way at a lexical level. In other words, they simply know the gender of nouns and do not need any cues.

Another finding in processing was that the heritage speakers displayed a general disadvantage (independent of proficiency) for masculine nouns. The slow processing of trials with masculine nouns was demonstrated in all groups of the participants and with the grammatical and ungrammatical trials. A similar pattern of the results was obtained in Akhutina et al. (1999, 2001) and Slioussar (2018). Therefore, we attribute this finding to the markedness effect. Masculine is assumed to be the unmarked value of gender features. The probability of coming across a masculine noun is higher than other genders, thus, a listener rather expects hearing elements marked for masculine and not feminine and neuter. However, when the expectations are violated, the disruption causes a slower reaction time (as we have observed in our data). Overall,

our results contribute data in support of the hierarchical relationship across three genders in the internal structure of the gender system in heritage Russian.

In addition, manipulating the degree of crosslinguistic overlap between L1 and L2 gender values allowed us to probe the extent of crosslinguistic influence at the lexical level. Recall that the effect of congruency was minimal in the results of offline production and no effect was yielded in offline comprehension. However, in line with previous studies (Bordag and Pechmann, 2007; Lemmerth and Hopp, 2017; Paolieri et al., 2010; Salamoura and Williams, 2007) the real-time comprehension demonstrated an effect for congruency. Namely, the heritage speakers obtained slower reaction times with the nouns in which gender in the L1 and L2s belonged to the different gender class, i.e., was incongruent. Thus, we suggest that heritage speakers coactivate their languages when processing gender agreement in heritage Russian. Moreover, we argue that listeners activate the gender of the L2 translation equivalent under some conditions. Namely, (a) if there is no overt gender marker supporting the gender of the noun (in the case of opaque nouns), (b) when the gender of the agreed element does not match with the noun gender (ungrammatical condition) and (c) when the gender value is the most unmarked (masculine gender in the case of Russian). In this regard, we obtained novel experimental data to support a gender representation model in which the gender systems are interconnected (e.g., Bordag and Pechmann, 2007; Lemhöfer et al., 2008; Paolieri et al., 2010).

Conclusion

Perspectives for future research

This was the first study aimed at evaluating the knowledge of gender in Russian heritage speakers in Spain in production and comprehension. Although valuable conclusions could be drawn from this study regarding the role of transparency of gender cues, crosslinguistical L2 influence and background factors among participants, several questions remain unanswered.

First, as was mentioned in Section 5.6, the acquisition of the whole declension paradigm for masculine, feminine and neuter influences the overall gender knowledge. In other words, these morphological features, gender and case, are bonded together and their mastery is important to successfully produce and comprehend gender agreement. Thus, a study with other case forms would be an interesting research topic.

Secondly, in our study, the performance of the high proficiency heritage speakers matched their monolingual peers. However, it remains unclear whether the low proficiency heritage speakers match the monolinguals or their results are comparable to L2 learners. In other words, in order to have a clearer picture of gender knowledge among heritage speakers, it seems necessary to compare the data with younger monolingual children and L2 Russian learners.

Thirdly, based on the evidence obtained in gender agreement production and comprehension, it can be suggested that the phonological ambiguity of input plays a negative role in gender acquisition, in particular concerning the acquisition of feminine and neuter nouns. Related to this point, it would be relevant to study the speech of caregivers and compare it with the gender agreement production of a child. Also, related to this point, an important implication for gender assignment and agreement learning could be made. Namely, the development of literacy skills in heritage Russian could positively affect morphological knowledge. Thus, parents and implied educators should provide plenty of exposure to the written modality of the heritage language.

Fourthly, with regard to the L2 influence on L1 gender agreement knowledge, this study touches upon a very important question of how the gender systems interconnect in the bilingual brain. In order to investigate this issue in detail, improvements in experimental design could be made, involving online methods in production. Also, eye-tracking could be useful to visualize decision patterns in comprehension.

Summarizing, the novel empirical evidence from this work yields implications for the study of gender as a complex grammatical phenomenon, as well as the study of heritage languages as a rich field for linguistic research.

General conclusions

The focus of this dissertation was the grammatical gender agreement with inanimate nouns in heritage Russian's syntactic constructions. While Russian gender and gender systems, in general, have received considerable attention in theoretical linguistics in monolingual, bilingual and even adult heritage speakers' populations, young heritage speakers is still an understudied group in the field. This fact had motivated the research into how these speakers use gender and what these speakers know about gender agreement in their heritage language.

According to the results in both production and comprehension experiments, we can confirm the gradient and hierarchical relationships that exist among gender values in heritage Russian. Thus, in line with the predictions, the heritage speakers were more accurate in agreement constructions with masculine nouns than with feminine or neuter. This result is suggestive of masculine as the default and unmarked gender in heritage grammars. In turn, the properties related to the morphological marking of the nouns resulted in playing a significant role in feminine gender knowledge for the low proficiency heritage speakers. Neuter gender was the most problematic for the heritage speakers most likely due to its low frequency in Russian and possible negative L2 influence. Generalizing, we found that L2 influence affects heritage Russian on different levels – the lexical level (visible on noun gender) and syntactic level (as evidenced for the agreement constructions

results). It is also worth emphasizing that crosslinguistic influence did not appear separately, but in linking with certain factors, i.e, morphological opacity of noun forms and low proficiency in heritage Russian. In the evidence of these results, we also argue that the gender systems of the heritage speakers are simultaneously activated in both gender production and comprehension. The question is whether it is constantly activated (whenever gender is accessed) or under certain conditions (as our results demonstrated). This finding, as well as the fact that the participants are indeed trilingual speakers, motivate a deeper investigation on how gender assignment and agreement are processed by those speakers.

Another important finding is that knowledge of gender agreement is tied closely to the amount of exposure, with speakers receiving greater amounts of exposure to Russian as those to be more likely to develop morphological skills in heritage Russian. We also provide evidence that high proficiency heritage speakers display more native-like performance in gender agreement than the low proficiency heritage speakers, thus behaving like the native speakers in the production and comprehension of gender agreement.

In light of the observed findings in gender agreement among heritage speakers, we conclude that the knowledge of the gender in this population is variable rather than categorical and is dependent on a combination of different factors, including the phonological and structural features of the languages as well as the individual and sociolinguistic factors of a heritage speaker.

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Appendices

Appendix I. Language background questionnaire for heritage speakers' families (English translation)

1. General information of the family:

1.1Name_____

1.2 Your contact email_____

1.3 I would like to receive the results of the research on my above written email ☐ Yes ☐ No

1.4 What town do you currently live in? _____

1.5 What is your monthly household income? (average monthly household (3 members) income is 2000€-3000€).

☐Low-mid ☐Middle ☐Mid-upper ☐Difficult to answer

2. Mother's profile:

2.1 Date of Birth _____

2.2 Country of Birth _____

2.3 Date of moving to Spain _____

(if you were born in Spain, leave the field empty).

2.4 Please check your highest education level

1-Less than High School 3- Some Graduate School 5-Masters

2-High School 4- Graduate School 6-Ph.D

Mother's language/s:

Choose the correct assumption:

2.5 Russian is my /native/ foreign/don´t speak language.

2.6 Spanish is my /native/ foreign/don´t speak language.

2.7 Catalan is my /native/ foreign/don´t speak language.

2.8 Other (specify _____) /native/ foreign/don´t speak language.

2.9 Please list all the languages you know **in order of dominance**:

1.	2.	3.	4.	5.	6.

2.10 Please list all the languages you know **in order of acquisition** (your native language first):

1.	2.	3.	4.	5.	6.

3. Father's profile

3.1 Date of Birth _____

3.2 Country of Birth _____

3.3 Date of moving to Spain _____

(if you were born in Spain, leave the field empty).

3.4 Please check your highest education level

1-Less than High School 3- Some Graduate School 5-Masters

2-High School 4- Graduate School 6-Ph.D

Mother's language/s:

Choose the correct assumption:

3.5 Russian is my /native/ foreign/don´t speak language.

3.6 Spanish is my /native/ foreign/don´t speak language.

3.7 Catalan is my /native/ foreign/don´t speak language.

3.8 Other (write here_____) /native/ foreign/don´t speak language.

3.9 Please list all the languages you know **in order of dominance**:

1.	2.	3.	4.	5.	6.

3.10 Please list all the languages you know **in order of acquisition** (your native language first):

1.	2.	3.	4.	5.	6.

4. Family environment:

What language do you use for communication (your percentages should add up to 100% for each situation (a-f)).

(a) You with your spouse?		*(b) You with children?*	
Russian _____%	Spanish _____%	Russian _____%	Spanish _____%
Catalan _____%	Other(specify) _____%	Catalan _____%	Other(specify) _____%

(c) Your spouse with children?		*(d)Your children with each other?*	
Russian _____%	Spanish _____%	Russian _____%	Spanish _____%
Catalan _____%	Other(specify) _____%	Catalan _____%	Other(specify) _____%

(e) Grandparents with children?		*(f) Tutors/childcares (if any) with childrwen?*	
Russian _____%	Spanish _____%	Russian _____%	Spanish _____%
Catalan _____%	Other(specify) _____%	Catalan _____%	Other(specify) _____%

5. Tell us about your child:

5.1 Name	
5.2 Date of Birth (day/month/year)	
5.3 Sex	☐ Female ☐ Male

5.4 Does your child have any language disorders?	☐ Yes ☐ No Other(specify) ____
5.5 Was your child born in Spain? If not, age when came to Spain	
5.6 Age when child started acquiring Russian	_____year(s) _____month(s)
5.7 Age when child started acquiring Spanish	_____year(s) _____month(s)
5.8 Age when child started acquiring Catalan	_____year(s) _____month(s)

5.9 Please rate on a scale from 0 to 5 how well can your child do the following in Russian?

0 – skill is absent 1 – skill is beginning to develop 2 – can do on a limited basis

3 – skill is basic and can do on a basic level 4 – can do adequately in a variety of tasks 5 – can do as native-like age-appropriate child

Listen (comprehend)	0	1	2	3	4	5
Speak	0	1	2	3	4	5
Read	0	1	2	3	4	5
Write	0	1	2	3	4	5

5.10 Please rate on a scale from 0 to 5 how well can your child do the following in Spanish?

0 – skill is absent 1 – skill is beginning to develop 2 – can do on a limited basis

3 – skill is basic and can do on a basic level 4 – can do adequately in a variety of tasks 5 – can do as native-like age-appropriate child							
Listen (comprehend)	0	1	2	3	4	5	
Speak	0	1	2	3	4	5	
Read	0	1	2	3	4	5	
Write	0	1	2	3	4	5	
5.11 Please rate on a scale from 0 to 5 how well can your child do the following in Catalan? 0 – skill is absent 1 – skill is beginning to develop 2 – can do on a limited basis 3 – skill is basic and can do on a basic level 4 – can do adequately in a variety of tasks 5 – can do as native-like age-appropriate child							
Listen (comprehend)	0	1	2	3	4	5	
Speak	0	1	2	3	4	5	
Read	0	1	2	3	4	5	
Write	0	1	2	3	4	5	

5.12 How often does your child use the languages below in different contexts on a weekly basis? (your percentages should add up to 100% for each situation (a-f)):

(a) At home				*(b) At school (including Russian school)*			
Rus	Spa	Cat	Other	Rus	Spa	Cat	Other
%	%	%	%	%	%	%	%
(c) After-school, extra-curricular activities				*(d) With friends/peers*			

Rus	Spa	Cat	Other	Rus	Spa	Cat	Other
%	%	%	%	%	%	%	%

5.13 Please rate on a scale from 0 to 5 how often your child does the following in Russian on a weekly basis in different contexts (at school, home, etc.)?

0 – never 1 – almost never 2 – rarely

3 – sometimes 4-often 5 – all the time

Watch TV	0 1 2 3 4 5
Listen to music or audio books	0 1 2 3 4 5
Read	0 1 2 3 4 5
Write	0 1 2 3 4 5
Use computer/Internet	0 1 2 3 4 5
Other (specify)_____	0 1 2 3 4 5

6. Motivation and expectations**:**

Please rate the statements below based on your level of agreement

6.1 Studying Russian is important for my children because in the future they can communicate with their Russian-speaking relatives.

6.2 I believe that in the future my children will understand and appreciate Russian culture.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

6.3 Studying Russian is important for my children because it will be useful for their carrier and job.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

6.4 I believe that my children will grow up they will know Russian at the same level as me.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

6.5 Studying Russian is important for my children because the knowledge of languages is appreciated in the society.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

6.6 Studying Russian is important for my children because they will understand and appreciate Russian way of life.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

6.7 In your opinion what motivates your children to learn Russian?

_____

_____

7. Any other thoughts that you would like to share in regards to language learning buy your children:

_____

_____

Thank you for taking time to complete this survey!

Appendix II. Set I. Nouns for comprehension and production experiments

Noun	Gender	Transparency	Congruency	English translation	Spanish translation	Catalan translation
**stakan*	M	T	C	glass	el vaso	el got
samolet	M	T	C	airplane	el avion	el avió
**hleb*	M	T	C	bread	el pan	el pa
stol	M	T	I	table	la mesa	la taula
**list*	M	T	I	leaf	la hoja	la fulla
**utjug*	M	T	I	iron	la plancha	la planxa
**remen'*	M	O	C	belt	el cinturón	el cinturó
gvozd'	M	O	C	key	el clavo	el clau
**korabl'*	M	O	C	ship	el barco	el vaixell
meč	M	O	I	sword	la espada	la espasa
**kluč*	M	O	I	key	la llave	la clau
**dožd'*	M	O	I	rain	la lluvia	la pluja
butylka	F	T	C	bottle	la botella	la ampolla
**zvezda*	F	T	C	star	la estrella	la estrella
**truba*	F	T	C	trumpet	la trompeta	la trompeta
bočka	F	T	I	barrel	el barril	el barril
**kniga*	F	T	I	book	el libro	el llibre
**kryša*	F	T	I	roof	el tejado	el teulat
**cep'*	F	O	C	chain	la cadena	la cadena
morkov'	F	O	C	carrot	la zanahoria	la pastanaga

**sol'*	F	O	C	salt	la sal	la sal
**tetrad'*	F	O	I	notebook	el cuaderno	el quadern
**kost'*	F	O	I	bone	el hueso	el os
grjaz'	F	O	I	mug	el barro	el fang
**jajco*	N	T	I	egg	el huevo	el ou
**kol'co*	N	T	I	ring	el anillo	el anell
**lico*	N	T	I	face	la cara	la cara
**koleso*	N	T	I	wheel	la rueda	la roda
**mylo*	N	O	I	soap	el jabón	el sabó
**zerkalo*	N	O	I	mirror	el espejo	el mirall
**jabloko*	N	O	I	apple	la manzana	la poma
**uho*	N	O	I	ear	la oreja	la orella

Note: M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent

Note. Nouns marked with * were used only in the comprehension experiment

Appendix III. Set 2. Nouns for comprehension and production experiments

Noun	Gender	Transparency	Congruency	English translation	Spanish translation	Catalan translation
**sok*	M	T	C	juice	el zumo	el suc
nosok	M	T	C	sock	el calcetìn	el mitjó
**podarok*	M	T	C	present	el regalo	el regal
**kover*	M	T	I	carpet	la alfombra	la catifa
**arbuz*	M	T	I	watermelon	la sandia	la síndia
čemodan	M	T	I	suitcase	la maleta	la maleta
**ogon'*	M	O	C	fire	el fuego	el foc
**rul'*	M	O	C	steering wheel	el volante	el volant
kirpič	M	O	C	brick	el ladrillo	el totxo
**fonar'*	M	O	I	torch	la linterna	la llanterna
**nogot'*	M	O	I	nail	la uña	la ungla
kamen'	M	O	I	stone	la piedra	la pedra
**ložka*	F	T	C	spoon	la cuchara	la cullera
**kofta*	F	T	C	shirt	la camisa	la camisa
kružka	F	T	C	cup	la taza	la tassa

**tarelka*	F	T	I	plate	el plato	el plat
**šljapa*	F	T	I	hat	el sombrero	el baret
palka	F	T	I	stick	el palo	el pal
**dver'*	F	O	C	door	la puerta	la porta
ten'	F	O	C	shadow	la sombra	la ombra
**kist'*	F	O	C	brush	la brocha	la brotxa
**stupen'*	F	O	I	step	el escalon	el graó
**obuv'*	F	O	I	boots	el calzado	el calçat
vermišel'	F	O	I	pasta	el fideo	el fideu
**pal'to*	N	T	I	coat	el abrigo	el abric
**vedro*	N	T	I	bucket	el cubo	el cubell
**okno*	N	T	I	window	la ventana	la finestra
**pero*	N	T	I	feather	la pluma	la ploma
**derevo*	N	O	I	tree	el arbol	el arbre
**telo*	N	O	I	body	el cuerpo	el cos
**odejalo*	N	O	I	blanket	la manta	la manta
**kreslo*	N	O	I	armchair	la butaca	la cadira

Note: M-masculine, F-feminine, N-neuter; T-transparent, O-opaque; C-congruent, I-incongruent

Note. Nouns marked with * were used only in the comprehension experiment

Appendix IV. Sociolinguistic background data of the heritage speakers

Name	Age in years	Sex	Age of onset in months	Amount of exposure in %	Proficiency score	Proficiency group	Accuracy in production	Accuracy in comprehension
Maksim	10	male	36	35	14	low	76	76
Ivan	7	male	0	33	18	high	87	84
Dmitrii	10	male	72	38	19	high	99	98
Anastasia	8	female	48	58	19	high	100	98
Daria	8	female	24	45	20	high	96	100
Nikita	8	male	0	19	11	low	46	68
Ana	11	female	0	10	17	low	71	82
Polina	8	female	16	41	19	high	94	94
Misha	10	male	3	40	20	high	99	90
Ekaterina	11	female	24	40	20	high	100	97
Alexey	8	male	6	44	18	high	86	80
Viktoria	10	female	0	24	10	low	75	81
Ksenia	11	female	0	13	12	low	67	75
Matvey	11	male	9	26	15	low	90	76
Timofey	7	male	0	26	10	low	69	75
Alisa	8	female	57	33	19	high	99	96
Veronika	7	female	0	15	15	low	89	70
Arina	10	female	0	15	17	low	83	83
Valeria	7	female	0	16	13	low	72	74

Roman	8	male	0	18	11	low	59	69
Margarita	11	female	7	30	20	high	100	98
Sergey	8	male	0	23	18	high	89	80
Julia	7	female	0	26	18	high	91	83
Lisa	7	female	0	38	18	high	94	91
Kira	10	female	0	19	17	low	79	79
Lera	7	female	0	35	17	low	85	83
Valentin	11	male	84	28	20	high	100	96
Konstantin	9	male	60	26	20	high	98	96
Leo	9	male	0	23	13	low	79	78
Yana	11	female	0	23	16	low	79	75