CHRONIC PAIN IN CHIDLREN AND ADOLESCENTS. A STUDY IN LEBANON.

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DOCTORAL THESIS
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DOCTORAL THESIS

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Tarragona, 2023

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I STATE that the present study, entitled “Chronic Pain in Children and Adolescents. A study in Lebanon”, presented by Jessica Finianos for the award of the degree of doctor, has been carried out under my supervision at the Department of Psychology of this university.

July 7, 2023, Tarragona

Jordi Miró, PhD

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Jessica Finianos

For my parents

For my deceased grandpa

For my nephews

For children in pain

For Lebanon

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Abstract

Chronic pain is a complex experience with huge impact in the life of children and adolescents. Its proper management depends on well-trained healthcare professionals and includes adequate assessment, and medical, psychological, and physical interventions. Yet, in low-income countries, like Lebanon where children and adolescents appear to be at higher risk of developing chronic pain, many obstacles impede the recommended treatment.

The general overarching objective of this Doctoral dissertation was to improve the understanding of the current situation of chronic pain in children and adolescents in Lebanon. In order to do so, we conducted a series of studies, including a systematic review, the translation into Arabic and cultural adaptation of four widely used pain intensity. In addition, we studied different psychometric properties of these scales and their agreement. This dissertation also includes a survey study developed to explore the education and training in pain of healthcare professionals working with children in Lebanon. Last, an epidemiological study was started to determine the nature, characteristics, and impact of chronic pain on the lives of children and adolescents living in Lebanon.

The main findings of this dissertation are briefly summarized in the upcoming pages (as all the details are to be found in the articles that are included in the Dissertation). These findings include the identification of a huge gap in the literature of chronic pain in children in Lebanon, the validity and reliability of the Arabic versions of the *Numerical Rating Scale-11* and the *Faces Pain Scale-Revised* when used with children and adolescents, the unidimensionality of four pain intensity scales (*Numerical Rating Scale-11*, *Faces Pain Scale-Revised*, *Visual Analogue Scale* and *Colored Analogue Scale*), the agreement of the *Visual Analogue Scale* and the

Colored Analogue Scale in adolescents, the unsatisfactory pain education and training of healthcare professionals and the reliance on pharmacological treatments to manage chronic pain in children in Lebanon.

The findings of this dissertation suggest that more attention and research are required to improve the management of chronic pain in children and adolescents in Lebanon. For instance, healthcare professionals should mind the disagreement between pain intensity scales when applicable, while using valid and reliable assessment scales like the Arabic version of the *Numerical Rating Scale-11.* Last, policy makers and people of concern should include pain education and training in the curricula of all healthcare professionals and integrate psychological and rehabilitative treatments in the management of chronic pain.

1. Introduction

You are about to read the achievement of my four-years journey between my colleagues in the ALGOS group and under the supervision of Dr. Miró. My wish to study Pain grew a few years ago, just after I completed my trainings for my nursing and psychology degrees where I saw the huge physical and psychological impact of this unpleasant experience on the patients, I was taking care of. Driven by the hope to help them, I started to study pain.

My dissertation consists grossly of four parts, representing six different studies. These include: (1) an analysis of the current knowledge and situation of chronic pain in children in Lebanon; (2) the translation, adaptation, and validation of pain intensity scales (with three studies); (3) the education and training in pain of healthcare professionals working in Lebanon and their current practices in the management of children with chronic pain; and (4) the epidemiological longitudinal study of chronic pain in children and adolescents living in Lebanon.

I started the introduction by some definitions and explanations of the key concepts. First, pain and chronic pain are defined, and the biopsychosocial model is presented. The impact of chronic pain on children, their families and the society follow. Then, pain assessment and management strategies are reviewed. This section ends by a general description of the present situation of chronic pain worldwide and specifically in Lebanon.

The main objective of the dissertation is then presented followed by the six study-specific objectives, and the hypothesis when available. Afterward, an overview of the methodology used in each of the studies is described including the participants, procedure, and measures. Then, each study is fully reported in the results section, as published in, or submitted to the journals.

To end the dissertation, the results are discussed and implications for future research are suggested. Lastly, a brief conclusion is given to each study for the closure.

1.1 Chronic pain: a general overview

1.1.1 On the concept of pain

Almost 45 years ago, the International Association for the Study of Pain (IASP) defined pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (IASP, 1979). This definition made a clear distinction between pain and nociception proposing that pain cannot be solely inferred to the neural encoding of a noxious stimulation since sometimes no actual damage is present but, what mattered the most was the person’s description and subjective experience of pain. In 2020, a revised definition was written to emphasize the complexity of pain as follow “an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage” (Raja et al., 2020). Certainly, pain nowadays is considered a personal complex experience resulting from the interaction of numerous factors including, but not limited to, physical, cognitive, behavioral, emotional, and cultural (Miró, 2003).

1.1.2 Chronic pain in children and adolescents

Many features were taken into consideration when the IASP classified pain: its etiology, quality, intensity, and most importantly duration (IASP, 1994). For instance, when pain is the dominant problem of an underlying medical condition like cancer it is classified as secondary. However, it is primary in the case of idiopathic back pain. Pain can be also classified as mild, moderate, and severe when the intensity is in interest. In 2015, the International Classification of Diseases (ICD) released the preliminary new classification of chronic pain (ICD-11, Treede et al., 2015) and confirmed it later in 2019 (Treede et al., 2019). The ICD-11 new classification categorized chronic pain into seven groups: chronic primary pain, chronic cancer pain, chronic posttraumatic and postsurgical pain, chronic neuropathic pain, chronic headache and orofacial pain, chronic visceral pain, and chronic musculoskeletal pain (Treede et al., 2015, 2019).

The groups are based on perceived location, etiology and affected systems however some groups defied these classification principals (Treede et al., 2019).

The key feature of pain for this study is its duration. Based on that, pain can be classified as acute or chronic. *Acute pain* is a sudden sharp pain that warns the body of a potential danger. This protective and adaptive role of pain is usually caused by an injury, illness, or painful medical procedures like a surgery, all of which are mostly related to tissue damage (IASP, 2022). Subsequently, acute pain is time-limited and when the threat is no longer there, and the damaged tissue heals it fades away (Carr & Goudas, 1999).

However, when the pain persists beyond normal healing time and recurs for more than three months it is classified as *chronic pain* (IASP, 1994; Treede et al., 2019). Around 20% of people worldwide are affected by chronic pain which makes it a frequent condition (Treede et al., 2019) that is also common in children and adolescents (Eccleston et al., 2006; Huguet & Miró, 2008b; Hunfeld et al., 2001; Miró et al., 2023).

Actually, pain is the most common reason that brings children to health care facilities (Kuttner, 2010). Chronic pain is mostly primary and has no protective role, which is why it is considered a disease in itself (Treede et al., 2019). The complexity of chronic pain results from the dynamic interplay between numerous factors (Etherton et al., 2014; Kerns et al., 2002; Miró, 2010) that will be discussed below.

1.1.3 The biopsychosocial model of chronic pain

According to the biopsychosocial model, chronic pain is the result of a complex interaction of biological changes, psychological status, and sociocultural contexts (Gatchel et al., 2007; Liossi & Howard, 2016; Nicholas, 2022; Turk et al., 2011). All these variables shape the person's experience of pain and contribute to the diversity of pain expression (e.g., severity, duration, and impact on the individual (Nicholas, 2022; Penney, 2010; Turk et al., 2011). Briefly, the biological factors initiate and transmit physical perturbations that happen in the body while the psychosocial

factors incorporate these dysfunctions with beliefs, behaviors, and effects of social interactions (Penney, 2010; Turk et al., 2011) and vice-versa, as psychological factors may in turn influence bodily functions like the activity of the autonomic nervous system (Turk et al., 2011), thus, the influence of factors like gender, social support, and previous life experiences on pain. A more thorough description of the variables would include physical (e.g., pain extent; (de la Vega et al., 2016; Miró et al., 2014)), cognitive (e.g., pain beliefs; (Jensen et al., 2017; Miró, Solé, et al., 2017)), emotional (e.g., depression; (Croft et al., 2010)), cultural (e.g., religion; (Dezutter et al., 2010)), and contextual factors (e.g., parental responses to their children's pain behaviors; (Huguet et al., 2008)).

1.1.4 Prevalence of chronic pain in children and adolescents

Chronic pain is a common experience among children and adolescents worldwide (Haraldstad et al., 2011; Harstall, 2002; Huguet & Miró, 2008b; King et al., 2011; Miró, 2010; Perquin et al., 2000; Roth-Isigkeit et al., 2004; Wager et al., 2020; Walters et al., 2018). Chronic pain prevalence among young people varies broadly between the countries (Huguet & Miró, 2008b; King et al., 2011) and is reaching nowadays 46% in a healthy community sample (Miró et al., 2023). Aside rising prevalence estimates, chronic pain is considered a public health concern (Miró, 2010) because of the burden it leaves behind (King et al., 2011).

1.2 Impact of chronic pain in children and adolescents

1.2.1 Impact of chronic pain on the patient

Chronic pain can have a huge impact on children as it interferes with their daily life functioning (King et al., 2011) and worsens their quality of life (Huijer et al., 2013; Hunfeld et al., 2001; Madi & Clinton, 2018). For example, children with chronic pain report higher levels of disability than their health counterparts (Huguet & Miró, 2008b). In fact, this negative impact can be seen in any area of the child's life (Cohen et al., 2010; Eccleston et al., 2006; Haraldstad et al., 2011; Hunfeld et al., 2001). Physically, chronic pain is well documented to be associated with fatigue,

disturbed sleeping patterns and decreased appetite and physical activity (Craig et al., 2013; Craig, 2015; de la Vega et al., 2016; Eccleston et al., 2006). Psychologically, chronic pain has been related to low mood and depression, anxiety and stress, and anhedonia (Ando et al., 2013; Cohen et al., 2010). Socially, chronic pain has been found to be associated with worst peer relationships, enforced social withdrawal and bullying (Forgeron et al., 2011; Madi & Clinton, 2018; Palermo, 2000; Solé et al., n.d.). Academically, poorer academic performance and school absenteeism have been significantly associated to chronic pain in children and adolescents (Haraldstad et al., 2011; Vervoort et al., 2014).

1.2.2 Impact of chronic pain on families

The negative consequences of chronic pain in children are not limited to their lives, they certainly extend and affect their families (Hunfeld et al., 2001; Madi & Clinton, 2018; Turk et al., 2008). Research has shown that parents of children and adolescents with chronic pain are more prone to experience stress and mental health problems (e.g., depression and anxiety; Palermo et al., 2014; Palermo & Eccleston, 2009), avoidance of social activities (Chow et al., 2016), guilt when the child is suffering (Jordan et al., 2007), affective rigidity (Palermo & Eccleston, 2009) and financial issues (Groenewald et al., 2014; Sleed et al., 2005). In addition, the siblings are at a higher risk of experiencing emotional and behavioral problems, including jealousy issues (Guite et al., 2007; Jaaniste et al., 2013).

1.2.3 Impact of chronic pain on society

The economic impact of chronic pain in children extends to the society too. For instance, billions of dollars are spent annually in the US to cover healthcare costs of chronic pain and lost productivity derived from it (e.g., parents missing work because of their child suffering from chronic pain; Groenewald et al., 2014; Phillips, 2009)

1.3 Assessment of chronic pain in children and adolescents

1.3.1 Pain domains

Effective pain management in children requires accurate pain assessment (Jain et al., 2012; Laures et al., 2019) and pain intensity is the most common assessed domain of pain (Fillingim et al., 2016; Jensen et al., 2019; Miró et al., 2016). However, chronic pain is more that pain intensity and many domains can and should be taken into consideration for effective management. In 2008, the consensus of the Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (PedIMMPACT) recommended assessing eight core domains when dealing with chronic pain in children (McGrath et al., 2008). The recommendations differ by age groups and include pain intensity (e.g., using the same self-report pain intensity scale over time); physical (e.g., using multidimensional scale to measure daily life activities like the Functional Disability Inventory by Walker & Greene, 1991), emotional (e.g., using well established scales of depression and anxiety) and role functioning (e.g., using school attendance as a measure of role functioning); symptoms and adverse events (e.g., assessing newly emerging signs, symptoms or laboratory findings like hospitalization), global judgment of satisfaction with treatment (e.g., using a numerical rating scale to determine the overall satisfaction of the treatment); sleep (e.g., using a sleep diary to keep record of night sleeping schedule); and economic factors (e.g., because of the complexity no specific recommendations were given yet however all costs of treatment should be taken into account; McGrath et al., 2008). Nonetheless, they suggested using pain intensity as a primary measure of pain in children of 3-18 years of age while emphasizing the importance of disability as seen in the physical, emotional, and role functioning (Huguet et al., 2010). Few years later, the Patient-Reported Outcomes Measurement Information System (PROMIS) has identified four subdomains for chronic pain assessment in children: pain quality, that is the subjective sensation of pain (e.g., pressure, temperature), pain intensity, that is its frequency and

intensity (e.g., how severe), pain interference, that covers its impact on daily life functioning (e.g., sleep, school), and pain behavior, that is what is observable by others (e.g., crying, resting; Jacobson et al., 2015).

1.3.2 Pain intensity

As mentioned above, pain intensity among all other outcomes is the most assessed domain of pain (Fillingim et al., 2016; Jensen et al., 2019; Miró et al., 2016). Three main approaches are used to assess pain intensity: physiological, behavioral, and self-reports (Huguet et al., 2010). The physiological approach relies on bodily measures like heart rate and blood pressure however they are not always indicative of the pain intensity. The behavioral approach uses nonverbal cues that are observable by the surrounding of the child in pain like frowning. These two approaches are mainly used in infants and children who are unable to communicate. Self-report remains the primary source and most commonly used pain intensity measurement procedure since pain is an internal and subjective experience (Fillingim et al., 2016; McGrath et al., 2008; Miró & Huguet, 2004; Stinson et al., 2006; Von Baeyer et al., 2011).

1.3.3 Most common scales

Despite some limitations of the self-report measures (e.g., social desirability, reporting less pain to avoid future painful medical procedures), there are many self-report pain intensity scales. For instance, 34 unidimensional self-report pain intensity scales were identified for children between 3-18 years of age (Stinson et al., 2006). The most commonly used are the 0-10 Numerical Rating Scale (NRS-11), the Faces Pain Scale – Revised (FPS-R), the Visual Analogue Scale (VAS) and the Colored Analogue Scale (CAS; Le May et al., 2018; Miró et al., 2012; Sánchez-Rodríguez et al., 2015, 2017). All four scales are one-item pain intensity measures, available in many languages and validated in different samples (Finianos et al., 2022; Kahl & Cleland, 2005; Miró & Huguet, 2004; Shields et al., 2003). Here is a brief description of each scale, however a more detailed description can be found in the articles below.

The 0-10 Numerical Rating Scale (NRS-11) – respondents are asked to rate their pain intensity using a number from 0 to 10 where 0 means no pain and 10 very much pain (Bailey et al., 2010).

The Faces Pain Scale-Revised (FPS-R) – respondents are asked to choose a face out of six that best represents their pain. The faces show ascending pain. First face to the left shows no pain and last face to the right shows very much pain (Hicks et al., 2001), but the lay out of the scale may differ depending on the language used (e.g., in the Arabic forms of the scale where the face showing the least pain is located at the right end).

The Visual Analogue Scale (VAS) – respondents are asked to mark their pain intensity on a 10 cm line where the first edge to the left anchors no pain and the second edge to the right anchors very much pain (Kahl & Cleland, 2005; Le May et al., 2018).

The Colored Analogue Scale (CAS) – respondents are asked to point at the color that represents their pain intensity where white means no pain and bright red means very much pain (McGrath & Gillespie, 2001; Miró et al., 2007).

Electronic versions of these four scales, and many more, have been developed and used in mobile apps like Painometer (de la Vega et al., 2013; 2014). The use of electronic and information technologies (EITs) to assess pain is increasing because of many advantages like greater and easier accessibility and compliance (Palermo et al., 2004; Stinson et al., 2006).

1.4 Management of chronic pain in children and adolescents

1.4.1 The biopsychosocial approach to treatment

As the result of a complex interaction between biological, psychological, and social factors chronic pain should be managed within the framework of these three domains (Liossi & Howard, 2016; Rajapakse et al., 2014). In fact, according to the World Health Organization (WHO)

multidisciplinary programs are the best option to manage chronic pain since it covers many affected areas of a child's life (World Health Organization, 2020). Ideally, such programs comprise pain education, pharmacological, physical, and psychological interventions (Miró et al., 2017; Rajapakse et al., 2014). The goal of pain education is to enhance coping by finding a common ground between the scientific knowledge of chronic pain and the subjective experience of the child. Pain education can be simply an informative brochure or an explanatory session that includes reassurance and briefing of relevant pain mechanisms and related factors to reduce the child's concerns (Koechlin et al., 2020). Pharmacological interventions consist of prescription and administration of simple analgesics, non-steroidal anti-inflammatory drugs, and/or opioids depending on the severity of the case (Grégoire & Finley, 2013). Physical interventions like physiotherapy, massage therapy, Transcutaneous Electrical Nerve Stimulation (TENS) and mirror box therapy are used because of the benefits of exercise on healing and to discourage sedentary lifestyle (Lynch-Jordan et al., 2014; Rajapakse et al., 2014). As for the psychological interventions, they focus mostly on Cognitive Behavioral Therapy (CBT) paired with strategies like relaxation, meditation, hypnosis, biofeedback, mindfulness, pacing (balancing rest and activity time), and sleep hygiene (Rajapakse et al., 2014; von Baeyer, 2007; Wren et al., 2019).

A recent review by WHO showed that pharmacological, physical, and psychological therapies had a pain reducing effect, yet no benefits were seen on sleep, quality of life and role functioning, and that physical functioning was improved with physical and psychological therapies only (Fisher et al., 2022). The results of this review were similar to previous one focusing on psychological therapies and stating that CBT, relaxation therapy and biofeedback, whether self- or therapist-administered produced significant positive effect on pain reduction in different pain conditions (e.g., headache and abdominal pain) in children (Palermo et al., 2010). An older review also reported that psychological therapies reduced pain frequency in children and adolescents with chronic headache, pain intensity and disability in young people with chronic pain right after the treatment and up

to a period of 12 months depending on their pain condition (Fisher et al., 2018). Interestingly, no benefits were seen on the anxiety and depression of these children (Fisher et al., 2018).

Despite their efficacity, inter- or multi-disciplinary chronic pain treatment programs are not always available (Miró et al., 2019). Recent technological developments (e.g., Internet, mobile applications) are being used to improve access to these treatments. Although there are just a few of these alternatives that have been thoroughly tested, the findings are promising (Keogh et al., 2010). For example, a randomized controlled trial (RCT) of an internet-delivered family behavioral therapy intervention for children and adolescents with chronic pain showed a significant reduction in pain intensity and activity limitations in the group that completed 8 weeks of online modules including relaxation training, cognitive strategies, parent operant techniques, communication strategies, and sleep and activity interventions (Palermo et al., 2009). Another RCT of an internet delivered CBT pain intervention of 8-10 weeks including modules like cognitive skills (e.g., reducing negative thoughts) and sleep hygiene, Web-Based Management of Adolescent Pain (WebMAP 2) for adolescents with chronic pain and their parents, demonstrated improvements at a 6-months follow up on activity limitations and quality of sleep (Palermo et al., 2016). Similarly, a study in Iran confirmed the effectiveness of a smartphone application on the reduction of pain intensity and amelioration in different dimensions of quality of life of adolescents with chronic pain (Shaygan & Jaberi, 2021).

1.4.2 Barriers to treatment

Despite the current level of knowledge and research on children with chronic pain, many barriers still impede its management (Czarnecki et al., 2011). Important potential barriers include but are not limited to access to treatment, its complexity and knowledge deficit among healthcare professionals (Shipton et al., 2018). Access to effective treatment remains a major challenge for children and adolescents suffering from pain (Brennan et al., 2016; Lohman et al., 2010) with less than 25% of the world's

population having access to the right pharmacological treatment in 2010 (Lohman et al., 2010). In addition, psychological interventions evidenced to improve pain management are not always available (Unruh & McGrath, 2014). However, knowledge deficit (i.e., inadequate pain education and training) among healthcare providers remains as the main barrier to proper pain management worldwide (Cuff et al., 2022; Hadjistavropoulos et al., 2014; Leegaard et al., 2014; Miró et al., 2019). It can be seen in common misconceptions among healthcare professionals like avoiding opioids administration to avoid narcotics addiction (Sigakis & Bittner, 2015) or perceiving pain management as a low priority (Czarnecki et al., 2011). Moreover, diagnosis uncertainty (e.g., when the parents of the child do not accept the diagnosis) can be also a significant cause for delay or rejection of treatment (Neville et al., 2020; Noel et al., 2016). One last barrier to pain management in children is related to organizational and governmental guidelines and involves lack of clear standards and pain management protocols in a certain system (Mędrzycka-Dąbrowska et al., 2015).

1.5 The current situation of chronic pain in young people

King et al. (2011) suggested that one in four children will deal with at least one chronic pain episode through their lifetime, commonly of headache or abdominal pain, and girls more than boys. However, chronic pain in young people continues to be undertreated (Cupples, 2013; Schug et al., 2019). With 80% of the global population affected by inadequate pain management, more than 150 countries are facing serious problems (Mędrzycka-Dąbrowska et al., 2015) especially with children who are at greater risk for inadequate pain management (Al-Mahrezi, 2017). This is particularly true in low-income countries confronting the above-mentioned barriers and scarce resources (Tang et al., 2021; Tawil et al., 2018; Tsang et al., 2008) like Lebanon that has a huge gap in the literature and high number of departing healthcare professionals (around 40% of doctors and 30% nurses since October 2019 according to WHO; Adhanom & Al Mandhari, 2021).

Lebanon is a small middle eastern Arab country that experienced wars, survived a recent blast in 2021 and that is drowning in its political and economic crises, and hosting millions of refugees. A systematic review done in 2010 called for attention to chronic pain in children and adolescents in Lebanon (Abu-Saad, 2010).

2. Objectives

The overarching goal of this doctoral dissertation was to improve the understanding of chronic pain in children living in Lebanon. The specific objectives and hypotheses when available were as follows:

1. To determine the current situation of chronic pain in young people in Lebanon and see whether there is any change in the last 13 years. To do so, a systematic review was conducted and is presented in Study1.

2. To translate, adapt, and study the construct validity and test-retest reliability of the Arabic version of the Numerical Rating Scale-11 when used with children and adolescents in Lebanon. We hypothesized that the scores of the NRS-11-Arabic measure a single dimension pain intensity withy strong reliability and validity properties.

3. To study the psychometric properties of the culturally adapted Arabic version of the Faces Pain Scale-Revised. To do so, construct validity as convergent and discriminant validity and test-retest reliability were conducted. We hypothesized a strong and positive statistically significant association between the scores of the FPS-R-Arabic and NRS-11-Arabic, and FPS-R-Arabic at two different times.

4. To determine the unidimensionality of electronic and Arabic versions of the four most widely used pain intensity scales (NRS-11, FPS-R, VAS, and CAS) and the agreement between their scores. We hypothesized that the four scales would measure one dimension pain intensity and the scores of VAS and CAS would be in agreement.

5. To improve the understanding of the training and education of healthcare professionals working with children with pain in Lebanon and the current practices in the management of pediatric pain. The process is described in Study V.

6. To improve the understanding of the nature, characteristics, process, and impact of chronic pain on the lives of children and adolescents living in Lebanon.

3. Methods

Six studies are included in this dissertation: (1) a systematic review of chronic pain in children in Lebanon (Study I); (2) the translation and validation of the scales NRS-11 and FPS-R (Studies II and III); (3) and analysis of the agreement and unidimensionality of the NRS-11, FPS-R, VAS, and CAS pain intensity scales (Study IV); the education and training about (pediatric) pain of healthcare providers in Lebanon (Study V); and the epidemiology of chronic pain and its characteristics in children in Lebanon (Study VI). In this section, the studies are briefly described as they are fully reported later in the dissertation. However, the last one is an ongoing study.

3.1 Participants

The first study (Finianos et al., 2021) is a systematic review of the literature to determine the current situation of pediatric chronic pain in Lebanon. A two-stage search strategy was used. Scientific databases like PsycINFO, Medline and Scopus were used, and references' list of relevant articles were checked. Only studies done in the last ten years, after Abu-Saad's publication (Abu-Saad, 2010) were included.

For the second study (Finianos et al., 2022), a school in North Lebanon was contacted to recruit participants. A minimum of 82 participants were required for this type of study and a total of 182 students participated.

For the third study (Finianos, et al., 2021), participants were recruited via flyers shared on social media and a snowball strategy. A total of 292 children and adolescents, fluent in Arabic, participated in this study.

For the fourth study (Finianos et al., under review), a design similar to study II was used. A total of 108 individuals was required to guarantee statistical power analysis. A sample of 292 participants (137 children and 155 adolescents) was recruited via social media and snowball strategy.

For the fifth study (Finianos et al., under review), healthcare providers working in Lebanon with children with chronic pain were targeted. They were recruited with the help of the Lebanese professional associations and orders they belong to. To increase the sample size, hospitals were contacted as well.

For the sixth study (Finianos et al., ongoing), up to this point 32 participants have completed the survey. Data collection period will be extended as needed to recruit the minimum number of participants required for this study (i.e., 352 participants).

3.2 Procedure

For the systematic review (Study I), as mentioned above, a common two-stage search was used to retrieve the papers. Then, references of relevant and retrieved articles were checked for additional studies that were missed in the computerized search. A full explanation of the procedure can be found in the paper (Finianos et al., 2021).

In study II, the pain intensity scales used (NRS-11, VAS and PCS-C) needed translation to Arabic, thus we implemented back-translation and pilot testing procedures. Once ready, North college school in the north of Lebanon was contacted to recruit a convenience sample. The same procedure of study II was also used to complete studies III and IV. A detailed explanation of both procedures can be found in the related articles.

In study III, the whole procedure was conducted online. Recruitment flyers were posted and shared on social media. Interested parents of 8-18 children were asked permission for their child's participation and invited to a first meeting, in which consent were taken and basic demographic data like gender and age were collected. Next, a link to the online survey would be sent to each participant. On that link, the participant would find 3 scales

to be used: the FPS-R-Arabic, the NRS-11-Arabic, and the Arabic version of the Pain Catastrophizing Scale (PCS-C-Arabic). To rate pain intensity using the Arabic versions of the FPS-R and the NRS-11 participants were asked to imagine themselves in one of two painful situations depending on their age. Children of 8-12 years of age were asked to imagine that they fell over and scraped their knees whereas adolescents of 13-18 years of age were asked to imagine that they burned their hands. In order to study reliability, two weeks later, the participants were invited for a second meeting to report pain intensity using the same scales and scenarios of the first time.

In study V, professional orders and associations of health care professionals working in Lebanon were contacted remotely and asked to disseminate a link to a 15-min survey about the healthcare professionals' education and training of pain and their current practices for children with pain To increase the number of participants Human Resources of few hospitals were also contacted and fellow colleagues were asked to share the objectives of the study and its link with healthcare professionals working with children with pain.

In study VI, eight schools from regions all over Lebanon were randomly chosen. They were contacted and asked to transmit the study's objectives to the parents of their students and get their approval for the participation of their children. Those interested were (and are) invited to take a 25 min survey about the pain experienced by their children, and its characteristics. The survey also asks about related domains like sleep, fatigue, and anxiety.

3.3 Measures

In the systematic review (Study I) no measure protocol was developed. However, the authors, year of publication, type of pain covered, and the targeted population of each included study were reported.

The four commonly used pain intensity scales (found in the introduction 1.3.4) in Arabic have been used in this dissertation: NRS-11 (used in study II, III and IV), FPS-R (used in study III and IV), VAS (used in study II and IV), CAS (used in study IV). In addition, the Arabic child version of the 13-item Pain Catastrophizing Scale (PCS-C-Arabic) was also used in studies II and III.

The child version of Pain Catastrophizing Scale is a 13-item scale that measures catastrophic thinking about pain (Crombez et al., 2003). To do so, the respondents indicate how frequently they have catastrophic beliefs (i.e., rumination, magnification, and helplessness) when in pain on a scale from 0 (“not at all”) to 4 (“extremely”).

In Study V, a modified version of Miró’s et al. (2021) survey about pain education and practices was administered. The survey covered two key areas pain education and training among healthcare professionals working with children with chronic pain in Lebanon and the current practices in the assessment and treatment of these children.

In Study VI, a survey including questions about pain, fatigue, sleep, pain interference, mobility, anxiety, depression, peer relationships and/or cognitive function was sent to the participants online. The survey had four forms (A and A’, and B and B’). The two A forms are for 8-12 years old children. The two B forms are for the 12-18 years old. All forms have three similar sections. First, the general data that include demographic and medical questions about age, gender, siblings and birth order, and medical history requesting information about chronic diseases. This section has additional detailed questions for the 12-18 years old related to menses and puberty (causing the difference between the forms A and B). Second, pain specific data in which the respondents describe their pain. The last part differentiates the forms A and B from A’ and B’ and explores what do the respondents do, think, and feel when they are in pain.

Aside the common parts (like academic performance and absenteeism) in the last section, form A and B include four PROMIS measures in their Arabic version whereas form A' and B' have four other PROMIS measures (See table below).

Form	A	A'	B	B'
Age Group	8-12	8-12	12-18	12-18
Section I	Demographic and medical data	Demographic and medical data	Demographic and medical data + **menses and puberty questions**	Demographic and medical data + **menses and puberty questions**
Section II	Pain specific data	Pain specific data	Pain specific data	Pain specific data
Section III	Data about mobility; anxiety; fatigue and peer relationships	Data about sleep disturbance; depressive symptoms; cognitive Function and pain interference	Data about mobility; anxiety; fatigue and peer relationships	Data about sleep disturbance; depressive symptoms; cognitive Function and pain interference

Forms A and B included four PROMIS measures: Pediatric Bank v2.0- Mobility; Pediatric Short Form v2.0- Anxiety 4a; Pediatric Short Form v2.0- Fatigue 4a; Pediatric Bank v2.0- Peer Relationships 4a whereas forms A' and B': Pediatric Short Form v1.0- Sleep Disturbance 4a; Pediatric Short Form v2.0- Depressive Symptoms 4a; Pediatric Short Form v1.0- cognitive Function 7a; Pediatric Short Form v2.0- Pain interference 8a.

The Pediatric Short Form Bank v2.0- Mobility 8a is an eight items scale to assess mobility as physical functioning in the pediatric population.

The Pediatric Short Form v2.0- Anxiety 4a is a four items scale to assess anxiety in the pediatric population.

The Pediatric Short Form v2.0- Fatigue 4a is a four items scale to assess fatigue in the pediatric population.

The Pediatric Bank v2.0- Peer Relationships 4a is a four items scale to assess peer relationships in the pediatric population.

The Pediatric Short Form v1.0- Sleep Disturbance 4a is a four items scale to assess sleep in the pediatric population.

The Pediatric Short Form v2.0- Depressive Symptoms 4a is a four items scale to assess depression in the pediatric population.

The Pediatric Short Form v1.0- cognitive Function 7a is a seven items scale to assess cognitive functioning (e.g., attention and focus) in the pediatric population.

The Pediatric Short Form v2.0- Pain interference 8a is an eight items scale to assess the interference of pain in the daily life of pediatric population.

4. Results

In this section, the six studies included in the dissertation are presented as published in the journals when possible. Studies IV and V are still under review, and Study VI is not finished yet, therefore it will not be included in the results section.

- **Study 1.** Finianos J, Huijer H A-S, Miró J. Chronic Pain in Young People: The Situation in Lebanon. Lebanese Medical Journal; 2021 ;69(1), 30-38.
- **Study II.** Finianos, J., Sánchez-Rodríguez, E., Ferrando, P. J., & Miró, J. Translation, Adaptation and Psychometric Properties of the Arabic Version of the Numerical Rating Scale when Used with Children and Adolescents. Current Medical Research and Opinion; 2022; 1-7.
- **Study III.** Finianos J, Sánchez-Rodríguez E, Miró J. The Arabic Version of the Faces Pain Scale-Revised: Cultural Adaptation, Validity, and Reliability Properties When Used with Children and Adolescents. Children; 2021, 8(12), 1184-1192.
- **Study IV.** Finianos J, Sánchez-Rodríguez E, Miró J. On the Unidimensionality and Agreement of Four Self-Report Pain Intensity Scales: A Study with Arabic-Speaking Children and Adolescents. *Under review in Child Care in Practice.*
- **Study V.** Finianos J, Huijer H A-S, Miró J. Professional Education about Pediatric Pain and Current Treatment Practices among Healthcare Professionals Working in Lebanon: A Survey Study. *Under review in Comprehensive Child and Adolescent Nursing.*
- **Study VI.** Finianos J, Miró J. Observational and Prospective Study of Chronic Pain in the Child and Adolescent Population Living in Lebanon. *Ongoing.*

4.1 Study I

Chronic Pain in Young People: The Situation in Lebanon.

MISE AU POINT/IN DEPTH REVIEW

CHRONIC PAIN IN YOUNG PEOPLE: THE SITUATION IN LEBANON

http://www.lebanesemedicaljournal.org/articles/69-1/review1.pdf

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Finianos J, Abu-Saad Huijer H, Miró J. Chronic pain in young people: The situation in Lebanon. J Med Liban 2021; 69 (1): 30-38.

ABSTRACT • Chronic pain in young people has become a public health problem worldwide with an enormous societal impact. However, chronic pain in children is still an understudied and undertreated problem, particularly in low income countries. A better understanding of the problem is critical to help improve the care this population receives. The objective of this review was to summarize the state of knowledge about children and adolescents with chronic pain in Leba-non by looking into the studies published in the previous 10 years. The data shows that young people living in Lebanon suffer from different chronic pain problems, and that the management of pain is far from being satisfactory. The re-view identified significant gaps in the study and treatment
of this problem. Research, with a specific sociocultural approach, is critical in order to help take informed decision on what to do and how to best use the limited resources. Improved education is also crucial to improve the treatment that professionals are currently providing, and to increase the awareness that chronic pain in young people is a public health problem which deserves close attention.

Keywords: children; chronic pain; Lebanon; pediatrics

Finianos J, Abu-Saad Huijer H, Miró J. Situation des enfants et adolescents souffrant de douleur chronique au Liban. J Med Liban 2021; 69 (1): 30-38.

RÉSUMÉ • La douleur chronique chez les jeunes est devenue un problème de santé publique dans le monde entier avec un énorme impact sur les sociétés. Cependant, la douleur chronique chez les enfants reste un problème sous-étudié et sous-traité, en particulier dans les pays à faible revenu. Une meilleure compréhension du problème est essentielle pour améliorer les soins que cette population reçoit. L'objectif de cette mise au point est de résumer la situation des enfants et adolescents souffrant de douleur chronique au Liban en examinant les études publiées au cours des 10 dernières années. Les résultats montrent que les jeunes vivant au Liban souffrent de différents problèmes de douleur chronique et que le contrôle de la douleur dans cette population est loin d'être satisfaisant, identifiant des lacunes importantes dans l'étude et le traitement de ce problème. La recherche, avec une approche socioculturelle spécifique, est essentielle pour aboutir à prendre des décisions éclairées, et comment utiliser au mieux nos ressources limitées. Une meilleure éducation est également cruciale pour améliorer les traitements actuellement dispensés et pour faire prendre conscience que la douleur chronique chez les jeunes est un problème de santé publique qui mérite une attention particulière.

Mots-clés: enfants; douleur chronique; Liban; pédiatrie

INTRODUCTION

Chronic pain has been conceptualized as an unpleasant sensory and emotional experience that has persisted beyond the normal healing time, currently considered three months [1]. From a biopsychosocial perspective, chronic pain is a complex experience that arises from a dynamic interaction among physical (e.g..pain extent [2,3], cognitive (e.g. pain beliefs [4,5], emotional (e.g. depression [6], cultural (e.g. religion [7]), and contextual factors (e.g. parental responses to their children's pain behaviors [8]). The International Association for the Study of Pain (IASP) distinguishes between primary and secondary chronic pain [9]. Primary chronic pain is understood as a disease in itself (e.g. abdominal pain, idiopathic back pain), whereas secondary chronic pain is the dominant problem of an underlying medical condition (e.g. cancer, juvenile arthritis [10]).

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Chronic pain in young people is a public health problem

Chronic pain in young people has been described as a public health problem [11]. Existing estimates show that between 20% and 37% of young people have chronic pain [12], and about 5% suffer from high levels of pain-related disability [13]. Despite the use of different definitions and research methods which can influence results [14], female and older children have consistently reported significantly higher prevalence rates [13,15-17].

Chronic pain can severely impact an individual's physical and psychological function and as such negatively impact wellbeing and quality of life [18-21]. Young people

with chronic pain usually report that pain severely interferes in their daily life such as absence from school, memory and attention problems, reduced contact with peers, decreased activity levels and emotional problems like depression and anxiety [21-25]. When left untreated, pain in children delays healing and recovery and makes future pain experiences worse [26]. Finally, the effects of chronic pain in these individuals may prolong well beyond adolescence. For example, having a chronic pain problem as an adolescent has been found to be a significant risk factor for chronic pain as an adult [26-28].

The negative impact of chronic pain extends to family members and society [16,20,29-30]. For example, parents with a child suffering from chronic pain show a lack of affective expressiveness and rigidity [31], and avoidance of activities such as staying away from other people [22] and even feelings of guilt for not being able to help their children [32]. Similarly, siblings of children with chronic pain have been found at a higher risk to develop emotional and behavioral symptoms than their peers [33-34].

Although common and with a highly detrimental impact, chronic pain in children is still an understudied and undertreated problem [35-38]. This is particularly true in low income countries [38-39]. For instance, it has been suggested that the prevalence of chronic pain in children and adolescents could be higher than currently thought [21] as most studies have been conducted in western high-income countries, and lower socioeconomic status has been significantly and positively associated with pain [6, 38,40-41]. Thus, low income countries may potentially suffer from higher chronic pain prevalence and incidence rates [21,38,42]. Future studies will have to elucidate this hypothesis.

Almost 10 years ago, Abu-Saad studied the situation of chronic pain in children living in Lebanon (2010). The author reported that despite the well-known impact of chronic pain on the children's lives no study had ever been conducted in Lebanon to tackle this issue, and cogently recommended the study of chronic pain prevalence and its correlates in Lebanon to be able to prevent and manage chronic pain in Lebanese youth. The objective of this review was to summarize the state of knowledge about children and adolescents with chronic pain in Lebanon, ten years after Abu-Saad's seminal review and suggestions [42], to help improve our understanding of the specific characteristics and needs of this young population suffering from chronic pain.

METHODS

To determine the current situation of pediatric chronic pain in Lebanon and its treatment, and in order to maximize the number of papers retrieved, a two-stage search strategy was used, similar to that implemented in analogous works [43]. First, we electronically searched the PsycINFO, MEDLINE, Scopus for studies published in the last ten years, that is, after the publication by Abu-Saad in 2010. Second, as it is common practice, the reference lists of relevant retrieved papers were specifically checked to identify other works that had not been found in the computerized search [40,44]. We focused on empirical articles, but we also searched for reviews which could help to provide the most comprehensive and updated information. In this search, we used the following terms: Pain AND (child* OR adolescent OR infant OR pediatric OR paediatric OR young OR youth) AND Lebanon. Studies with participants up to 18 years of age were included in this review. Only articles written in English were included.

RESULTS

Our initial search retrieved 71 citations. After removing duplicate publications and with the inclusion of six additional works – identified through searching the reference lists – 22 articles were selected based on their title and abstract. Of those, 14 articles were excluded, and eight were read in full for this review. See Figure 1 for a flow diagram of the article selection process.

In this work, a narrative review approach has been used to synthesize the most important data. Relevant information of the studies is listed in Table I.

Half of the studies (N=4; 50%) were devoted to adolescents, particularly addressing assessment-related issues. Only two articles (25%) were on pain management, both on cancer pain problems. The sample size in these studies ranged from 12 to 180 participants with almost equal numbers of males and females. In three (37%) studies, the focus of interest was the parents of the children suffering from pain, and participants were mostly mothers.

Most studies dealt with secondary chronic pain (N = 7; 87%): six of them focused on cancer-related pain (75%), one was on sickle cell disease pain (12%) and another on pain in neurological injuries (12%). One study addressed primary chronic pain (i.e. neck pain). Studies were mostly cross-sectional (N = 7; 87%), only one included a follow-up.

Cancer-related pain

Five studies were published on cancer-related pain. Two of them were devoted to children and adolescents. One focused on symptoms' prevalence, quality of life and palliative care in a sample of 85 children and adolescents who were being treated from cancer, mainly leukemia, at an academic teaching hospital in Lebanon [45]. The data

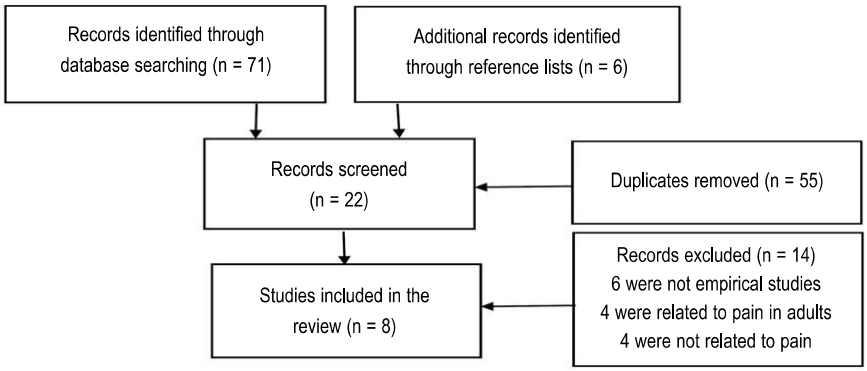

Figure 1. Flow chart of the selection process

showed that pain was one of the most commonly reported symptoms (53% of participants). The findings also showed that participants attending school regularly reported less pain and that despite the distressing symptoms, including pain, children reported good quality of palliative care [45].

In the second study, 62 children with cancer (mostly leukemia; 20) were interviewed. The purpose of the study was to describe pain characteristics and functional ability of children under treatment. The results showed that all children suffered from pain, which was mostly of moderate intensity (see Table I). Most of them not only suffered from pain due to their illness but also from treatment-related procedures. Half of the children reported that pain episodes lasted for at least two hours, and 8% reported having pain all the time. The forehead was the most common location of pain (38%). In addition to pain, most children (71%) suffered from moderate functional disability due to their pain (like not being able to run and play [20]).

The other three studies were related to parents of children with cancer and pain. One involved 125 parents whose children were suffering from leukemia that were requested to complete a questionnaire about the use of complementary and alternative medicine (CAM) therapies [46]. The objective of the study was to examine the types, frequency and reasons of CAM use. The results showed that CAM therapies (e.g., dietary supplements, prayer and spiritual healing, and unconventional cultural practices such as bone ashes ingestions) were used for different purposes, including pain management, especially in families that had previously dealt with painful cancer experiences. The authors made specific recommendations about the need to increase awareness on the effects and risks of CAM therapies, and suggested that only empirically-supported CAM therapies should be used [46].

The second study included 29 parents who lost their children to cancer [47]. The aim of the study was to evaluate the quality of palliative care provided in the last month of their children's lives. The parents were individually interviewed and requested to inform about the symptoms, their burden and management, communication, decision-making and quality of palliative care delivered. Among other severe problems, the authors found that most children (N = 23; 79%) suffered from pain during the last month of their lives [47]. Among these, 82% (N = 19) sought treatment to manage pain, however, less than half (42%) fully benefited from the treatment. Parents suggested some areas for improving palliative care, specifically mentioning : communication with health care providers and between the team, organization of care and teamwork, competence of the staff involved and psychological and social support for patients and their families [47].

The last study included 85 parents of children with cancer, mostly Leukemia [48]. The purpose of this study was to evaluate the quality of life and of palliative care, symptoms prevalence and management in children suffering from cancer from the parent's perspective.

The parents' input showed that 47% of children reported pain in addition to other frequent symptoms such as irritability, decreased energy and appetite. Of those, 67% sought treatment but only 66% succeeded. The study also showed that girls significantly reported more pain and that overall, parents were highly satisfied with the quality of care provided.

Sickle cell disease pain (SCD)

One of the studies reviewed included 12 adolescents with SCD [49]. The objective of this work was to study participants' daily responses and experiences with SCD, including pain. Participants reported pain as the most

TABLE I SUMMARY OF REPORTED FINDINGS

Authors	Sample Size	Sample Age	Study Design	Type of Pain Location / Diagnosis	Findings
Studies with children suffering from pain as participants					
Fares Ayoub Fares Khazim Khazim & Gebeily (2013)	122	< 18 years old Mean age = 14	Prospective study	Cluster munitions injuries	- 88% diagnosed with PTSD. - 74% (N = 83) of children with non-lethal injuries were amputated. - 100% of children with amputations reported pain. - Types of pain reported were RLP (N = 59; 71%) and PLP (N = 31; 37%).
Abu-Saad Sagherian & Tamim (2013)	85	7-18 years old Mean age = 12.5	Cross-sectional study	Cancer (Leukemia 37 Lymphoma 17 Head & Neck 12 Bones 11 Others 8)	- 28% of children and 25% of adolescents reported pain as one of the most common symptoms. - 90% of children and 68% of adolescents seek treatment for pain. - Children attending schools reported better pain scores.
Atoui Kurdahi Dreniel Khoury Shahine & Abboud (2015)	12	12-17 years old	Cross-sectional study	SCD	- Pain was reported as the most common and limiting symptom affecting their functioning. - Acute pain was treated by medications. - Chronic pain was either downplayed in terms of severity to avoid guilt, denied or accepted as part of daily life and/or God's will. - School, physical and psychological problems were reported. - Families were identified as a source of support, but also a source of guilt.
Fares Fares & Fares (2017)	180	8-17 years old	Cross-sectional study	Neck	- School grades were declining in 64% (N = 114) of patients. - 82% (N = 147) of patients had behavioral changes (irritability) and poorer communication as reported by the parents. - Some became stressed (N = 112; 62%), anxious (N = 107; 59%) and/or showed depressive symptoms (N = 17; 9%).
Madi & Clinton (2018)	62	8-17 years old	Cross-sectional correlational study	Cancer (Leukemia & Lymphoma 31 CNS tumor 16 Bone tumor 5 Other 10)	- All children suffered from pain, mostly from a moderate and severe intensity: 16% (N = 10) mild, 71% (N = 44) moderate, and 13% (N = 8) severe. - Median duration of pain was 2h per episode. - The forehead was the most common location of pain (38%).
Studies involving parents of children with pain					
Naja Alameddine Abboud Bustami & Al Halaby (2011)	125	Mean age = 38	Cross-sectional study	Leukemia	- 15% of the parents reported using CAM at least once. - Types of CAM reported were dietary supplements, prayer and spiritual healing and unconventional cultural practices. - 42% reported using CAM to strengthen immunity, 21% to improve chance of cure and 11% to decrease pain.
Saad Huijer Noureddine Muwakkit Saab & Abboud (2011)	29	Mean age = 43	Cross-sectional study	Cancer (different types of Leukemia and Sarcoma)	- 79% of parents reported pain as one of the most prevalent and distressful symptoms for their children. - 82% informed that their children received treatment, but only 42% fully benefited from treatment. - Reported areas of improvement of PC were communication, empathy and competence of staff, accessibility to HCP, organization of care and teamwork, involvement of parents in decision making, and psychological and social support.
Abu-Saad Sagherian & Tamim (2013)	85	**	Cross-sectional study	Cancer (Leukemia 38 Lymphoma 18 Head & Neck 12 Bones 10 Lung 2 Gastric 2 Spinal cord 2 Kidney 1)	- 47% of parents reported that pain, aside other symptoms, is frequent among their children. - 66% of parents reported the success of pain treatment. - Girls significantly reported more pain. - Parents were highly satisfied with the quality of care despite inadequate management of some physical and psychological symptoms.

Abbreviations : **PTSD** : Post-traumatic stress disorder **RLP** : Residual limb pain **PLP** : Phantom limb pain **SCD** : Sickle cell disease **CNS** : Central nervous system **CAM** : Complementary alternative medicine **PC** : Palliative care **HCP** : Health care provider
** Not available

common and limiting problem that affected their function. When acute, pain was controlled with medications. However, authors believed that patients with chronic pain were either denying their pain and/or underreporting it, to reduce their sense of guilt deriving from the burden they impose on their caregivers, or accepting it as divine intervention and a part of their daily lives [49]. Adolescents also mentioned school issues (e.g., difficulty to focus, attendance), and physical and psychological limitations (e.g. inability to engage in physical activities, frustration for not being able to perform) due to their pain. In addition, they identified their families both as source of support (e.g. *"When hospitalized, my mother helps me to eat and go to the bathroom."*) and guilt (e.g. *"When hospitalized, my mother sometimes sleeps on the floor all night which makes me feel guilty."*).

Neck pain

A study conducted with 180 children with chronic neck pain with spasms showed, as reported by their parents, that most of the children's (64%) school grades were declining. Eighty-two percent of the parents reported seeing behavioral changes (i.e., irritability) and poor communication in their children. Psychological effects such as stress (62%) and anxiety (59%) were commonly reported by participants, some of them (9%) also reported depressive symptoms [50].

Munitions injuries pain

In a study with 122 young people from South Lebanon, symptoms of neurological injuries and pain related to cluster munitions were prospectively evaluated [51]. Ten children (8%) died during the time of the study. Among those that survived, all were diagnosed with post traumatic stress disorder (PTSD), and 74% of them were amputated. All children with amputations reported having pain. Common types of pain were residual limb pain (71%) and phantom limb pain (37%).

DISCUSSION

Our work reviewed the studies that have been published about pediatric pain in Lebanon since the seminal work of Abu-Saad (2010). The review only identified eight studies that were of interest granted its scope and boundary conditions. Studies were mostly descriptive and cross-sectional with small samples.

The data from reviewed publications demonstrate that young people living in Lebanon suffer from different pain problems. Most importantly, reviewed studies suggest that there still are significant gaps in key areas in the study and treatment of pain as related to children. Most studies addressed secondary chronic pain, particularly cancer related. Interestingly, primary chronic pain like headaches, or abdominal pain, causing an enormous societal negative impact worldwide [12], has not critically attracted the interest of researchers.

Despite studies reporting on interventions to improve the management of pain in young people [20,49,51], the control of pain in this population in Lebanon seems to be far from being satisfactory, as suggested by Noun *et al.* [52]. For example, data from two of the studies involving parents of children undergoing treatment for their cancer-related pain showed that parents perceived that their children pain was not properly managed. In one, 42% of parents reported that their children, while undergoing palliative care, did not fully benefit from pain treatment [47]. In the other, parents reported to be using complementary and alternative medicine (CAM) therapies, hoping to reduce pain of their children, relying on cultural beliefs (e.g. congestion of bone ashes) more than on empirical-based evidences [46]. Interestingly, in the third study, parents were however satisfied with the quality of care delivered [48].

The need to improve the management of pain in young people has been described in several works by Lebanese researchers [e.g. 18,20,39,47]. Thus, additional experimental treatment studies are necessary to improve the care provided. Some authors have suggested including family support and religion in pain management programs [e.g. 42,53]. Regardless of the content, treatment programs should be specially tailored for children, affordable, based on the culture and easily accessible. One way to progress, would be promoting the use of mobile health-related applications among health care practitioners and patients in Lebanon. A recent study has shown that there is a widespread use of mobile phones in the country, with almost four million and a half cell phones currently in use [54], which could increase the access to assessment and treatment for those in need. There are many mobile applications created for pain [43]. Although the field is undergoing some adjustments [55], there are mobile applications that have already undergone usability and effectiveness studies, accredited with quality seals, both for the assessment (e.g. [43]) and treatment (e.g. [56]) of young people with pain problems, that could be used at a very low or no cost to improve pain management of young people living in Lebanon.

In this review, we were not able to identify any epidemiological study. This type of studies is key to clarify what is most needed to improve the care provided to children with pain living in Lebanon. Epidemiological cross-sectional studies are important to identify what resources and treatments would result in the best benefit-cost ratio, whereas longitudinal studies are needed to identify what are the most important factors that might

negatively (and positively) influence the adjustment to and coping with pain among young people in Lebanon. Epidemiology studies are therefore needed to help policy makers and health care managers make informed decisions on whether and how to invest the resources available to manage chronic pain in children in Lebanon.

Similarly, no studies on the assessment of children with pain were retrieved in our search. Sound psychometric questionnaires are critical to pain management. Therefore, works might also be needed to develop novel and better measures or to study the psychometric properties of those that are already being used in the assessment of this population. Translation is not enough to ensure a proper function of a questionnaire; measures need to undergo thorough validation procedures [57-58]. For example, psychosocial variables like pain-related attitudes have been suggested to influence pain intensity reports and function among children suffering from chronic pain (e.g. [59]). In Lebanon, beliefs about pain are somewhat related to God's will, shame or stigma [53] and gender [20] issues. Illness and pain are commonly understood as God's will – thus, a problem that no one should interfere with –, felt as shameful – which could explain why many Lebanese keep it as a secret – and assumed that boys – if they are brave and strong – should endure pain with stoicism, whereas girls – somehow weaker –, can express their pain and emotional distress.

Recent studies with very diverse samples from different countries have shown that pain intensity questionnaires not only provide information about pain intensity, and that such "additional" information depends on the self-report questionnaire that is being used (e.g. [60-62]). Thus, specific studies with Lebanese samples are required to understand how these otherwise well-translated and validated measures work.

The inadequate management of pain in Lebanon and the limited number of published studies [20] might be in part due to the political, financial and occupational instability that has been taking place in the country for more than 30 years now, as suggested by Abu-Saad (2010). Lebanon is a country that has recurrently suffered from wars (the most recent in 2006), therefore, individuals living in Lebanon might be at an increased risk to suffer from chronic pain, mainly due to the association between chronic pain and PTSD [63]. This is particularly true for the most vulnerable individuals in society, which is the case of children.

An important barrier to improve the care of children with pain in Lebanon is the shortage of specialized health care providers [42,64]. In the country, only a few health care providers have specialized training and knowledge on the management of pain in young people [52] which is why pain is treated by general practitioners [21].

However, working with this population is challenging, particularly with children whose ability to express pain is limited or impaired [65]. In fact, this problem has been associated with an increased risk of developing chronic pain in other countries like the U.S. [66-68]. Studies conducted in Lebanon have shown that general non-specialized nurses tend to sometimes underestimate the pain of children, and even avoid its regular assessment due to their lack of knowledge [53], which has been identified as a potential risk factor in the development of chronic pain problems among children [69].

Inadequate training and education of professionals has been identified as an important barrier to proper pain management worldwide (e.g. [36,70-71]). There are no specific reports on how training of professionals is provided in Lebanon (number of hours, training model, etc.), but granted that there is a shortage of well-trained professionals, it is highly likely that education and training of future professionals is limited. Therefore, improving the training of professionals could help to positively change the situation of the treatment of children with pain in Lebanon.

In addition, children and their families as well could benefit from education on pain-related issues. For example, teaching children to report pain adequately and use appropriate coping strategies (e.g. distraction) would likely make them feel more involved [72]. On the other hand, educating parents about care options would help increase the use of evidence-based practices. Interestingly, the International Association for the Study of Pain Global Year 2019 was devoted to raise awareness, as well as to improve pain assessment and management for the most vulnerable, including pain in infants and young children, by promoting education and training to improve pain care worldwide [10].

Another important barrier for a proper pain management in children in Lebanon is the limited access to some pharmacological treatments (e.g. opioids). For example, in 2001, only 465 children (most of them with cancer) in Lebanon benefited from pain relief and palliative care when around 15000 children were in need of palliative care [64]. This shortage of potentially effective pharmacological treatments could help to explain, in part at least, the widespread use of non-pharmacological and CAM-related approaches among families living in Lebanon [65].

To summarize, the studies reviewed showed that chronic pain is a problem for young people living in Lebanon. This is no different to the situation in other countries.

However, specific contextual factors might increase its negative societal impact in Lebanon, for example, massive budget deficits [64] resulting in the inability to afford medical expenses [52] or the fact that healthcare

is almost restricted to suburban areas [21]. Although some important studies have been published since the work of Abu-Saad in 2010, additional works to help improve the treatment provided to young people suffering from chronic pain in Lebanon are warranted. Research is needed in order to help take informed decision, on what to do and how to best use the limited resources. As described previously, epidemiology works are of most importance. In addition, assessment and treatment-related studies addressing specific cultural factors are also essential. Education is also crucial in order to improve the treatment that professionals are currently providing. Furthermore, education is of most interest to increase the awareness that pain in children, particularly chronic pain, is a public health problem, one deserving close attention and in need of additional resources.

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4.2 Study II

Translation, adaptation, and psychometric properties of the Arabic version of the numerical rating scale when used with children and adolescents.

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ORIGINAL ARTICLE

Translation, adaptation and psychometric properties of the Arabic version of the numerical rating scale when used with children and adolescents

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ABSTRACT

Objective: The 0–10 Numerical Rating Scale (NRS-11) is widely used with Arabic-speaking pediatric populations. However, there is no data about its validity or reliability. Thus, the aims of this research were to translate the NRS-11 into Arabic and study its dimensionality and construct (convergent and discriminant) validity, and reliability.

Methods: A group of 190 Lebanese students between 8 and 18 years old participated. Participants were interviewed online and asked to imagine themselves in a hypothetical painful situation and rate the expected pain intensity using the NRS-11-Arabic and an Arabic version of the Visual Analogue Scale (VAS-Arabic). They were also requested to respond to the pediatric Arabic version of the Pain Catastrophizing Scale (PCS-Arabic). Data collection lasted for a month.

Results: Data showed that the NRS-11-Arabic and the VAS-Arabic scores measure the same common construct. In addition, they showed strong statistically significant correlations between NRS-11 and VAS (ranging from 0.83 for the whole sample and 0.83 and 0.84 for the 8–12-year-olds and the 13–18-year-olds, which support its construct validity). These correlations were higher than those between the NRS-11-Arabic and the PCS-Arabic, which support the discriminant validity of NRS-11-Arabic scores. Test-retest reliability was 0.86 for the whole sample, and 0.89 and 0.82 for the 8–12-year-olds and the 13–18-year-olds, respectively, which shows the reliability of the NRS-11-Arabic scores.

Conclusions: The data provide preliminary evidence of the unidimensionality, validity and reliability of the NRS-11-Arabic scores, thus supporting its use in clinical and research activities involving Arabic-speaking pediatric samples.

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Introduction

Chronic pain (i.e. a pain condition that recurs or persists for more than three months)[1] is a significant problem among children and adolescents with prevalence rates ranging between 11 and 38%[2]. Chronic pain in children and adolescents is undertreated[3,4], and this is particularly the case in low-income countries[5,6]. In order to improve the management of chronic pain in young people, it is important to have psychometrically sound measurement instruments.

Although it is not the only factor involved, pain intensity is commonly used as the main domain in the study and treatment of chronic pain[7]. There are several self-report pain intensity questionnaires for assessing pain in children and adolescents[8], each with its own strengths and weaknesses. The 0–10 Numerical Rating Scale (NRS-11) is one of the most used pain intensity questionnaires with young people (as it has proved to provide valid and reliable pain intensity scores in studies with samples suffering from different conditions and with different languages)[9].

The NRS-11 is used with Arabic-speaking pediatric pain samples[10], although to date no studies have been made on the psychometric properties of the NRS-11 reports when used in Arabic-speaking children and adolescents. Although it is very simple and easy to use, it should not be assumed that the results found in Arabic-speaking samples of children and adolescents are the same as those found in studies with samples of young people from different cultures with other languages, or as those found in studies with Arabic-speaking adults. The psychometric properties of translated instruments should always be evaluated and tested[11]. Thus, research needs to be done on the psychometric properties of the NRS-11 when used with the Arab pediatric population. If the scores are found to be valid and reliable, then they could be used to help tens of millions of young people who speak the language worldwide (there are 466 million people who speak Arabic in the world)[12], particularly those who only speak Arabic despite living in countries with other languages. For example, in 2019, 6,370,000 Arab-speaking individuals were reported to be living in Europe and 2.1 million individuals of Arabian ancestry in the United States of America[13]. It would also help children who have Arabic as their first language and live in Arab countries, and the most vulnerable individuals among them, such as refugee children. For example, 42%

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of the people displaced in 2020 are children below 18 years of age[14] and more than 30% of the global refugee population are Arabs[15].

Therefore, the purpose of this study was to evaluate some of the psychometric properties of the Arabic version of the 0–10 Numerical Rating Scale (NRS-11-Arabic) when used to assess pain intensity in children and adolescents. Specifically, we wanted to examine (1) the dimensionality and construct (convergent and discriminant) validity, and (2) the reliability of the NRS-11-Arabic scores.

Materials and methods

Participants

The sample size needed in the analyses was calculated using G*Power version 3.1.9.6. Assuming a medium effect size ($r = 0.3$), an alpha of 0.05 and a power of 0.8, the study needed a minimum of 82 participants. In order to avoid potential problems due to attrition, we invited a sample of 190 children and adolescents. They were recruited after distributing flyers in a school in Zgharta (Lebanon). To participate, students had to be aged between 8 and 18 years old, and be able to read, write, and speak Arabic. Potential participants were excluded if they had cognitive disabilities that interfered with participation, did not give their assent to participate, or did not provide an informed consent form signed by their parents.

Measures

Sociodemographic information

Participants were asked to provide information about their gender, age, and school grade.

Pain

Participants were asked to report their pain intensity using the Arabic versions of the 0–10 Numerical Rating Scale (NRS-11-Arabic) and the Visual Analog Scale (VAS-Arabic), as described in the Procedure section. The NRS-11 asks respondents to rate their pain intensity with a number, between 0 and 10, where 0 means "No pain" and 10 "Very much pain". Pain intensity reports provided with this scale have been found to be valid in children as young as 6 years old[9,16–18]. The VAS consists of a 10-cm line, with anchors at both ends representing "No pain" (the left anchor) and "Very much pain" (the right anchor). With the VAS, responders are requested to mark their pain intensity on the line. Pain intensity is computed as the distance between the "No pain" anchor and the mark made by the responder. Research has also shown that pain intensity reports reported with the VAS provide valid information when used with children and adolescents[19–22].

Pain catastrophizing

We used an Arabic translation of the Pain Catastrophizing Scale-Child (PCS-C)[23] to measure catastrophic thinking about pain. The PCS-C is a 13-item questionnaire that requires respondents to indicate the extent to which they have catastrophic beliefs when in pain on a scale from 0 ("not at all") to 4 ("extremely"). Scores range from 0 to 52, and the higher the score the more the respondent catastrophizes about pain. The PCS-C assesses three pain catastrophizing domains: Rumination (e.g. "I cannot keep it out of my mind"), Magnification (e.g. "I am afraid that pain will get worse"), and Helplessness (e.g. "There is nothing I can do to reduce pain"). The PCS-C scores have been shown to have sound psychometric properties in different languages and in different samples of children and adolescents[24–26]. In this study, we used only the total score of the questionnaire, not the information from the subscales. The reliability estimate of the scores of the Arabic version of the PCS-C was assessed using Cronbach's alpha, which mainly reflects the amount of internal consistency among the items (i.e. the extent to which the items relate highly and positively between them). The estimate ($\alpha = 0.91$) is very high and shows that the scores are accurate enough for individual measurement purposes.

Procedure

Translation of the questionnaires

A back-translation procedure was used to translate the instructions and items of the questionnaires used in this study (i.e. the NRS-11, the VAS, and the PCS-C) into Arabic[27,28]. First, three bilingual healthcare professionals separately translated the instructions from English into Arabic (i.e. forward translation). Then they met and agreed on one form (i.e. reconciliation of the translation). Subsequently, the translated versions were back-translated from Arabic into English by a certified translator who was ignorant of the original instruments (i.e. back translation). The back-translated instructions of the NRS-11 and VAS were evaluated by two independent researchers with wide experience in the study and treatment of individuals with chronic pain. No changes in the instructions were deemed necessary. The English back-translated version of the PCS-C was sent to the instrument's author to check whether the back-translation was appropriate (i.e. harmonization). Some minor changes were made in the Arabic instructions following the author's recommendations to solve slight discrepancies between the back-translated English version and the original. Finally, the Arabic translations of these questionnaires were pilot-tested with a sample of 10 students to check for understandability and cultural relevance of the translated versions (i.e. cognitive debriefing). The Arabic translations of these questionnaires are available upon request from the corresponding author.

Procedure

We contacted the North College School (Zgharta, Lebanon) to recruit participants for this study. The school helped us to get in touch with the parents of their 8–18-year-old students. The parents that showed an interest were asked for

permission for their child's participation. Only two of the parents who approached declined. The study was conducted in April of 2021. Due to the COVID-19 lockdown, it was not possible to conduct the study face to face, and the procedure was fully conducted online, using *Microsoft Teams* (the platform that the school used for online teaching during the COVID-19 pandemic).

Parents who agreed to proceed with the study were called to an online meeting with their children. At the beginning of the first online meeting, the researcher met the participant and her or his parent (mother or father), introduced herself and described the study procedure to both the parent and the participant. If the participant was $\leq$12 years old, the parent was invited to stay in the video meeting but asked to remain silent and intervene only if there was a technical difficulty that the child could not easily solve by her or himself (e.g. a disconnection, a common problem in Lebanon at the time this study was conducted). However, no parents actually had to intervene, as we did not encounter any technical difficulties that interfered with the implementation of the study.

After obtaining consent from the parent and the participant, the researcher asked the participants to report the following demographic information: gender and age. Then, they were sent a link to the online survey and asked to respond to the questions on pain intensity, in the presence of the researcher.

The online survey had five different pages: (1) the instructions to participate and the informed consent (only by clicking "YES" in response to a question about consent could they move forward to the next pages of the survey); (2) the demographic questions; (3) the NRS-11-Arabic; (4) the VAS-Arabic; and (5) the PCS-C-Arabic. When the last page was filled in and submitted, a thank you note appeared on the participant's screen and a report with all the answers given was sent by email to the researcher, under a randomly assigned code for each participant that was secured on a two-password protected laptop.

To respond to the questions about pain intensity, the researcher followed a procedure successfully used with similar objectives[11] and asked the participants to imagine themselves in a potentially painful situation. We used two different scenarios and we chose one or the other depending on the age of the participant. The 8–12-year-olds were asked to imagine that they fell over and scraped their knees, whereas the 13–18-year-olds were asked to imagine that they burned their hand. Then, the researcher read the instructions for the NRS-11-Arabic and asked the participant to report the pain intensity on the online survey. Next, the researcher read the instructions for the VAS-Arabic and again asked the participant to report the pain intensity on the online survey. Previous studies comparing pain intensity scales[8,29] found that the order in which the scales were presented had no influence on the responses, so we chose not to randomize the presentation of the NRS-11-Arabic and VAS-Arabic in this study. Finally, participants were asked to respond to the PCS-C-Arabic.

At the end of this meeting, a second one was scheduled for three weeks later. In this second meeting, participants were only requested to report their pain intensity with the NRS-11-Arabic and VAS-Arabic, following the same procedure as in the first meeting. This study was approved by the Ethics Committee of Universitat Rovira I Virgili (CEIPSA-2020-TD-0002).

Data analysis

First, we computed descriptive statistics of the demographic variables (percentages, means and standard deviations) to describe the study sample and of the psychometric measures used in the study. All the measures showed unimodal, and fairly symmetrical distributions (i.e. the skewness coefficients were well below 1 in all cases). Furthermore, the number of response categories was 11 or more for all the measures. These conditions support that Product-Moment (Pearson) correlations would be appropriate to measure the association among the variables and that the linear model based on these correlations would be an appropriate choice for the analyses implemented in this research[30].

Given the distributional results above, we next performed a combined analysis to assess the reliability, convergent validity and unidimensionality of the NRS-11-Arabic scores. To study reliability, we computed the Pearson correlation coefficient between ratings on the NRS-11-Arabic at time 1 and time 2. There were 3 weeks between both time measurements. To study the convergent validity of the NRS-11-Arabic scores, we first computed the Pearson correlation coefficient between the ratings on the NRS-11-Arabic and the VAS-Arabic. Then, to further assess that both sets of scores were measuring the same single construct of pain intensity, we implemented a modified factor analytic (FA) approach, because a standard FA solution requires at least three indicators if it is to be identified and at least four if it is to be tested. With only two indicators, as is the case in this study, the only reasonable approach is to fit the FA solution as an error-in-variables model with known reliabilities for both indicators[31,32]. That is, if the two FA loadings in the solution are set to fixed values by using the reliability estimates (the test-retest scores in this study) as if they were known parameters, then, the disattenuated correlation between the true scores in both measures can be estimated. If the disattenuated correlation is fixed to unity, we obtain one degree of freedom to test the hypothesis that both the NRS-11-Arabic and the VAS-Arabic scores measure the same single construct.

Finally, to evaluate the discriminant validity of the scores of the NRS-11-Arabic, we conducted a Steiger's z test[33], which compared the magnitude of the correlation between the ratings on the NRS-11-Arabic and the VAS-Arabic with the magnitude of the correlation between the NRS-11-Arabic and the PCS-C-Arabic. Since we used two different scenarios, which depended on the age of the participants, we also divided the group into two – the 8–12-year-olds and the 13–18-year-olds – to study the planned associations. We also looked into the associations of the group as a whole.

Table 1. Descriptive data of the study participants.

Participants (*n*)	190
Mean age (SD; age range)	12.7 (2.29; 8–18 years old)
Gender *N* (%)	
Male	102 (54%)
Female	88 (46%)
NRS-11 scores: mean score (SD)	
Whole group	4.9 (3.06)
8–12 years old	4.80 (3.27)
13–18 years old	5.00 (2.86)
VAS scores: mean score; (SD)	
Whole group	4.05 (2.84)
8–12 years old	3.60 (2.92)
13–18 years old	4.48 (2.71)
PCS-C scores: mean score; (SD)	
Whole group	15.92 (10.26)
8–12 years old	17.48 (10.61)
13–18 years old	15.40 (9.71)

Abbreviations. NRS-11, Numerical Rating Scale; VAS, Visual Analogue Scale; PCS-C, Pain Catastrophizing Scale-Child.

We hypothesized that the NRS-11-Arabic is a unidimensional questionnaire that measures the same dimension as the Visual Analogue Scale, another questionnaire known to measure pain intensity. This hypothesis will be assessed by first computing the product-moment correlation between both sets of scores (i.e. convergent validity evidence)[34] and then testing that the corresponding disattenuated correlation is 1 (i.e. when measurement error is removed, both sets of scores measure exactly the same dimension) by using a factor-analytic approach. We further hypothesized that the magnitude of the association between the scores of the NRS-11-Arabic and the scores of the Arabic version of the VAS (VAS-Arabic) would be significantly greater than the association between the scores of the NRS-11-Arabic and the scores of the Arabic version of the Pain Catastrophizing Scale-Child version (PCS-C-Arabic), a questionnaire measuring a construct that is theoretically different to pain intensity (i.e. discriminant validity). Finally, we hypothesized a strong and statistically significant correlation between the scores of the NRS-11-Arabic at two different times (i.e. test-retest reliability estimate). All analyses were conducted using the Statistical Package for Social Sciences for Windows version 27.0[35] and LISREL 8.80[36].

Results

Participants

In total, 190 schoolchildren were enrolled and 182 (96%) of these provided complete data. A little bit more than half of the participants were males (54%), with an average age of 12.70 years old (SD= 2.29). Just a small group of participants (6.3%) reported pain at the time of the interview, most of which was located in the head (75%). Table 1 provides additional descriptive information about the sample of participants.

Dimensionality, validity, and reliability assessments

The off-diagonal elements in the matrices in Table 2 show the product-moment correlations between the different scores used to study the validity and dimensionality characteristics of the NRS-11-Arabic scores. The elements on the main diagonal show the corresponding reliability estimates. For the NRS-11-Arabic and VAS-Arabic scores, the reliability estimates are the test-retest estimates.

Table 2. Correlations among the different measures used in the study.

	NRS-11	VAS
Whole sample ($N = 190$)		
NRS-11	0.86**	
VAS	0.83**	0.81**
PCS-C	0.40**	0.36**
8–12 years old ($N = 94$)		
NRS-11	0.89**	
VAS	0.83**	0.83**
PCS-C	0.40**	0.45**
13–18 years old ($N = 96$)		
NRS-11	0.82**	
VAS	0.84**	0.78**
PCS-C	0.38**	0.32*

Abbreviations. NRS-11, Numerical Rating Scale; VAS, Visual Analogue Scale; PCS-C, Pain Catastrophizing Scale-Child.
*$p < .01$; **$p < .001$.

Reliability

One hundred and eighty-two children and adolescents (96%) responded to both measurements. There were no statistically significant differences regarding sex and age between those who did and did not complete the second measurement. As shown in Table 2, the test-retest reliability estimates for the NRS-11-Arabic scores ranged between 0.82 (13–18 years old) and 0.89 (8–12 years old), thus showing good reliability. In all cases, they were statistically significant. These estimates suggest that the scores will be accurate enough to be used in all types of applications, including individual assessments.

Validity and unidimensionality

Convergent Validity was supported by the strong correlations between the scores on the NRS-11-Arabic and the scores on the VAS-Arabic in both age groups and in the whole sample (see Figure 1 and Table 2). Evidence was then obtained of the *unidimensionality* of the NRS-11-Arabic scores by fitting the error-in-variables model described above. The disattenuated correlation estimates and the corresponding approximate 90% confidence intervals between the NRS-11-Arabic and the VAS-Arabic scores were: 0.996 (0.748; 1.00) in the 8–12-year-olds; 0.999 (0.752; 1.00) in the 13–18-year-olds, and 0.993 (0.813; 1.00) in the whole group. For all three groups, the upper end of the confidence interval contains the unit correlation as an admissible value. Setting the disattenuated value to unity provided the following chi-squared goodness-of-fit results with one degree of freedom: $\chi^2 = 0.001$, $p = .98$ (8–12 group); $\chi^2 = 0.267$, $p = .60$ (13–18 group); and $\chi^2 = 0.004$, $p = .95$ (whole group). As expected, the fit in the three cases was very good, thus providing evidence that the NRS-11-Arabic and the VAS-Arabic scores measure the same common construct.

Discriminant Validity was supported because the magnitude of the correlation between the NRS-11-Arabic and the

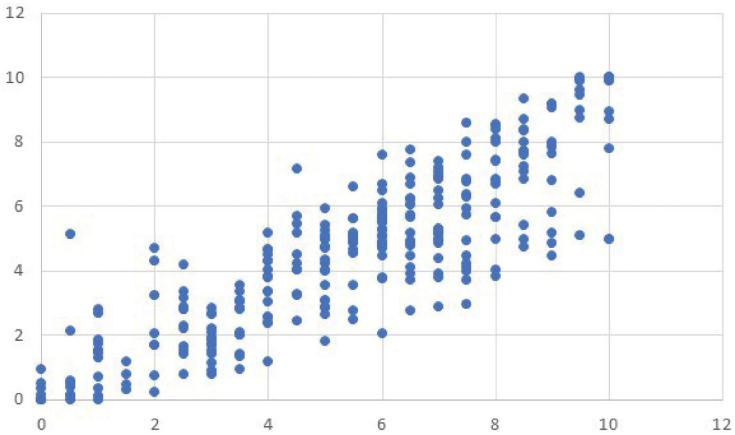

Figure 1. Correlations between NRS-11-Arabic and VAS-Arabic scores in the whole sample.

VAS-Arabic was significantly greater than the correlation between the NRS-11-Arabic and the PCS-C-Arabic for the whole sample ($z = 8.23$, $p < .001$) and for the 8–12-year-olds ($z = 8.29$, $p < .001$) and the 13–18-year-olds ($z = 8.67$, $p < .001$).

Discussion

Our aim was to study some psychometric properties of the Arabic version of the 0–10 Numerical Rating Scale (NRS-11-Arabic). As we hypothesized, we found that NRS-11-Arabic provided scores that measured a single dimension with strong reliability and validity. Thus, the NRS-11-Arabic proved to be a suitable self-report questionnaire to inform about pain intensity in this sample of young people between 8 and 18 years old. Moreover, the NRS-11-Arabic was easy to understand (i.e. none of the participants requested additional explanations) and use. Importantly, these findings are in line with data supporting the validity and reliability of the NRS-11 scores when it is used with pediatric populations[16,37–40], including studies using electronic versions of the scale[41].

Some limitations should be taken into account when interpreting the study's findings. First, participants were a convenience sample of schoolchildren from one school in the north of Lebanon that may or may not be representative of the Arabic-speaking population. Thus, additional research with other samples from other Arabic-speaking countries is needed to determine which of the study findings are valid. Nevertheless, the findings are in line with studies using the NRS-11 in many different languages (e.g. Catalan, English, French, German, Spanish) and with clinical and student samples from different countries[8,42–46]. Second, to report the expected level of pain intensity, the procedure required participants to imagine situations that they might or might not have experienced or which had happened a long time ago (i.e. Imagine that you burned your hand). This could have influenced the results. Therefore, studies with samples of children with acute and chronic pain are also needed. However, this procedure has been successfully used in previous studies[37,47] with similar results. Third, we did not randomize the presentation of the pain intensity scales used in this study (i.e. NRS-11-Arabic and VAS-Arabic). Therefore, it is unclear whether there were order effects on the ratings reported by the schoolchildren. However, previous studies have found that the order in which the scales are presented makes no difference[16,47,48]. Finally, there are other psychometric properties of interest that were not examined in this study (e.g. feasibility, sensitivity to change over time). Therefore, additional studies should be made to evaluate other characteristics. In addition, future research should also compare the NRS-11-Arabic with other widely used self-report questionnaires (e.g. Faces Pain Scale-Revised)[11,21,49,50], and study if there are any preferences related to variables like age or gender. Moreover, future studies should examine whether paper-and-pencil forms of the NRS-11-Arabic provide pain intensity reports that are equivalent to verbally or electronically administered forms of the questionnaire.

Despite these limitations, the findings suggest that the Arabic version of the NRS-11 provides valid and reliable scores for assessing pain intensity in young people. If these findings are found to be valid in future studies, it would support the use of the NRS-11-Arabic, thus facilitating transcultural studies about the expression of pain intensity which in turn might improve the assessment and management of pain in children worldwide.

Transparency

Declaration of funding

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The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

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Author contributions

JF: Data collection, Data curation; Methodology; Software; Writing-Original draft preparation. ES-R: Data analysis; Writing – review & editing. PJF: Data analysis; Writing – review & editing. JM: Conceptualization; Methodology; Supervision; Writing – review & editing; Funding acquisition

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4.3 Study III

The Arabic Version of the Faces Pain Scale-Revised: Cultural Adaptation, Validity, and Reliability Properties when Used with Children and Adolescents.

children

MDPI

Article

The Arabic Version of the Faces Pain Scale-Revised: Cultural Adaptation, Validity, and Reliability Properties When Used with Children and Adolescents

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Abstract: The Faces Pain Scale-Revised (FPS-R) is widely used to assess pain intensity in young people. The aims of this research were to study the convergent and discriminant validity and reliability properties of a culturally adapted version of the FPS-R for its use with Arabic-speaking individuals. The sample consisted of 292 students living in Lebanon. They were interviewed online, asked to imagine themselves in one of two given situations based on their age (8–12 and 13–18 years old), and then asked rate the intensity of pain they would experience using the FPS-R-Arabic and a Numerical Rating Scale (NRS-11-Arabic). They were also asked to respond to the Pain Catastrophizing Scale (PCS-C-Arabic). Two weeks later, participants were asked to repeat the same procedure. The data showed strong associations between the scores of the FPS-R-Arabic and NRS-11-Arabic ($r = 0.72$; $p < 0.001$), which were higher than the associations of the scores of the FPS-Arabic with the PCS-C-Arabic scores ($z = 7.36$, $p < 0.001$). The associations between the FPS-R-Arabic scores on the two measurements were also strong ($r = 0.76$; $p < 0.001$). The findings support the convergent and discriminant validity and reliability of the FPS-R-Arabic scores when used to measure pain intensity in young people aged 8 to 18 years old.

Keywords: Faces Pain Scale-Revised; Arabic; validity; reliability; pain assessment; pain intensity; children

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1. Introduction

Pain is a common experience in children and adolescents [1–4]; but, even so, assessing pain in children is still a challenge [5–7]. Research has shown that self-reporting is the best and primary source of information for assessing pain intensity in children [8–10]. Various self-report questionnaires exist for measuring and assessing pain intensity, all with positive and negative characteristics [9,11–14].

Faces are commonly used in self-report pain intensity questionnaires, especially with younger children because they are appealing, simple, and easy to use [15]. Of the different faces scales, the revised version of the Faces Pain Scale [16,17] is one of the most used for measuring and assessing pain intensity [18–20]. The Faces Pain Scale-Revised (FPS-R) has six facial expressions and has two main advantages over other faces self-report pain intensity measures: namely, pain intensity scores can be matched with the common 0–10 metric used by most scales, like the numerical rating scale [17], and the faces are depicted without smiles or tears, thus avoiding the confusion between pain intensity and distress [19,21–23].

Currently, as well as its original English version, the FPS-R's instructions are available in 69 languages (https://www.iasp-pain.org/resources/faces-pain-scale-revised/#download; last accessed 4 November 2021). However, not all these versions have been thoroughly studied, and there is no information about their psychometric characteristics [8,24–26].

The FPS-R has been translated into Arabic, but the psychometric properties of the translated instrument have not been studied. Although the FPS-R is very simple and easy to use [8,15,16] and is widely used with children and adolescents [13,19,27–29], it should not be assumed that the strong psychometric properties reported in studies of samples from countries with different languages and cultures remain the same when it is used with Arabic-speaking samples [8,30–33]. Thus, before it is recommended for general use and implementation, its psychometric properties should be subject to rigorous research. Indeed, research on the Arabic version of the FPS-R is important, as it could help improve how pain intensity is measured and assessed in Arabic-speaking children around the world [34,35], most of whom are monolingual or report difficulties when using a second language [36,37]. It would also help facilitate transcultural studies about the expression of pain.

The objectives of this research were to study the construct validity (i.e., convergent and discriminant validity) and reliability (i.e., test-retest reliability) of a culturally adapted version of the FPS-R for use with Arabic-speaking children and adolescents. If the scores of the FPS-R-Arabic were to be valid, we hypothesized that they would show a strong and positive statistically significant association with pain-intensity scores of the Arabic version of the Numerical Rating Scale (NRS-11-Arabic). We also hypothesized that the magnitude of the association between these two scores would be greater than between the FPS-R-Arabic and the Arabic version of Pain Catastrophizing Scale [38], a theoretically different scale to pain intensity, supporting discriminant validity. Finally, we hypothesized a strong and positive statistically significant association between scores of the FPS-R-Arabic at two different times, which would support its test-retest reliability properties.

2. Materials and Methods

2.1. Participants

A total of 292 children and adolescents living in Cada Zgharta and Beirut (Lebanon) participated in this study. This convenience sample was recruited via flyers shared on social media and a snowball strategy. To take part, eligible participants had to be between 8 and 18 years old and fluent in Arabic. Interested individuals were excluded if they had cognitive disabilities or failed to provide an informed consent form signed by their parents or their assent.

2.2. Measures

2.2.1. Sociodemographic Information

Children and adolescents participating in the study were asked to provide information about their gender, age, and school grade.

2.2.2. Pain

Participants were asked to report their pain intensity using both the Arabic versions of the Faces Pain Scale-Revised (FPS-R-Arabic) and the 0–10 Numerical Rating Scale (NRS-11-Arabic).

The NRS-11 is a one item questionnaire that assesses pain intensity by asking the child to estimate his or her pain using numbers from 0, referring to "no pain", to 10, referring to "very much pain". Pain intensity reports of the NRS-11 have been shown to be valid and reliable when used with pediatric populations [39–41], including Arabic-speaking samples [42].

In this study, we had to adapt the FPS-R for use with Arabic-speaking children. In the original English version, the FPS-R has six faces showing ascending pain intensity (from left to right). The first face (the leftmost) is described as showing "no pain", and the sixth (the rightmost) is described as showing "very much pain". However, in order to use a culturally sensitive form of the FPS-R, we had to reverse the position of the faces because Arabic individuals read from right to left. Therefore, in the Arabic version that we have used in this study, the faces showed an ascending level of pain from right to left, so the

instructions also had to be slightly changed from the originals to reflect the different order of the faces.

2.2.3. Pain Catastrophizing

In addition to pain intensity, participants were asked to respond to the 13-item Arabic version of the Pain Catastrophizing Scale-Child (PCS-C; 38) to measure catastrophic thinking about pain, in which respondents indicate how frequently they have catastrophic beliefs when in pain on a scale from 0 ("not at all") to 4 ("extremely"). Scores range from 0 to 52, and the higher the score, the more the respondent catastrophizes about pain. The PCS-C assesses three pain catastrophizing domains: rumination (e.g., "I cannot keep it out of my mind"), magnification (e.g., "I am afraid that pain will get worse"), and helplessness (e.g., "There is nothing I can do to reduce pain"). However, in this study, we only used the total score. The PCS-C scores have been shown to have sound psychometric properties in different languages and in different samples of children and adolescents [42–44]. Cronbach's alpha of the Arabic version of the PCS-C used in this study was excellent ($\alpha = 0.91$).

2.3. Procedure

This study was approved by the Ethics Committee of the Universitat Rovira i Virgili (CEIPSA-2020-TD-0002) and conducted fully online in April and May of 2021. Recruitment flyers were posted and shared on social media (via Whatsapp, Instagram, and Facebook) seeking parents of children and adolescents aged between 8 and 18 years old living in Lebanon. The parents who showed an interest were asked permission for their child to participate. Six of the parents approached refused the request. The parents who agreed to proceed with the study were called to an online meeting.

During the first online meeting, the researcher met each participant and her or his mother or father, introduced herself, and explained the study procedure. Parents of participants younger than 13 years old were invited to stay in the meeting to provide technical help if needed as long as they remained silent. However, no parents had to intervene.

After obtaining the parents' consent and participant's assent, the researcher asked each participant to report the following information: gender, age, school grade, and pain if any. Then, the researcher sent the participant a link to the online survey and asked him/her to respond to the questions on pain intensity in her presence. When clicking on the link, participants found five sequential yet different pages. However, they could only move forward to the next pages of the survey by approving the first page, the informed consent, the demographic questions, the FPS-R-Arabic, the NRS-11-Arabic, and the PCS-C-Arabic, each following on a different page. Once the survey had been filled in and submitted, a thank-you note appeared on the participant's screen, and a report with all the answers given was sent by email to the researcher under a randomly assigned code for each participant that was secured on a two-password-protected laptop.

Two different scenarios were used to elicit pain intensity reports with the FPS-R-Arabic and the NRS-11-Arabic. We followed a procedure used with similar objectives [8] and asked the participants to imagine themselves in one potentially painful situation or another depending on their age. Children of 8–12 years old were asked to imagine that they fell over and scraped their knees, whereas adolescents of 13–18 years old were asked to imagine that they burned their hand. Then, the researcher read the instructions for the FPS-R-Arabic and NRS-11-Arabic and asked the participant to report the pain intensity on the online survey, one after the other. Subsequently, participants were asked to respond to the PCS-C-Arabic before a second meeting was scheduled for two weeks later, when they would report their pain intensity with the FPS-R-Arabic and the NRS-11-Arabic using the same scenario and procedure of the first meeting.

2.4. Data Analysis

To describe the study sample, we computed the descriptive statistics of the demographic variables (percentages, means, and standard deviations). Then, to study the convergent validity of the FPS-R-Arabic scores, we computed a Pearson correlation coefficient between the ratings on the FPS-R-Arabic and the NRS-11-Arabic. Next, we conducted a Steiger's *z*-test [45] to evaluate the discriminant validity of the scores of the FPS-R-Arabic by comparing the magnitude of the correlation between the ratings on the FPS-R-Arabic and the NRS-11-Arabic with the magnitude of the correlation between the FPS-R-Arabic and the PCS-C-Arabic. Finally, to study reliability, we computed a Pearson correlation coefficient between ratings on the FPS-R-Arabic at time 1 and time 2. To study the planned associations, we examined the group as a whole and also in two age groups (the 8–12-year-olds and the 13–18-year-olds) since we used two different scenarios. All analyses were conducted using the Statistical Package for Social Sciences for Windows version 27.0 (SPSS Inc., Chicago, IL, USA).

3. Results

3.1. Participants

A sample of 292 children and adolescents participated in this study. The average age was 13.11 years (SD = 2.73), and there were slightly more females (51%).

3.2. Validity

3.2.1. Convergent Validity

Table 1 provides the Pearson correlations between the scores of the FPS-R-Arabic and those of the NRS-11-Arabic for the whole sample and both age groups. The correlations are strong and statistically significant and support the convergent validity of the FPS-R-Arabic scores.

Table 1. Correlations between the different measures used in the study.

Whole Sample (*N* = 292)		
	FPS-R-Arabic	**PCS-C-Arabic**
NRS-11-Arabic	0.72 *	0.44 *
PCS-C-Arabic	0.38 *	
8–12 years old (*N* = 137)		
	FPS-R-Arabic	PCS-C-Arabic
NRS-11-Arabic	0.73 *	0.47 *
PCS-C-Arabic	0.40 *	
13–18 years old (*N* = 155)		
	FPS-R-Arabic	PCS-C-Arabic
NRS-11-Arabic	0.71 *	0.42 *
PCS-C-Arabic	0.39 *	

Note: FPS-R-Arabic, Arabic version of the Faces Pain Scale-Revised; PCS-C-Arabic, pediatric form of the Arabic version of the Pain Catastrophizing Scale; NRS-11-Arabic, Arabic version of the Numerical Rating Scale-11. * $p < 0.001$.

3.2.2. Discriminant Validity

The magnitude of the correlation between the scores on the FPS-R-Arabic and the scores on the NRS-11-Arabic was significantly greater than the magnitude of the correlation between the scores on the FPS-R-Arabic and the scores on the PCS-C-Arabic for the whole sample (z = 7.36, $p < 0.001$), for the 8–12 year-olds (z = 5.07, $p < 0.001$), and for the 13–18 year-olds (z = 4.91, $p < 0.001$).

3.3. Reliability

The test-retest reliability coefficients for the FPS-R-Arabic scores were good (r = 0.76 for the whole sample, 0.74 for the 8–12-year-olds, and 0.76 for the 13–18-year-olds).

4. Discussion

The purpose of this study was to evaluate the construct validity (i.e., convergent and discriminant) and reliability of the FPS-R-Arabic when used with children and adolescents to assess pain intensity. The data supported the hypothesis. That is, they showed a strong statistically significant positive association between the scores of the FPS-R-Arabic and the NRS-11-Arabic. Moreover, the magnitude of the associations between the FPS-R-Arabic and NRS-11-Arabic scores was greater than those between the FPS-R-Arabic and the PCS-C-Arabic scores, thus showing that the scores had good convergent and discriminant validity. The data also showed a strong statistically significant positive association between the scores of the FPS-R-Arabic at the two times of testing, thus showing that the scores had a good test-retest reliability.

The findings of this study extend those from previous research on the use of the FPS-R to measure pain intensity in children and adolescents between 8–18 years old [8,15,17,20] and is the first in evaluate its use in Arabic-speaking populations.

This study has limitations that should be taken into consideration when interpreting the findings. First, the study used a convenience sample of children and adolescents living in two Lebanese regions that may or may not be representative of the Arabic-speaking population. Therefore, studies need to be made with other samples from other Arabic-speaking countries to replicate the findings and determine which ones are valid. Nevertheless, the findings of this research do not differ from those of other studies using different versions of the FPS-R in samples with different languages [8,24,26,46,47]. Second, the nature of the procedure that requires imagination might have affected the results since some of the children might not have experienced burning their hand; yet, the procedure was used as it had been in several previous studies [48,49]. Third, the presentation of the pain intensity scales was not randomized, making it unclear whether the order influenced the ratings' report. Yet again, however, previous similar studies found that the order in which the scales are presented does not make a difference [40,50,51].

Future studies should examine other psychometric properties (e.g., feasibility, sensitivity to change over time) that were not evaluated in this research and evaluate the influence of previous pain experiences on the interpretation of the top anchor of the questionnaire. Importantly, studies with samples of children with acute and chronic pain are also needed. Moreover, research with different age groups is needed to determine the minimum age at which the FPS-R-Arabic can be used, validly and reliably, in this population [8,16,17]. Moreover, future studies should also compare the FPS-R-Arabic scores with those from other common pain intensity scales, like the Visual Analogue Scale, to evaluate their agreement and facilitate their interchangeable use according to the child's age and preferences.

Despite the study's limitations, and in agreement with previous findings, the FPS-R-Arabic scores have shown strong validity and reliability properties when used with children and adolescents. The findings, if shown to be valid in future studies, would support the use of the FPS-R-Arabic to measure and assess pain intensity in young people. Having easy-to-administer, culturally adapted intensity scales with sound psychometric properties tested in the native language of the children with whom it will be used may encourage pain to be assessed, and this, in turn, may improve pain management and result in positive clinical outcomes.

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Institutional Review Board Statement: This study was approved by the Ethics Committee of the Universitat Rovira i Virgili (CEIPSA-2020-TD-0002).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to ethical restrictions and privacy.

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Conflicts of Interest: The authors declare that they have no conflict of interest.

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4.4 Study IV

On the Unidimensionality and Agreement of Four Self-Report Pain Intensity Scales: A Study with Arabic-Speaking Children and Adolescents.

On the Unidimensionality and Agreement of Four Self-Report Pain Intensity Scales: A Study with Arabic-Speaking Children and Adolescents

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Abstract

Purpose: The agreement of pain intensity reports is still a matter of controversy in pediatric pain studies. The aims of this study were to determine the unidimensionality of the electronic versions of four of the most widely used scales (i.e., eNRS-11, eVAS, eFPS-R and eCAS), and the level of agreement between their pain intensity scores, when used with Arabic-speaking children and adolescents.

***Methods*:** A convenience sample of 292 participants, including 137 children (8-12 years old) and 155 adolescents (13-18 years old) were asked to imagine themselves in a painful situation and rate the expected pain intensity using the four scales. A confirmatory factor analysis (CFA) was conducted to determine their unidimensionality. Subsequently, the level of agreement was calculated using the Bland–Altman method in the samples of children and adolescents independently. The maximum limit of agreement was set at ±2 with a confidence interval of 80% (CI).

Results: The data showed the unidimensionality of the four scales and that, with a confidence interval of 80%, only the pain intensity reports of the eVAS and the eCAS in the sample of adolescents were concordant. The data showed no agreement among the pain intensity scores in the sample of children.

Conclusions: The findings suggest that the Arabic versions of the four scales measure a single factor: pain intensity. However, only the scores of the eVAS and the eCAS in adolescents could be used interchangeably.

Keywords: Pain Intensity, Faces Pain Scale-Revised, Numerical Rating Scale, Visual Analogue Scale, Colored Analogue Scale, Agreement, Unidimensionality, Children, Adolescents

Introduction

Pain is common in young people (Huguet & Miró, 2008b; King et al., 2011). For effective management (Jain et al., 2012; Laures et al., 2019; Stevens et al., 2012), it is of the utmost importance that it be measured properly (Franck & Bruce, 2009; Jain et al., 2012) because it determines the effectiveness of a given treatment (Gordon et al., 2002; Wadensten et al., 2011) and enables health care providers to take informed decisions (Stevens et al., 2012). Thus, having psychometrically sound questionnaires for assessment is essential for pain management.

Pain intensity, the most used domain in the study and treatment of pediatric pain, is mostly assessed using self-report scales (Miró et al., 2016). Nowadays, the use of electronic versions of the traditional pencil and paper questionnaires (Castarlenas, Sanchez-Rodríguez, Tome-Pires et al., 2013; McGrath et al., 2006; Nieto et al., 2008) and electronic versions of self-report scales has become more widespread for many reasons (Castarlenas et al., 2015; de la Vega et al., 2014), among other things, they are (1) more appealing, which in turn increases patients' compliance (Nieto et al., 2008), (2) more accessible (Palermo et al., 2004; Stinson et al., 2006) and (3) more accurate, as users do not have to recall the pain because they can report it right away (Palermo et al., 2004; Stinson et al., 2006). Several studies have shown that electronic versions of self-report pain intensity scales provide valid estimates (Finianos et al., 2021, 2022; Sánchez-Rodríguez et al., 2015). However, research on the agreement between their scores has shown contradictory findings. Moreover, it is unclear whether there are age-related differences in relation to the agreement. For example, two studies (Bailey et al., 2007; Sánchez-Rodríguez et al., 2012) reported no agreement between the scores provided with the four most widely used pain intensity scales (i.e., the 0-10 Numerical Rating Scale (NRS-11), the Faces Pain Scale-Revised (FPS-R), the Visual

Analogue Scale (VAS) and the Colored Analogue Scale (CAS)) whereas five studies reported agreement between just some of them (Bailey et al., 2007; Miró et al., 2012; Sánchez-Rodríguez et al., 2012, 2017). For instance, two studies (Bailey et al., 2007; Sánchez-Rodríguez et al., 2012) found that the scores of the four scales did not agree in their traditional paper-and-pencil forms with a confidence interval (CI) of 95% but VAS and CAS scores did agree with a CI of 80% CI (le May et al., 2018; Miró et al., 2012). Finally, another study (Sánchez-Rodríguez et al., 2017) reported that the scores obtained with the electronic forms of the NRS-11, the VAS and the CAS could be used interchangeably (Sánchez-Rodríguez et al., 2017). These studies have examined the agreement of the pain intensity scores in samples with different age ranges, and the findings about potential age-related differences are not conclusive. For example, one study focused on the agreement in children aged 6-8 years old and found a concordance only between the scores provided by the VAS and the CAS (Sánchez-Rodríguez et al., 2012). Other studies with adolescents aged 12-18 years old (e.g., Sánchez-Rodríguez et al., 2015, 2017), reported an agreement between NRS-11, VAS, and CAS scores. Some other studies with samples with a wider age range reported different findings. For example, Bailey et al (2007) comparing pain intensity scores on a VAS, a CAS, a NRS and the Wong-Baker FACES scale found that only the VAS and the CAS showed an acceptable agreement in a sample of children aged 8 to 18 years with moderate to severe acute abdominal pain. Similarly, Le May et al (2018) compared scores on a VAS, a CAS, and the FPS-R, in a sample of children 6 to 17 years old presenting to the emergency department with a musculoskeletal injury. Although their data showed good psychometric properties for all scales, just the scores on the VAS and the CAS were concordant. Therefore, some studies, but not all, suggest differences in the level of agreement of pain intensity scores according to age. The differences in findings might be related to age, but also to other factors

(e.g., the use of traditional paper-and-pencil or electronic versions of the scales). Therefore, additional research is warranted to clarify the agreement between the scores of these widely used scales with different samples, and study potential age-related differences in the agreement of the scores.

Recently, important new data have been reported on the psychometric properties of the Arabic versions of these commonly used pain intensity scales when used with children and adolescents. For example, Finianos and colleagues informed that pain intensity scores reported with electronic versions of both the Arabic NRS-11 (Finianos et al., 2022) and the Arabic FPS-R (Finianos et al., 2021) showed good test-retest reliability and a strong correlation with each other (construct validity was good). Nevertheless, in order to help millions of children who speak Arabic worldwide (e.g., refugees who are displaced and other vulnerable young group that only speak Arabic in countries of other language) and before being extensively recommended for use in clinical and research activities, additional research to study other psychometric properties (e.g., the unidimensionality, agreement) of the Arabic versions of these four pain intensity scales is warranted.

Given these issues, the aims of this research were to study (1) the unidimensionality of the pain intensity scores provided by four common pain intensity scales (the NRS-11, the FPS-R, the VAS and the CAS) when used in their electronic form with Arabic-speaking children and adolescents (eNRS-11; eFPS-R, eVAS and eCAS), (2) the agreement between the pain intensity scores provided with these four scales, and (3) the age-related differences in the agreement of the pain intensity scores. On the basis of the findings in the literature, briefly summarized above, we hypothesized that the four scales would measure a single dimension (i.e., pain intensity), and that the agreement among pain intensity scores would differ depending on the age of the participants. That is to say, pain intensity scores provided

with the Arabic forms of the eNRS-11, the eFPS-R, the eVAS and eCAS would be in agreement when used with adolescents (i.e., participants 13-18 years old); whereas only the scores of the eVAS and the eCAS would be in agreement when used with children (i.e., participants 8-12 years old).

Materials and methods

Participants

To calculate the sample size needed, we used G*Power version 3.1.9.6. Assuming a medium effect size (0.30), an alpha of 0.05, a power of 0.80 and 2 degrees of freedom, the study needed a minimum of 108 participants. However, to avoid attrition problems, we recruited a total of 292 students aged between 8-18 years old via flyers shared on social media and distributed mainly in Zgharta (Lebanon). Interested individuals were considered eligible as long as they were fluent in Arabic and had no cognitive impairments that could interfere with their participation. Interested individuals had to provide their assent and their parent's informed consent.

Procedure

Due to the Covid-19 pandemic lockdown, the study was conducted remotely. Participants were recruited in two ways. First, flyers explaining the study were circulated via social media asking for the collaboration of parents of school-aged children. Second, flyers were also sent to parents of children and adolescents who were between 8 and 18 years old enrolled in schools in Zgharta (Lebanon). Interested parents were asked to give permission so that their children could participate in the study. Those that agreed were invited to an online meeting where the researcher met the eligible participant, introduced the study, and

explained the procedure. Both the parent and the child were required to provide their informed consent and assent.

Once the consent and assent had been obtained, the researcher asked the participants for their age and gender. Then, the researcher provided them with a link to the online study. After accessing the link, and depending on their age, participants were asked to imagine themselves in one of two potentially painful situations. Children aged 8 to 12 were asked to imagine falling over and scraping their knees, while adolescents aged 13 to 18 were asked to imagine burning their hand. Then, on the basis of the hypothetical painful scenarios, participants were asked to rate their expected pain intensity using four scales: the Arabic electronic versions of the Faces Pain Scale-Revised (eFPS-R-A), the 0-10 Numerical Rating Scale (eNRS-11-A), the Visual Analogue Scale (eVAS-A) and the Colored Analogue Scale (eCAS-A). This method has been successfully used in studies with comparable goals (Miró & Huguet, 2004).

The study was approved by the Ethics Committee of Universitat Rovira i Virgili (CEIPSA-2020-TD-0002).

Measures

Sociodemographic Information. Participants reported their gender and age, before using the four pain intensity scales.

Pain intensity. In this study, to measure pain intensity we used the Arabic electronic versions of the Faces Pain Scale-Revised (eFPS-R-A), the 0-10 Numerical Rating Scale (eNRS-11-A), the Visual Analogue Scale (eVAS-A) and the Colored Analogue Scale (eCAS-A).

The FPS-R is a self-report questionnaire that depicts six faces showing different levels of pain intensity. In the original version (Hicks et al., 2001) the faces show pain ascending

from left to right. However, in the Arabic version used in this study, the faces showed pain intensity (Finianos et al., 2021) from right (no pain) to left (very much pain). This culturally adapted Arabic version of the FPS-R has been shown to provide valid and reliable pain intensity scores when used in pediatric Arabic-speaking samples (Finianos et al., 2021). With the FPS-R-A, as with the original version, users are asked to choose the face that best reflects their pain intensity. In this study, the eFPS-R-A was used (de la Vega et al., 2014). The six faces were shown in the middle of the screen of the electronic device (i.e., mobile phone, tablet or laptop) and the participants had to tap on the face that best reflected the pain intensity they thought they would experience in that specific situation.

When using the NRS-11, respondents are asked to choose a number from 0 (no pain) to 10 (very much pain) that best reflects their pain. Pain intensity scores using the NRS-11-A have been shown to provide valid and reliable information when used with children and adolescents as young as 8 years old (Finianos et al., 2022). This study used the electronic version of the scale (eNRS-11-A) (de la Vega et al., 2014). Potential responses (numbers from 0 to 10) were depicted in the middle of the screen and the respondents had to choose and tap on the number that best represented their pain intensity.

The VAS is a 10 cm horizontal line. One end shows “no pain” and the other shows “very much pain”. In the Arabic version used in this study, the right-hand side of the scale showed “no pain” and the left-hand side showed “very much pain”. The children’s task was to mark the intensity of their pain at a point on the line. The distance between the marker and the right anchor (no pain) represented their pain intensity. In this study, we used an electronic version of the scale (eVAS-A) (de la Vega et al., 2014). The line appeared in the middle of the screen and participants had to slide a marker along the line to report their pain intensity.

VAS scores have been shown to be valid when used with children and adolescents (Kahl & Cleland, 2005; le May et al., 2018; Shields et al., 2003).

The CAS is a 10 cm long color-graduated triangular shape with an anchor at each end. In the culturally adapted Arabic version of the CAS used, the color to the right is white and represents “no pain”. It gradually turns dark red as it moves towards the left indicating “very much pain”. Pain intensity scores provided with the CAS have been found to be valid and reliable with children and adolescents (McGrath & Gillespie, 2001; Miró et al., 2007). To report their pain intensity, participants had to point to the color intensity that represented their pain. In this study, the electronic version of the scale (eCAS-A) showed a triangle in the middle of the screen, and participants had to slide a marker along the triangle using their finger and leave it on the color intensity that best reflected their pain intensity (de la Vega et al., 2013).

Data analysis

First, we computed descriptive statistics of the demographic characteristics. Then, we examined the data to ensure that they met the assumptions for the planned analyses. We studied sampling adequacy with the Kaiser-Meyer-Olkin Test and Bartlett´s Test of Sphericity (Bentler, 1990). Next, in order to determine whether the four scales measure a single common factor or not, we computed a Confirmatory Factor Analysis (CFA). Since our data did not follow a normal distribution, we used the mean-adjusted maximum likelihood (MLM) method for factor extraction. Finally, in order to analyze the adjustment of the one-factor model, we used the following fit indices: the Root Mean Square Error of Approximation (RMSEA), for which a value below 0.05 indicates a good fit, and a value below 0.08 indicates a moderate fit (Steiger, 1990); the Standardized Root Mean Square Residual (SRMR) for which a value below 0.08 demonstrates a good fit (Hu & Bentler, 2009)

and the Comparative Fit Index and the Tucker-Lewis Index (CFI & TLI); for which a value above 0.90 is indicative of an adequate fit and a value above 0.95 indicates a good fit (Bentler, 1990; Tucker & Lewis, 1973).

A series of analyses using the Bland–Altman method were also conducted to test the agreement of the scores reported for the four pain intensity scales for each age group. In this method, the difference between the scores reported with two different scales was compared with the mean of these two scores. A maximum limit of agreement was set a priori to ±2. This value corresponds to the minimal clinical significant difference (MCSD) when using the CAS in children and adolescents. We chose this limit instead of the MCSD of other scales because it is the most liberal one. We also used an 80% confidence interval (Miró et al., 2012; Sánchez-Rodríguez et al., 2015; von Baeyer, 2012).

Statistical analyses were conducted using Mplus 5.1 (Muthen, 2010), FACTOR 12.01.02 (Lorenzo-Seva & Ferrando, 2006) and the Statistical Package for Social Sciences for Windows version 28.0 (Nie et al., 1975).

Results

Participants

A sample of 292 students participated in this study: 137 children and 155 adolescents. The average age of the 8-12 years old children was 10.66 years (SD=1.17), and there were more females (54%), whereas the average age of the 13-18 years old adolescents was 15.28 years (SD=1.69), and there were slightly more males (53%).

Unidimensionality

The KMO Index (0.84) and Bartlett's Test of Sphericity (876.3; df = 6; $p < 0.001$) showed that the data were suitable for factorization. The goodness of fit indices showed a

good fit to a single-factor model (RMSEA = 0.08; SRMR = 0.02; CFI = 0.99 and TLI = 0.99). The loadings of each scale on the factor can be seen in Table 1.

[Insert Table 1 approximately here]

Agreement

The limits of agreement according to the Bland–Altman method are shown in Table 2, Table 3, and Appendix 1 and 2. As can be seen, with a confidence interval of 80%, only the eVAS-A and eCAS-A scores in adolescents (participants in the 13-18 years old group) are in agreement.

[Insert Tables 2 and 3 approximately here]

Discussion

The aims of this study were to study the unidimensionality and the level of agreement of the electronic versions of the Numerical Rating Scale (eNRS-11), the Faces Pain Scale-Revised (eFPS-R), the Visual Analogue Scale (eVAS) and the Colored Analogue Scale (eCAS) when used with Arabic-speaking children and adolescents, while also exploring potential age-related differences in the level of agreement.

The data showed that the four Arabic electronic versions of the self-report scales are unidimensional, thus confirming the hypothesis that they all measure a single factor (i.e., pain intensity). This finding is in line with previous studies showing that the eFPS-R, eNRS-11, eVAS and eCAS measure a single factor when used with children and adolescents (Sánchez-Rodríguez et al., 2012, 2015; Thong et al., 2018).

In relation to the agreement of the scores, the data partly supported the hypothesis. That is, only the scores of the eVAS-A and the eCAS-A in the group of adolescents (i.e., participants 13-18 years old) were in agreement when they were analyzed with a confidence interval of 80%. This finding is in line with previous studies (Bailey et al., 2007; Miró et al.,

2012; Sánchez-Rodríguez et al., 2017). For example, Le May and colleagues (Le May et al., 2018) found an agreement between VAS and CAS scores, with more than 95% of the scores falling within the a priori maximum limit of agreement set at ± 2.0 in a sample of participants 8-18 years old. Similarly, in a study with 87 children with abdominal pain, Bailey and colleagues (Bailey et al., 2007) found 95% limits of agreement for the VAS and CAS of −18.6 and 14.4 (Bailey et al., 2007). However, these findings contradict those of other studies which pointed to moderate agreement between the scores on the FPS-R, the NRS-11 and the VAS (von Baeyer et al., 2009), and between the scores on the FPS-R and the VAS (Newman et al., 2005). The findings in the group of children 8-12 years of age showing no agreement in any of the scales' scores also oppose those reported in previous studies (Miró et al., 2012; Sánchez-Rodríguez et al., 2012). The disagreement between the scores of the four pain intensity scales might be caused by the fact that the participants had to report their pain intensity in different ways. That is, the eFPS-R-A and the eNRS-11-A requested users to choose one of the response alternatives shown on the screen, whereas the eVAS-A and the eCAS-A requested them to manipulate a slide. However, this possibility could not be checked in this study, so further research is required to address this issue. Previous studies (e.g., Sánchez-Rodríguez et al., 2012) suggested that the lack of agreement between pain intensity scores could be attributed to the studies' procedure or the use of different response forms. The findings of this study also suggest that the lack of agreement between pain intensity scores might be related to age. Additional studies with different samples are needed to determine the validity of the findings.

This study has some limitations that must be taken into consideration when the study's findings are interpreted. First, the participants were mostly healthy individuals, which may or may not be representative of the population. Therefore, to replicate the findings and

establish their validity and reliability, future studies are needed with different samples including children of different ages. Second, the presentation of the scales was not counterbalanced. It is unclear whether this had an influence on the findings and, if it did, in what direction the influence was. However, previous studies have shown that the order in which the scales are presented is not related to the scores (Huguet & Miró, 2008a; Miró et al., 2009; Sánchez-Rodríguez et al., 2015; von Baeyer et al., 2009). Third, the procedure used required the participants to imagine themselves in a potentially painful situation, and we do not know if this influenced the findings. It is worth noting, however, that previous studies have used this procedure and found it to be valid and reliable (Castarlenas, Miró, et al., 2013; Gupta et al., 2016). Nevertheless, to study the validity of these findings, additional studies with children with acute and chronic pain are warranted.

Despite these limitations, the findings have important implications for assessing pain intensity in children. All four electronic versions of the self-report scales can be used to measure pain intensity with Arabic-speaking children and adolescents. However, they are not concordant. Therefore, if a scale is used to assess pain at a given time, the same scale should be used to re-assess pain intensity in that same individual. Yet, the eVAS-A and the eCAS-A can be used interchangeably in adolescents.

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Table 1. Loadings of each scale on the factor

Scale	**Factor 1**	**Communality**
e-NRS-11-A	0.87	0.76
e-FPS-R-A	0.78	0.61
e-CAS-A	0.87	0.76
e-VAS-A	0.92	0.85

Note: e-NRS-11-A: Arabic electronic version of the Numerical Rating Scale; e-FPS-R-A: Arabic electronic version of the Faces Pain Scale-Revised; e-VAS-A: Arabic electronic version of the Visual Analogue Scale; e-CAS-A: Arabic electronic version of the Colored Analogue Scale.

Table 2. Limits of agreement according to the Bland-Altman method in children aged 8 to 12 years

	80% CI	
	Lower limit	**Upper limit**
e-NRS-11-A – e-FPS-R-A	-2.29	3.37
e-NRS-11-A – e-VAS-A	-1.36	2.38
e-NRS-11-A – e-CAS-A	-1.65	2.57
e-FPS-R-A – e-VAS-A	-3.00	2.40
e-FPS-R-A – e-CAS-A	-3.47	1.87
e-VAS-A – e-CAS-A	-2.33	1.33

Note: CI: Confidence Interval; e-NRS-11-A: Arabic electronic version of the Numerical Rating Scale; e-FPS-R-A: Arabic electronic version of the Faces Pain Scale-Revised; e-VAS-A: Arabic electronic version of the Visual Analogue Scale; e-CAS-A: Arabic electronic version of the Colored Analogue Scale.

Table 3. Limits of agreement according to the Bland-Altman method in children aged 13 to 18 years

	80% CI	
	Lower limit	**Upper limit**
e-NRS-11-A – e-FPS-R-A	-1.70	2.70
e-NRS-11-A – e-VAS-A	-1.22	2.72
e-NRS-11-A – e-CAS-A	-1.22	2.80
e-FPS-R-A – e-VAS-A	-2.14	2.65
e-FPS-R-A – e-CAS-A	-2.03	2.61
e-VAS-A – e-CAS-A	-1.81	1.91

Note: CI: Confidence Interval; e-NRS-11-A: Arabic electronic version of the Numerical Rating Scale; e-FPS-R-A: Arabic electronic version of the Faces Pain Scale-Revised; e-VAS-A: Arabic electronic version of the Visual Analogue Scale; e-CAS-A: Arabic electronic version of the Colored Analogue Scale.

Figure Captions

Figure 1: Agreement between eNRS-11-A and eFPS-R-A in children aged 8 to 12 years ……..Appendix 1

Figure 2: Agreement between eNRS-11-A and eVAS-A in children aged 8 to 12 years ……..……..Appendix 1

Figure 3: Agreement between eNRS-11-A and eCAS-A in children aged 8 to 12 years ……..Appendix 1

Figure 4: Agreement between eFPS-R-A and eVAS-A in children aged 8 to 12 years ……...……..Appendix 1

Figure 5: Agreement between eFPS-R-A and eCAS-A in children aged 8 to 12 years ……...…… … Appendix 1

Figure 6: Agreement between eVAS-A and eCAS-A in children aged 8 to 12 years ……...…...… … Appendix 1

Figure 7: Agreement between eNRS-11-A and eFPS-R-A in children aged 13 to 18 years ……..Appendix 2

Figure 8: Agreement between eNRS-11-A and eVAS-A in children aged 13 to 18 years ……..……..Appendix 2

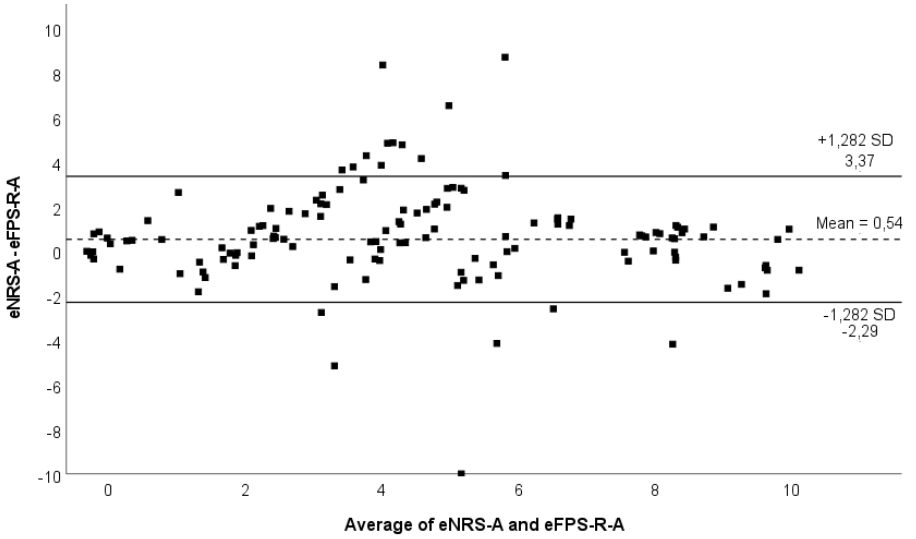
Figure 9: Agreement between eNRS-11-A and eCAS-A in children aged 13 to 18 years ……..Appendix 2

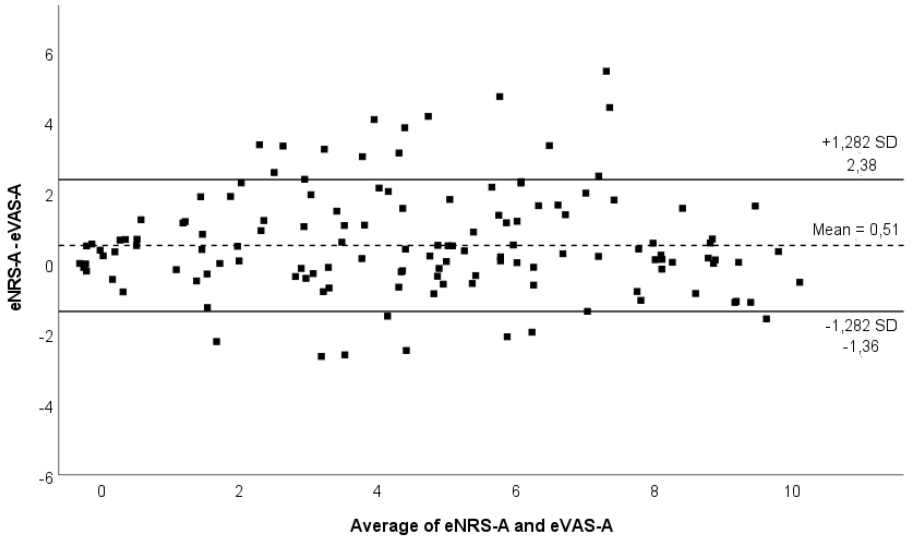
Figure 10: Agreement between eFPS-R-A and eVAS-A in children aged 13 to 18 years ……...……..Appendix 2

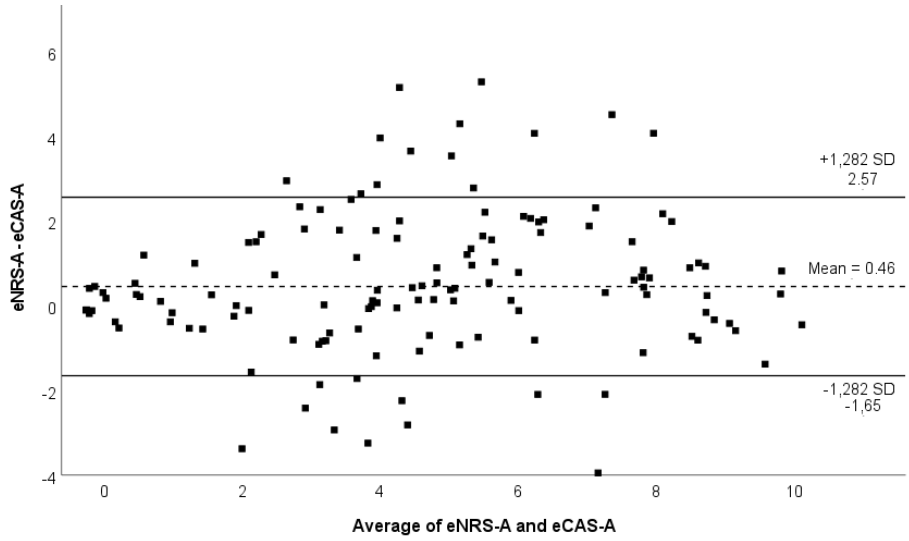
Figure 11: Agreement between eFPS-R-A and eCAS-A in children aged 13 to 18 years ……...…… … Appendix 2

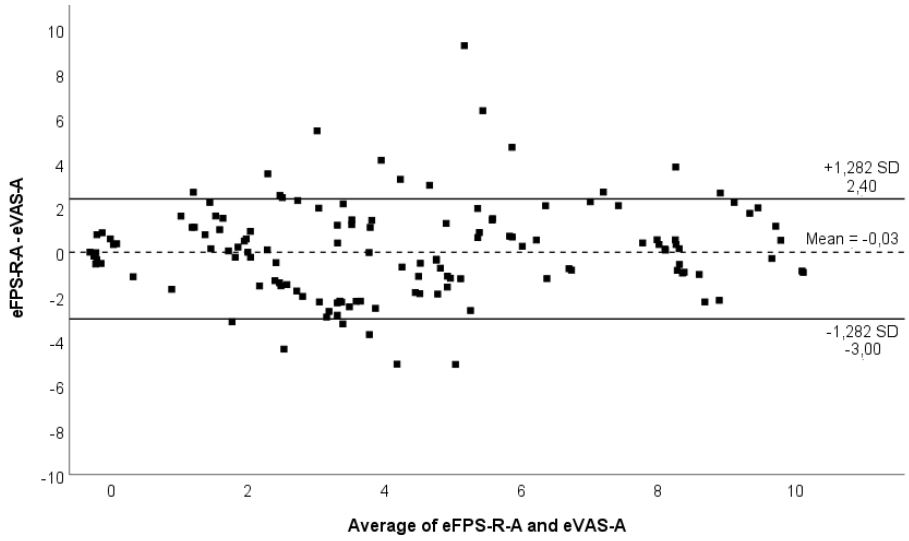
Figure 12: Agreement between eVAS-A and eCAS-A in children aged 13 to 18 years ……...…...… … Appendix 2

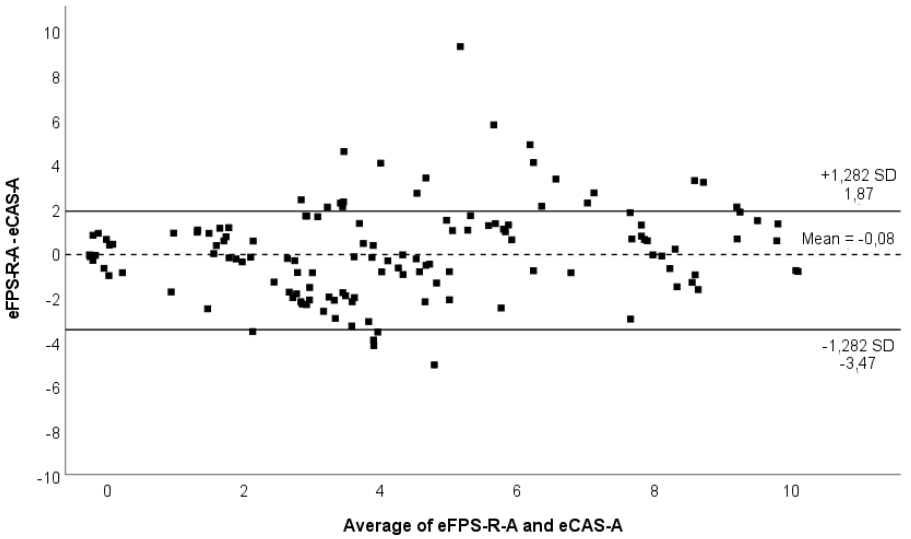
Appendix 1: Bland and Altman plots showing agreement for children aged 8 to 12 years old

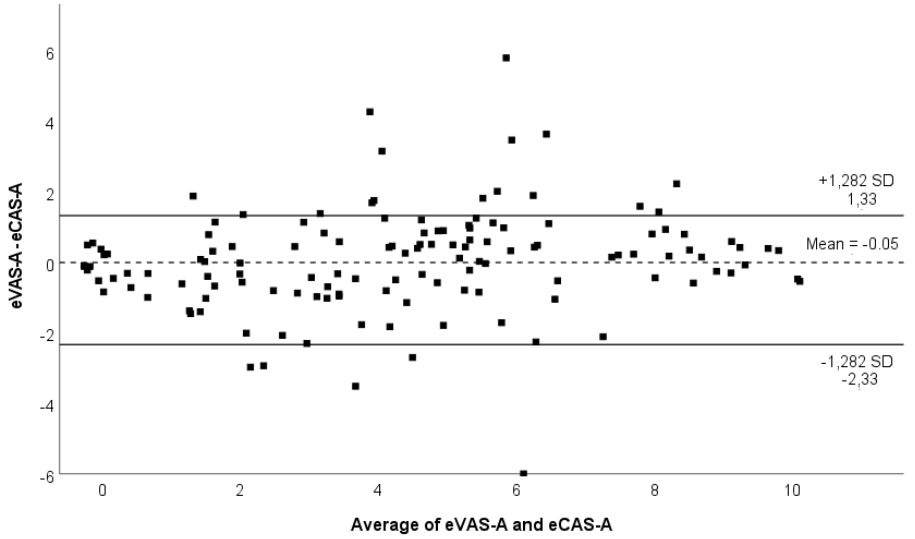




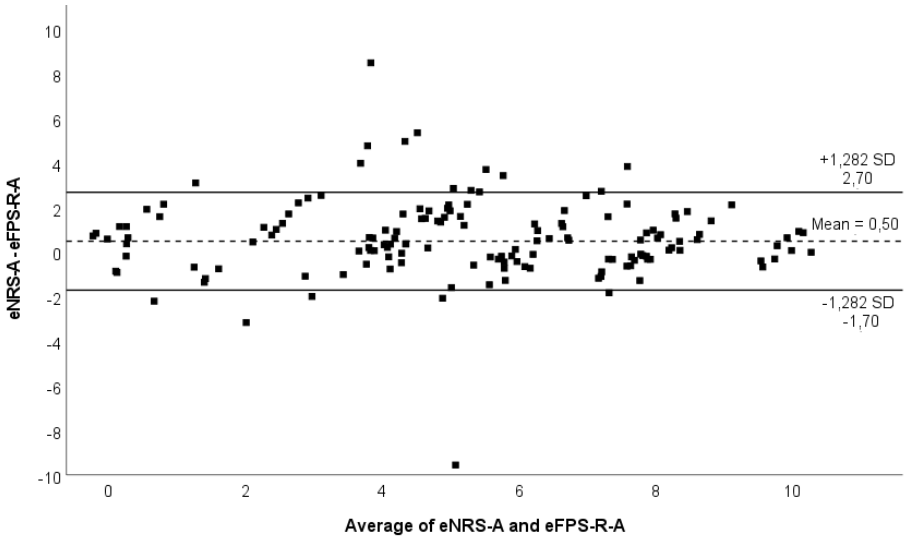

eNRS-A - eCAS-A
6
4
2
0
-2
-4
+1,282 SD
2.57
Mean = 0.46
-1,282 SD
-1,65
0
2
4
6
8
10
Average of eNRS-A and eCAS-A

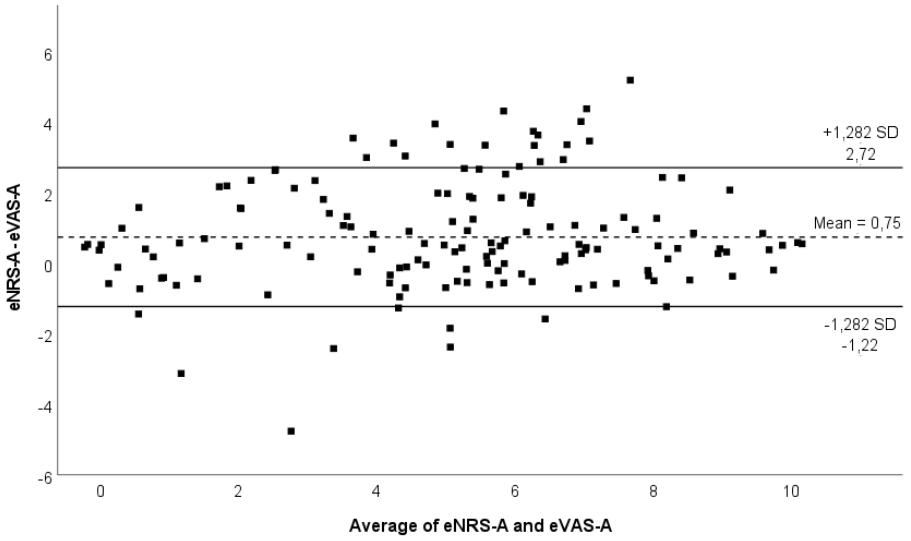

eFPS-R-A - eVAS-A
10
8
6
4
2
0
-2
-4
-6
-8
-10
+1,282 SD
2,40
Mean = -0,03
-1,282 SD
-3,00
0
2
4
6
8
10
Average of eFPS-R-A and eVAS-A

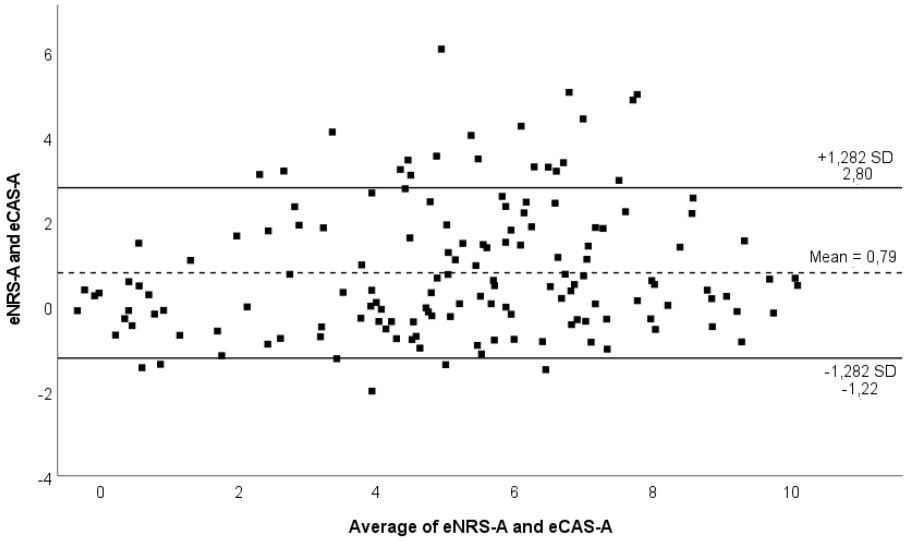

eFPS-R-A - eCAS-A
Average of eFPS-R-A and eCAS-A
+1,282 SD
1,87
Mean = -0,08
-1,282 SD
-3,47

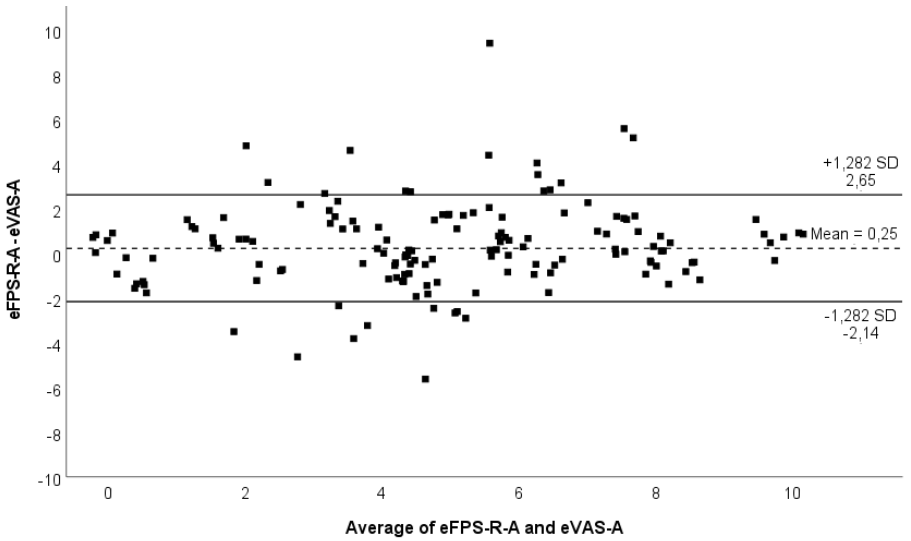

eVAS-A - eCAS-A
Average of eVAS-A and eCAS-A
+1,282 SD
1,33
Mean = -0.05
-1,282 SD
-2,33

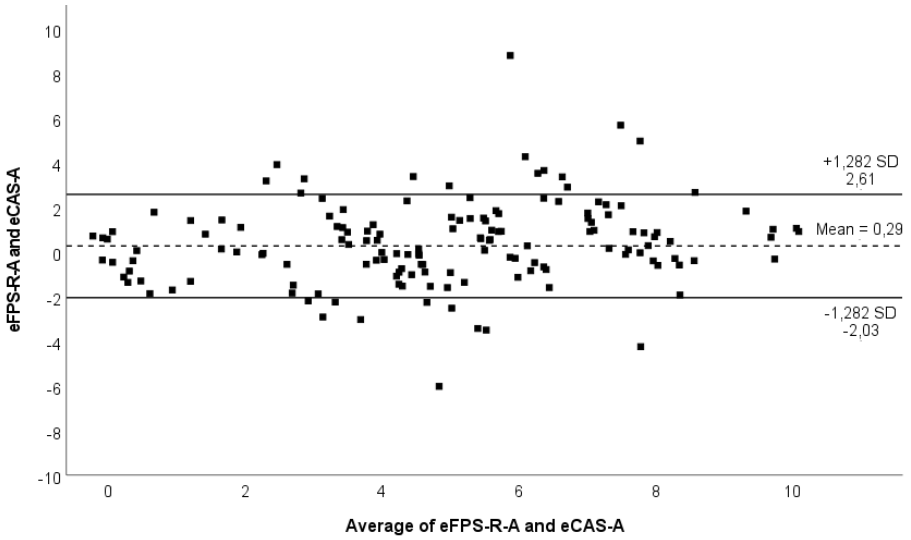
Appendix 2: Bland and Altman plots showing agreement for children aged 13 to 18 years old

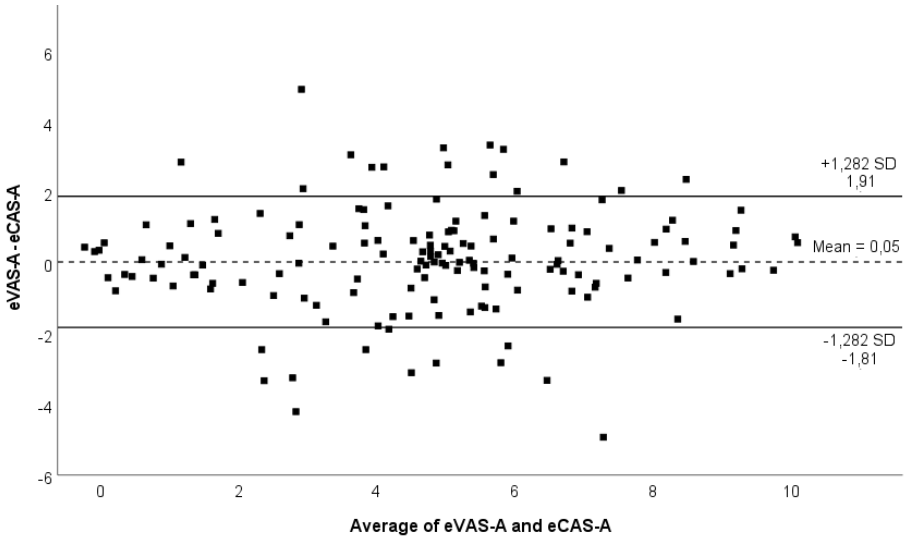





eNRS-A and eCAS-A
6
4
2
0
-2
-4
+1,282 SD
2,80
Mean = 0,79
-1,282 SD
-1,22
0
2
4
6
8
10
Average of eNRS-A and eCAS-A

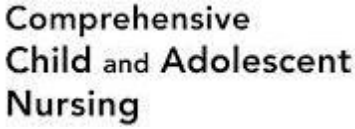

eFPS-R-A - eVAS-A
10
8
6
4
2
0
-2
-4
-6
-8
-10
+1,282 SD
2,65
Mean = 0,25
-1,282 SD
-2,14
0
2
4
6
8
10
Average of eFPS-R-A and eVAS-A


eFPS-R-A and eCAS-A
Average of eFPS-R-A and eCAS-A
+1,282 SD
2,61
Mean = 0,29
-1,282 SD
-2,03


eVAS-A - eCAS-A
Average of eVAS-A and eCAS-A
+1,282 SD
1,91
Mean = 0,05
-1,282 SD
-1,81

4.5 Study V

Professional Education about Pediatric Pain and Current Treatment Practices among Healthcare Professionals Working in Lebanon: A Survey Study.



PROFESSIONAL EDUCATION ABOUT PEDIATRIC PAIN AND CURRENT TREATMENT PRACTICES AMONG HEALTHCARE PROFESSIONALS WORKING IN LEBANON: A SURVEY STUDY

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Abstract:

Professional education has been suggested to be a key barrier in the implementation and availability of treatment programs for children with pain. The purpose of this study was to improve our understanding of the pain education of healthcare professionals working with children with pain in Lebanon, and the current assessment and treatment practices that are used with children and adolescents with chronic pain in Lebanon. A group of 120 experienced healthcare professionals participated. Participants had to respond to an online survey with 47 questions about pain education and organizational characteristics of their pain treatment programs. The results of the study mainly showed that most participants (80%) reported having not received any type of formal training. Treatment of children with chronic pain was mostly based on medical procedures. A third of participants (34%) reported to be, at least, dissatisfied with the treatment provided in Lebanon to children with pain. The findings can now be used to improve pain education and the care given to pediatric patients with pain in Lebanon.

Keywords: Healthcare providers; Pain; Children; Survey; Training; Education

1. Background

Pain is a common experience in childhood from neonatal life to late adolescence (Miró, 2010). For example, the prevalence of moderate to severe pain while children are at the hospital is high (Groenewald, Rabbitts, Schroeder, & Harrison, 2012; Stevens et al., 2012). Similarly, the prevalence of young individuals with chronic pain in young individuals is also high (Huguet & Miró, 2008; King et al., 2011) and increasing, including the most severe cases (Miró et al., 2023).

Pain can significantly interfere in the life of young people (Haraldstad, Sørum, Eide, Natvig, & Helseth, 2011; Miró, Solé, Gertz, Jensen, & Engel, 2017). For example, patients with chronic pain report that they are missing school, withdrawing from social activities, and feeling tired, down, and worried (Agoston, Gray, & Logan, 2016; Craig et al., 2013; Forgeron et al., 2010; Walters, Kynes, Sobey, Chimhundu-Sithole, & McQueen, 2018). Furthermore, pain can also become a burden to family members (Herzer et al., 2010; Ho et al., 2009; Lewandowski, Palermo, Stinson, Handley, & Chambers, 2010), causing a significant social and economic impact (Fayaz, Croft, Langford, Donaldson, & Jones, 2016; Groenewald, Essner, Wright, Fesinmeyer, & Palermo, 2014). In fact, chronic pain is reported to be the leading cause of disability and disease burden worldwide (Vos et al., 2017).

Treatment of pain in children and adolescents is complex, particularly when it becomes chronic (Hechler et al., 2015). Moreover, although the treatment of young people with chronic pain has improved in the last 30 years (Miró, McGrath, Finley, & Walco, 2017; Unruh & McGrath, 2014), pediatric chronic pain is still poorly managed (Eccleston et al., 2021) and young people suffer unrelieved pain unnecessarily (Miró, Micó, & Reinoso-Barbero, 2020). For example, multidisciplinary programs have proved to be the best option for treating young people with chronic pain (World Health Organization, 2020). However, there are still too few of these programs to address the needs of this population (Miró, Reinoso-Barbero, Escribano, & Marti, 2019), particularly in low-income countries (Tawil, Iskandar, & Salameh, 2018; Tsang et al., 2008) where research is limited (Ciocca & Delgado, 2017; Hofman, Ryce, Prudhomme, & Kotzin, 2006; Steinert, Atika Nyarige, Jacobi, Kuhnt, & Kaplan, 2021) and children and adolescents might be at higher risk of developing chronic pain (Finianos, Huijer, & Miró, 2021).

Research has identified a few potential barriers in the implementation and availability of chronic pain programs for young people, these include, but are not limited to, treatment accessibility, complexity of treatment and knowledge deficit (Shipton, Bate, Garrick, Steketee, & Visser, 2018). For example, less than 25% of the world's population has access to effective medication to alleviate moderate-to-severe pain (Lohman, Schleifer, & Amon, 2010). Furthermore, psychosocial treatments that have proved to provide relief for many young people with chronic pain (World Health Organization, 2020) are not always available (Unruh & McGrath, 2014). The access to treatment is a major challenge for young people with chronic pain (Brennan, Carr, & Cousins, 2016), and inadequate education and training in pain management among healthcare providers has been reported to be one of the most important barriers to improving pain relief and care worldwide (Cuff et al., 2022; Hadjistavropoulos et al., 2014; Leegaard, Valeberg, Haugstad, & Utne, 2014; Miró et al., 2019). Thus, by studying the education and training of professionals and the treatments that are being used, we would be able to understand current practices, identify areas that need changes and implement professional education programs to improve what is needed, and reinforce the good practices that exist.

Therefore, the objectives of this study were to improve our understanding of (1) professional pain education of healthcare professionals working with pediatric populations in Lebanon; and (2) current practices in the assessment and treatment provided for children and adolescents with chronic pain in Lebanon.

2. Materials and Methods

2.1. Participants

This study targeted all healthcare professionals working with children and adolescents with chronic pain in Lebanon. Interested individuals had to be working in hospitals in Lebanon, and able to read and understand English as the survey was offered in that language. Potential participants were recruited with the support of the associations and orders they belong to.

2.2. Measures

We used a slightly modified version of the survey developed by Miró and colleagues to meet the study's objectives (Miró et al., 2021). The initial survey had 41 questions about different issues (e.g., education received, years of training and practice, treatments used). The survey was reviewed for suitability by 5 native bilinguals healthcare experts. The final version of the survey included 47 questions covering two key areas: pain education and training, and current practices in the assessment and treatment of children and adolescents with chronic pain. The survey was implemented using LimeSurvey program and it is available on demand from the corresponding author.

2.3. Procedure

Potential participants were recruited with the support of The Lebanese Order of Physicians, Order of Nurses in Lebanon, Lebanese Psychological Association, and the Order of Physiotherapists in Lebanon. They were instrumental in sharing the information about the study and providing the links to the survey to their associated members. In order to widen the scope of potential participants, we also contacted Lebanese hospitals. In this case, we sent a message to the hospital's human resources managers explaining the objectives of the project and requesting their collaboration to inform their healthcare professionals about it. Finally, we also asked colleagues working in the field to respond to the survey and share the project and link to the survey with other colleagues that they knew that could provide key information. Three reminders (once per week) were sent encouraging those that did not respond to collaborate and help in disseminating the survey.

The message that interested professionals received included a link to the survey. Participants completed the survey online. The survey took approximately 15 min to be completed.

This study was approved by the Institutional Ethical Board at the American University of Beirut (AUB; SBS-2020-0398) and was conducted from June to December 2021. Due to the low rate of responses, the data collection period was extended twice.

2.4. Data Analysis

We first computed means and percentages to describe the sample of participants. We then used absolute (n) and relative (%) frequencies to describe participants' responses. The statistical analysis was performed using the Statistical Package for Social Sciences for Windows version 28.0 (SPSS, IBM, Armonk, NY, USA).

3. Results

3.1. Participants

A total of 120 healthcare professionals responded to the survey, in whole or in part. The mean age of the participants was 33 years old (SD=10.08; range=21-58). Most participants were females (89%), nurses (84%) and had either a master or a doctoral degree (61%). Most of the participants worked full-time (89%) in either pediatric-neonatal units (28%) or Pediatric and Neonatal Intensive Care Units (22%). On average, participants in the study saw four new patients experiencing pain each week (4.2; SD= 4.9), and two new pediatric chronic pain patients were seen per week (2.35; SD=3.79; 0-15). Most patients (42%) were school-aged children, and abdominal pain was the most common location of the cases seen (50%). See Table 1 for additional detailed information of participants' demographic characteristics.

[Insert Table 1 about here]

3.2. Pain Education and Training

Most participants reported having not received any type of formal training (80%). The rest took some university coursework about pain during their bachelor's or master's degree. In fact, the majority took informal training- through pain conferences, webinars, workshops and reading books or articles- of limited hours and/or learned from their experience in the hospital. A few participants considered it enough (5%) and were very satisfied with it. Research activities were minimal. In fact, only one participant reported to be a member of a research group and published one pain-related article. See Table 2 for additional details of the participants training.

[Insert Table 2 about here]

3.3. Current Practices in the assessment and treatment of children and adolescents with chronic pain

Participants reported using numerous scales to assess pain in children especially the Faces Pain Scale-Revised (55%). Still, some professionals did not use any (28%).

Treatment of children with chronic pain was mostly based on medical procedures, including surgeries (17%) and medications. To treat children with chronic pain healthcare professionals sometimes used pain-related medical procedures like surgeries, implanted pumps, and blocks with local anesthetics. Non-opioid pain relievers, like paracetamol (95%), and opioid pain killers like morphine (61%) were widely used. Half of the units used corticosteroids whereas the rest did not use any pain-related adjuvant therapy. Tricyclic antidepressants –amitriptyline- and selective serotonin reuptake inhibitors -fluoxetine- were also common (95%). Carbamazepine and gabapentin were among the antiepileptics and anti-convulsive used (61%). As for the anesthetics, lidocaine was the only local anesthetic used (78%) and ketamine the only general anesthetic (95%). In addition, most units also used benzodiazepines (78%).

A good number of units did not offer psychology- and/or physiotherapy-related interventions. For example, half of the units did not offer any psychological intervention, as reported by the participants. The rest offered relaxation (33%), Acceptance and Commitment Therapy (28%) and Cognitive Behavioral Therapy (17%). On the other hand, physiotherapy interventions were more common (in 83% of the units) and offered under the form of simple and minimal range of motion exercises (78%) and stimulation/gradual exposure (5%). Only one unit (5%) provided additional complementary and alternative interventions for its patients (i.e., massage).

Last, among all, only three participants worked in a unit specialized in managing pediatric pain; and these units had a team of professionals involved with children with chronic pain. Two teams included nurses and pediatricians only, and the other one included an anesthetist, neurologist, and psychologist. The latter was also involved in pain research and advocacy and offered training and education in pediatric pain (i.e., internship, residency, and webinars) for its members.

Overall, none of the participants was very satisfied with the treatment provided for pediatric pain in their institution, and only some were satisfied (16%). In the question asking about their satisfaction with the pain treatment provided in Lebanon, a third of participants responded that they were “dissatisfied” or “very dissatisfied” (34%). See Table 3 for additional details of the current management practices of pediatric chronic pain.

[Insert Table 3 about here]

4. Discussion

The objectives of this study were to explore the professional pain education and training of healthcare professionals working with pediatric populations in Lebanon, and the practices provided for the youth with chronic pain in Lebanon. Two main findings emerged. First, pain education and training seemed to be less than ideal. For example, most participants (78%) reported having received “none” or “minimal” training. In those cases that participants received some training, this was, for the most part (89%), an informal type of training mainly obtained at pain conferences (89%). These data are in line with previous studies in Lebanon and other world regions. For example, a study done in Lebanon, showed that only 4% of the nurses meet the required knowledge for effective pain management (Abdul Rahman, Huijer, & Noureddine, 2013). Moreover, in a similar study conducted in Spain, half of the participants reported that they had not been given any specific education or training on pediatric chronic pain management during their studies, whereas the majority acknowledged important gaps in their training (Miró et al., 2020). Similarly, in a study with nurses in Turkey, Uysal reported that healthcare providers have imperfect knowledge about basic principles of pain management (Uysal, 2018). Taking these findings as a whole, they are indicative of the need for specialized, additional and better education and training programs for healthcare professionals working with pediatric samples with pain in Lebanon.

Second, and perhaps not surprisingly, treatment for chronic pain patients was generally limited to medical-related interventions, which mostly consisted of surgery and nerve blocks, and medicines.

Thus, showing a departure of what current guidelines suggest about best treatment practices for this population. For example, the recently revised World Health Organization guideline reports that the management of pain should be multimodal and entail all its dimensions (physical, psychological, and social), thus the need to a multidisciplinary approach that includes physical, psychosocial, and physiotherapy interventions (de la Vega, Roset, Galán, & Miró, 2018; Fisher et al., 2018; Landry et al., 2015; Odell & Logan, 2013; World Health Organization, 2020). Interestingly, some practitioners considered themselves well trained and were highly satisfied with their training without even receiving any formal training. In relation to this, however, some participants (28%), reported that they were not using any specific pain intensity scales. This could mean that some of the practitioners are not aware of the importance of formal training in pain management and the implementation of findings of pain research into clinical work.

This study is not exempt from limitations that should be considered when interpreting the findings. First, the sample size could be seen as small (n=120), despite the extension of data collection period which was expanded three times, one month each (a total of 3 months). However, it is similar to participating samples in studies with similar objectives (Briggs et al., 2015; Miró et al., 2020). Different issues might be responsible for this. For example, the data collection was conducted in the middle of the covid-19 pandemic and Lebanese crisis that left healthcare providers overwhelmed. Another explanation might be that research in Lebanon can be improved, and that Lebanese health care providers are might not be interested in research (El Achi et al., 2020). Therefore, additional studies are needed to validate the findings.

Second, all participants were either medical doctors or nurses. Maybe, there are very few other healthcare professionals (e.g., psychologists, physiotherapists) involved in the treatment of patients with chronic pain. If that was the case, this would be showing a specific need that healthcare and education authorities in Lebanon should try to address in order to improve the care that children and adolescents with chronic pain receive.

5. Conclusions

Regardless of these limitations, this study provides new and important information about the current pain-related practices in Lebanon and about the professional education and training of the healthcare providers working with children with chronic pain. The findings show important avenues for improvement that can be used by Lebanese authorities concerned with improving the education that healthcare professionals receive, and the care provided to children and adolescents with chronic pain.

Transparency

Funding: This research was partially funded by the Spanish Ministry of Economy, Industry and Competitiveness under Grants RTI2018-09870-B-I00; RED2018-102546-T, and the European Regional Development Fund (ERDF), the Government of Catalonia (AGAUR; 2017SGR-1321), Universitat Rovira i Virgili (PFR program) and ICREA-Acadèmia. The Chair in Pediatric Pain is supported by Fundación Grünenthal.

***Disclosure Statement*:** The authors declare no conflict of interest for this study.

***Data Availability Statement*:** Data is available upon request from the corresponding author.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of the American University of Beirut (SBS-2020-0398; May 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Acknowledgments: We would like to thank all those who helped in this study especially the Lebanese order of nurses.

Author Contributions: Conceptualization: J.M.; methodology: J.F. and J.M.; software: J.F.; formal analysis, J.F.; investigation: J.F.; resources: J.F., J.M. and H.H.; data curation: J.F.; writing—original draft preparation: J.F. and J.M.; writing—review and editing: J.F., J.M. and H.H.; supervision: J.M.; project administration: J.F. and J.M.; funding acquisition: J.M. All authors have read and agreed to the published version of the manuscript.

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Table 1. Descriptive information of the study's participants.

Participants (n)	120
Mean age (SD; age range)	33 (10.08; 21-58)
Gender (%)	
Female	89
Male	11
Highest degree achieved (%)	
Bachelor's degree	39
Master's degree	39
Medical doctor degree	22
Profession and Position (%)	
Nursing	84
Staff nurse	*53*
Clinical nurse	*12*
Attending nurse	*7*
Head nurse	*7*
Nursing supervisor	*7*
Case manager	*7*
Clinical educator	*7*
Intern Physician	16
Pediatrician	*34*
Surgeon	*33*
General practitioner	*33*
Schedule (%)	
Full-time	89
Part-time	11
Workplace (%)	
Private and Urban hospital	77
Governmental and Rural hospital	23
Units specialized in Pain	20
Teams specialized in Pain	15
Pain research and advocacy group	5
Unit Specialty (%)	
Pediatric-Neonatal	28
Pediatric and Neonatal intensive care unit	22
Medical-surgical	17
Nursing administration	11
Ophthalmology	6
Endoscopy	6
Bone marrow transplantation	5
Children's Developmental stage (%)	
Infants	17

Toddlers	8
Preschoolers	33
School-aged	42
Adolescents	0
Most common pain (%)	
Abdominal pain	50
Tension Headache	18
Cancer-related pain	11
Postoperative pain	11
Migraine	5
Musculoskeletal pain	5

Table 2. Participants' pain-related training.

Training (%)	
Minimal	45
Moderate	17
Advanced	5
Training source (%)	
University	34
Hospital	28
None	38
Formal Training (%)	
University coursework	14
Bachelor's degree	*80*
Master's degree	*20*
Internship	6
None	80
Informal Training (%)	
Taken	89
Pain Conferences	*63*
Readings	*19*
Workshops	*13*
Webinars	*5*
None	11
Training Satisfaction (%)	
Very Satisfied	6
Satisfied	22
Neutral	44
Dissatisfied	28
Very Dissatisfied	0

Table 3. Current practices in the management of pediatric chronic pain by Lebanese Professionals.

Pain Scales used (%)	
Faces Pain Scale-Revised	55
Numerical Rating Scale-11	28
Verbal Scale	22
Visual Analogue Scale	17
Pain-related Medical Procedures (%)	
Surgeries	17
Blocks with local anesthetics	11
Implanted pumps	5
Radiofrequency blocks / cryotherapy / neurolytic agents	5
Spinal stimulation technique	5
Non-opioid Pain Relievers (%)	
Paracetamol	95
Ibuprofen	61
Diclofenac	28
Naproxen	6
Acetylsalicylic acid	6
Opioid Pain Killers (%)	
Morphine	61
Fentanyl	39
Tramadol	33
Codeine	17
Psychological Interventions (%)	
Relaxation	33
Acceptance and Commitment Therapy	28
Cognitive Behavioral Therapy	17
Physiotherapy Interventions (%)	
Range of motion exercises	78
Stimulation/gradual exposure	5
Satisfaction with pain treatment as provided by the institution (%)	
Very Satisfied	0
Satisfied	16
Neutral	34
Dissatisfied	39
Very Dissatisfied	11
Satisfaction with pain treatment as provided in Lebanon (%)	
Very Satisfied	0
Satisfied	10
Neutral	56
Dissatisfied	17
Very Dissatisfied	17

4.6 Study VI

Observational and Prospective Study of Chronic Pain in Children and Adolescents Living in Lebanon.

This study was developed to improve the understanding about chronic pain in children and adolescents living in Lebanon. It was designed similar to the study that Dr. Miró is conducting in Spain, and in other countries, as a complementary objective was to study the influence of culture (e.g., thoughts and beliefs) in the experience of chronic pain in young people.

Unfortunately, this study has not been finished due to the many difficulties that Lebanon and the world has faced during the last three years, including a world health-related crisis (i.e., COVID-19) and different but related Lebanese crisis (e.g., economic crisis and strikes). Nevertheless, this study is active, unfolding, and collecting data.

Currently, we have data from 32 participants, mostly females (69%). The average age of this group is 14 years (SD= 3.15). In this group, six adolescents reported having chronic pain (19%).

5. Discussion

The goal of this dissertation was to improve our understanding of chronic pain in children living in Lebanon. It was essential to start by summarizing the state of knowledge. Therefore, a systematic review was conducted and only eight descriptive and cross-sectional studies with small samples fitted its scope of interest (Finianos et al., 2021). The reviewed studies showed different pain problems facing young people in Lebanon (Huijer et al., 2013; Atoui et al., 2015; Fares et al., 2017; Fares et al., 2013), unsatisfactory pain management in this population (Madi & Clinton, 2018; Noun & Djambas-Khayat, 2012; Saad et al., 2011), in addition to a shortage of healthcare providers specialized in pain (Abu-Saad, 2010; Daher et al., 2002; Noun & Djambas-Khayat, 2012). The findings suggested that important areas of study and treatment of pediatric chronic pain in Lebanon remain under- or un-explored: assessment of chronic pain in children, professional education and training of health care providers working with children with chronic pain, and epidemiological works that study the impact of chronic pain on children in Lebanon (Finianos et al., 2021).

These findings helped to design a roadmap to future research studies to improve pain management. And since accurate pain assessment comes first in effective pain management (Fillingim et al., 2016; Laures et al., 2019; McGrath & Gillespie, 2001), having sound psychometric scales to assess pain captured our highest interest. Three assessment studies focused on pain intensity, the most assessed domain of pain (Fillingim et al., 2016; Miró et al., 2016). They were conducted online using Arabic and electronic versions of the commonly used pain intensity scales like Numerical Rating Scale, Faces Pain Scale-Revised, Visual Analogue Scale, and Colored Analogue Scale (Le May et al., 2018; Miró et al., 2012; Sánchez-Rodríguez et al., 2015, 2017). The first two studies showed the reliability and validity of the Arabic and electronic versions of NRS-11 and FPS-R respectively, supporting their use to measure pain intensity in young people speaking Arabic in Lebanon (Finianos et al., 2021; 2022). The agreement study showed that the Arabic and electronic versions of the four scales measure

one factor; pain intensity, however, only VAS and CAS can be used interchangeably in adolescents (Finianos et al., 2023). The findings of the study on the Arabic version of NRS-11 supported the findings of similar previous studies (e.g., Castarlenas et al., 2013; Miró et al., 2009; Ruskin et al., 2014). Similarly, the findings of the study on the Arabic version of the FPS-R were in line with earlier studies on its use with children (Hicks et al., 2001; Hunter et al., 2000; Miró & Huguet, 2004; Tsze et al., 2013). Moreover, the finding on the undimensionality of the electronic and Arabic versions of the NRS-11, FPS-R, VAS and CAS is in line with previous studies (Castarlenas et al., 2015; Sánchez-Rodríguez et al., 2012; Thong et al., 2018). However, the findings on the unidimensionality partially support previous research in adolescents of 13-18 years old (Bailey et al., 2007; Miró et al., 2012; Sánchez-Rodríguez et al., 2017) and oppose others with children between 8-12 years old (Miró et al., 2012; Sánchez-Rodríguez et al., 2012).

The study on the education and training in pain of healthcare professionals working in Lebanon showed that the majority received minimal or no formal training (Finianos et al., n.d.). The same study also explored the current practices provided in Lebanese hospitals for young people with chronic pain showing that they were limited to medical and pharmacological interventions (Finianos et al., n.d.). These findings are similar to previous studies showing that 4% of the nurses meet the required knowledge for effective pain management (Abdul Rahman et al., 2013), oppose the current guidelines to make pain management multimodal (Fisher et al., 2019; Odell & Logan, 2013; World Health Organization, 2020), and show the need to set new pain curricula and/or ongoing training for healthcare professionals and regulations to include psychological interventions in the treatment of children with chronic pain.

We intended to conduct a prospective epidemiological study to improve the understanding of the nature, characteristics, process, and impact of chronic pain on the lives of children and adolescents living in Lebanon essential to ameliorate pain management. However, due to many uncontrollable obstacles (e.g., Covid-19 pandemic; Beirut blast and

Revolution in Lebanon) data collection period was extended two times and is currently ongoing. In fact, the timing of this dissertation was a limitation because it coincided with many crises at national and international levels.

The studies of this dissertation were not exempt from limitations. They were mainly related to the procedure in the assessment studies which included imagination of a pain to rate the scales and the non-randomized presentation of the scales. However, this procedure was successfully used in previous studies (Bailey et al., 2010; Castarlenas et al., 2013; Gupta et al., 2015) and the presentation of pain intensity scales had no impact on the findings (Huguet & Miró, 2008a; Miró et al., 2009; Sánchez-Rodríguez et al., 2015). Sample representativeness and size were also a limitation in the assessment and healthcare professionals' survey studies respectively.

This dissertation provides new information about the current situation of chronic pain in children in Lebanon and identifies areas for improvement in relation to the management of chronic pain in children living in Lebanon. Future studies should examine variable related preferences' (like age and gender), difference between classic paper-and-pencil and electronic forms, and other advanced psychometric properties (e.g., sensitivity to change over time) of the pain intensity scales and include other pain domains. Moreover, additional research is needed to replicate the findings of the assessment studies in different samples especially with children suffering from chronic pain and study specific contextual and cultural factors that influence chronic pain in young people in Lebanon.

6. Conclusions

The main conclusions are:

1. Children and adolescents living in Lebanon suffer from different chronic pain problems, but proper pain management procedures are not widely available.

2. The Arabic version of the 0-10 Numerical Rating Scale (NRS-11) showed sound psychometric properties (construct validity and test-retest reliability) supporting its use to assess pain intensity in pediatric samples.

3. The Arabic version of the Faces Pain Scale-Revised (FPS-R) has strong validity and reliability properties when used to assess pain intensity in young people of 8-18 years of age.

4. The Arabic version of the Faces Pain Scale-Revised (FPS-R), the Arabic version of the 0-10 Numerical Rating Scale (NRS-11), the Arabic version of the Visual Analogue Scale (VAS) and the Arabic version of the Colored Analogue Scale (CAS) measure pain intensity in young people however only VAS and CAS can be used interchangeably in adolescents (12-18 years old).

5. Pain education and training and current practices used to manage chronic pain in children in Lebanon must be revised and improved.

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