UNIVERSITAT DE BARCELONA

Perfiles clínicos en las adicciones comportamentales y trayectorias de curso terapéutico

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Perfiles clínicos en las adicciones comportamentales y trayectorias de curso terapéutico

Memoria de tesis doctoral presentada por

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para optar al grado de Doctora por la Universitat de Barcelona

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Como directoras de tesis,

CERTIFICAN:

Que **Susana Valero Solís** ha realizado la Tesis Doctoral que lleva por título *"**Perfiles clínicos en las adicciones comportamentales y trayectorias de curso terapéutico"***, que está en condiciones para ser defendida para la obtención del Grado de Doctora por la Universidad de Barcelona frente al correspondiente Tribunal. Que se han cumplido los códigos étidos y de buenas prácticas. Y que no tienen conocimento de que se haya producido plagio alguno.

Y para que así conste, firman la siguiente certificación en Barcelona, 13-Octubre-2021.

Susana Jiménez Murcia Roser Granero Pérez

.

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Abreviaturas clínicas:

AS	Adicción al sexo
AV	Adicción a videojuegos
APA	"American Psychiatric Association"
CC	Compra compulsiva
DSM	"Diagnostic and Statistic Manual of Mental Disorders"
TCC	Terapia cognitivo conductual
TJ	Trastorno de juego

Abreviaturas estadísticas:

ANCOVA	Análisis de la covariancia
ANOVA	Análisis de la variancia
Cohen-*d*	Coeficiente estandarizado tamaño efecto Cohen-*d*
Cohen-*h*	Coeficiente estandarizado tamaño efecto Cohen-*h*
DE	Desviación estándar
EE	Error estándar
LCGA	"Latent Class Growth Analysis"
MLE	"Maximum Likelihood Estimation"
MLR	"Maximmun Likelihood Robust Estimation"
Pearson-*R*	Coeficiente de correlación de Pearson
SEM	"Structural Estimation Model"

Enumeración de los artículos

Tesis en formato de compendio de artículos.

La tesis consta de siete objetivos y cuatro artículos publicados.

Los cuatro artículos están publicados en revistas indexadas en el *Journal Citation Reports (JCR),* y ocupan posiciones dentro del rango Q1 y Q2.

A continuación, se citan los artículos, junto al orden en el cual serán referidos a lo largo de este documento:

Artículo 1: **Valero-Solís S,** Granero R, Fernández-Aranda F, Steward T, Mestre-Bach G, Mallorquí-Bagué N, Martín-Romera V, Aymamí N, Gómez-Peña M, del Pino-Gutiérrez A, Baño Alcazar M, Moragas L, Menchón JM, Jiménez-Murcia S. The contribution of sex, personality traits, age of onset and disorder duration to behavioral addictions. *Front. Psychiatry.* 2018; 9:497.
Available from: https://doi.org/10.3389/fpsyt.2018.00497.
Factor Impacto (JCR 2018, Social Sciences and Sciences): 3.161
Q2 Área de Psiquiatría (posición 37/142 en SS; posición 54/146 en S)

Artículo 2: Granero R, **Valero-Solis S**, Fernández-Aranda F, Gómez-Peña M, Moragas L, Mena-Morena T, del Pino-Gutiérrez A, Codina E, Martín-Romera V, Casalé G, Agüera Z, Baenas-Soto I, Valenciano-Mendoza E, Mora-Maltas B, Sánchez I, Lozano-Madrid M, Menchón JM, Jiménez-Murcia S. Response trajectories of gambling severity after cognitive behavioral therapy in young-adult pathological gamblers. *J. Behav. Addict.* 2020; *9*(1), 140-152.
Available from: https://doi.org/10.1556/2006.2020.00008.
Factor Impacto (JCR 2020, Social Sciences and Sciences): 6.756
Q1 Área de Psiquiatría (posición 12/143 en SS; posición 19/156 en S)

Artículo 3: Granero R, Fernández-Aranda F, **Valero-Solís S**, del Pino-Gutiérrez A, Mestre-Bach G, Baenas I, Contaldo SF, Gómez-Peña M, Aymamí N, Moragas L, Vintró C, Mena-Moreno T, Valenciano-Mendoza E, Mora-Maltas B, Menchón JM, & Jiménez-Murcia S. The influence of chronological age on cognitive biases and impulsivity levels in male patients with gambling disorder. *J. Behav. Addict.* 2020; *9*(2), 383-400.
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Factor Impacto (JCR 2020, Social Sciences and Sciences): 6.756
Q1 Área de Psiquiatría (posición 12/143 en SS; posición 19/156 en S)

Artículo 4: Granero R., Fernández-Aranda F, Castro-Calvo J, Billieux J, **Valero-Solís S**, Mora-Maltas B, Rivas-Pérez S, Valenciano-Mendoza E, del Pino-Gutiérrez A, Gómez-Peña M, Moragas M, Baenas I, Mena-Moreno T, Casalé-Salayet G, Codina E, González-Bueso V, Santamaría JJ, Baño-Alcázar M, Menchón JM, & Jiménez-Murcia S. Subtyping Treatment-Seeking Gaming Disorder Patients. *Addict. Behav.* 2021; *123, 107086.*
Available from: https://doi.org/10.1016/j.addbeh.2021.10708
Factor Impacto (JCR 2020, Social Sciences and Sciences): 3.913
Q1 Área Abuso Sustancias (posición de la revista 8/37, Social Sciences)
Q2 Área Psicologia Clínica (posición de la revista 37/131, Social Sciences)

Resumen

Perfiles clínicos en las adicciones comportamentales y trayectorias de curso terapéutico

Introducción

Las adicciones comportamentales constituyen patologías emergentes cuyas prevalencias están experimentando un crecimiento importante durante las últimas décadas, lo cual ha despertado un notable interés científico y clínico. Se trata de trastornos adictivos sin sustancia, pero que cursan con una acentuada falta de control de una determinada conducta y presentan sustratos neurobiológicos, clínicos y de respuesta al tratamiento similares a las adicciones con sustancia. Los sujetos que presentan estas patologías no pueden cesar en la realización de la conducta adictiva, a pesar de las consecuencias negativas que estas actividades les causan en su entorno personal, familiar y social. El trastorno de juego es el que ha recibido más atención en el ámbito de la investigación científica, pero bajo la denominación de adicción conductual se incluyen otras condiciones como la compra compulsiva, la adicción al sexo, la adicción a los videojuegos o las adicciones a las nuevas tecnologías, a pesar de no estar reconocidas la mayoría de ellas en los manuales diagnósticos al uso, a excepción del trastorno por videojuegos ("gaming disorder") y el trastorno por comportamiento sexual compulsivo, en la recientemente publicada CIE-11 (a pesar de que este último no se ha incluido bajo el epígrafe de trastornos debidos a comportamientos adictivos. Los sujetos que presentan estos problemas acostumbran también a presentar otras condiciones psicopatológicas comórbidas, como abuso de sustancias, depresión, ansiedad, o otros múltiples síntomas psicológicos.

Los trastornos adictivos vinculados a actividades humanas pueden comenzar como hábitos de conducta aparentemente inofensivos (como las compras), o que se realizan con una finalidad meramente lúdica (como el juego), pero que con el tiempo pueden convertirse en comportamientos adictivos con una interferencia grave en la vida cotidiana de las personas afectadas y de su entorno cercano. El elemento central de las adiciones comportamentales no es por tanto el tipo de conducta que se realiza, sino la forma en que dicha actividad se realiza y la falta de control por parte de los sujetos, que persisten en dichos comportamientos al margen de la disfuncionalidad que les causan.

La prevalencia de las adicciones comportamentales es relativamente alta, y los informes actuales apuntan que los datos de frecuencia están al alza. La sociedad en que vivimos, dinámica y con un fuerte impacto de las nuevas tecnologías, generan un medio favorecedor del inicio y progreso de estos problemas (los medios digitales y las redes sociales facilitan el acceso a múltiples plataformas que pueden potenciar las conductas adictivas). Atendiendo a los indicadores de la Organización Mundial de la Salud, la frecuencia de personas que pueden llegar a presentar problemas de este naturaleza podría alcanzar el 25%, aunque los datos obtenidos en estudios epidemiológicos son muy diferentes dependiendo de las áreas geográficas, la procedencia de las muestras (clínicas o comunitarias, o con diferentes niveles de riesgo), los instrumentos de evaluación que se emplean o incluso las definiciones conceptuales que se utilizan.

Esta tesis se plantea como un proyecto empírico para el estudio de los mecanismos implicados en las adicciones comportamentales, tanto en el perfil clínico de los pacientes que solicitan atención por este tipo de trastornos como en los resultados terapéuticos que se obtienen con la terapia cognitivo conductual. El proyecto de tesis se presenta como compendio de cuatro trabajos empíricos publicados en revistas indexadas en el Journal Citation Reports.

Hipótesis - objetivos

El objetivo general de la tesis es obtener evidencia empírica de los factores que contribuyen al perfil clínico de pacientes que solicitan tratamiento, debido a los problemas que les generan diferentes formas de adicción comportamental. Uno de los estudios que forman la tesis aborda el rol del sexo, la edad de inicio y la duración de las conductas adictivas, y los rasgos de personalidad en el perfil clínico del trastorno de juego, la adicción a videojuegos, la compra compulsiva y la adicción al sexo. Otro de los estudios valora si los niveles de impulsividad (en diferentes dominios) y los sesgos cognitivos presentes en la conducta de juego estan asociados a la edad de los pacientes y a la gravedad del trastorno de juego. El siguiente estudio es un análisis de clasificación que explora la existencia de clústeres, en pacientes que cumplen criterios clínicos para adicción a videojuegos. El último artículo identifica trayectorias evolutivas de la gravedad del trastorno de juego en pacientes jóvenes, desde el momento de entrada al estudio hasta seis meses después de la intervención terapéutica.

Métodos

Los participantes que se incluyen en los diferentes estudios empíricos de esta tesis son pacientes que han acudido a la Unidad de Juego Patológico y Otras Adicciones Comportamentales del Hospital Universitario de Bellvitge. La elección de los sujetos se ha basado en el cumplimiento de los criterios de inclusión/exclusión de cada estudio.

Resultados principales

En líneas generales, los resultados han evidenciado que el sexo, la edad de inicio y la duración de los problemas adictivos contribuyen de forma diferente en el perfil clínico, de las distintas adicciones comportamentales. La edad además presentó una tendencia cuadrática con los sesgos cognitivos asociados a la conducta de juego (los grupos de edad más extrema presentaron patrones de pensamiento más disfuncionales), y una tendencia lineal negativa con la impulsividad asociada a la búsqueda de sensaciones. En el caso de pacientes con adicción a videojuegos, se identificaron dos clústeres empíricos diferenciados en el nivel de funcionamiento global (en variables de psicopatología y personalidad), y con diferencias también en edad, edad de inicio y duración de las conductas adictivas, sexo, estado civil y situación laboral. Finalmente, el análisis de la evolución de la gravedad del trastorno de juego, desde la línea base hasta 6 meses post-intervención, facilitó la identificación de 3 trayectoras evolutivas, dos caracterizadas por pacientes con buena evolución y una por pacientes con evolución pobre.

Conclusiones

Las adicciones comportamentales están suscitando enorme interés en múltiples ámbitos, que abarcan el área clínica, la investigación científica y la sociedad en general. En la actualidad numerosas publicaciones (libros, artículos y diversos formatos de divulgación general) aportan datos sobre la génesis y la progresión de estos trastornos. Pero las dificultades (y controversias) existentes en la definición conceptual de estas adicciones (la propia taxonomía DSM-5 incluye en la sección de condiciones emergentes alguna de estas conductas excesivas, problemáticas y, potencialmente, adictivas), la falta de conocimiento sobre cómo interactúan los múltiples factores que inciden en su inicio y evolución, así como la escasez de datos clínicos sobre los mecanismos explicativos de los resultados de la terapia, dan fe de la necesidad de

nuevos estudios que aporten evidencia empírica sobre los mecanismos explicativos de estas complejas condiciones clínicas.

Esta tesis doctoral presenta resultados específicos sobre cómo variables fundamentales como el sexo, la edad cronológica, la edad de inicio y la duración influyen en el perfil clínico en pacientes que cumplen criterios clínicos para diferentes adicciones comportamentales. La tesis también aporta evidencia sobre la heterogeneidad del fenotipo asociado a una de las adicciones que mayor interés social y sanitario está generando durante los últimos años (la adicción a los videojuegos), en gran medida por el impacto que supone en sujetos que son considerados de alta vulnerabilidad debido a su corta edad (adolescencia e inicios de la edad adulta). Se aportan también resultados sobre los diferentes perfiles (trayectorias) que se identifican tras la aplicación de la terapia cognitivo-conductual en pacientes jóvenes, con trastorno de juego, durante los seis primeros meses tras la intervención, y de las variables explicativas de los diferentes cursos.

Los resultados obtenidos en esta tesis poseen implicación en el ámbito de los factores de riesgo y terapéutico. Identificar patrones de asociación que son específicos de cada subtipo de adicción comportamental facilitará la elaboración de instrumentos de cribado y de diagnóstico que resulten más precisos, y que permitan evaluar tanto la gravedad de los trastornos como sus correlatos más directos. Identificar los diferentes fenotipos que conforman cada una de estas adicciones también resulta sumamente útil para el desarrollo de planes preventivos y de tratamientos específicos que se focalicen en las variables centrales de cada perfil, y que respondan a las necesidades concretas de cada paciente.

Palabras clave

Adicciones Comportamentales, Trastorno de Juego, Compra Compulsiva, Adicción al Sexo, Adicción a Videojuegos, Terapia Cognitivo Conductual.

1. Introducción

1.1 Adicciones comportamentales: conceptualización

Al definir las adicciones comportamentales nos enfrentamos a conductas que en sí mismas no son susceptibles de ser consideradas "adictivas", pero que algunos sujetos repiten de forma incesante y sin control con el fin de obtener un determinado refuerzo (habitualmente sensaciones placenteras). El término adicción se refiere por lo tanto a la frecuencia y la forma con la que se realizan las conductas, y al hecho de que acaban interfiriendo de forma significativamente negativa en la vida cotidiana de las personas (en el ámbito personal, familiar, social, laboral e incluso financiero). Los sujetos con este tipo de comportamientos son incapaces de cesar en la ejecución de las conductas problemáticas, en algunos casos porque no logran realizar una valoración acertada de la razón coste-beneficio y en otros porque dicha evaluación no es suficiente para deternerse.

Bajo el epígrafe "adicción comportamental" se incluyen diferentes condiciones clínicas que de forma progresiva van logrando reconocimiento en clasificaciones diagnósticas de referencia en los ámbitos de la clínica y la investigación científica. Pero aún estamos en un momento de desarrollo, y algunas formas de adicción comportamental todavía no han alcanzado la definición estandarizada formal que se precisa como punto de partida para el ulterior desarrollo de estudios orientados a la búsqueda de evidencias en el plano etiológico y terapéutico, incluso para estudios epidemiológicos para obtener datos de frecuencia e impacto en muestras clínicas y comunitarias.

En cualquier caso, se debe reconocer que durante los últimos años la clasificación diagnóstica de los trastornos adictivos sin sustancia haexperimentado notables cambios en las principales nosologías taxonómicas, por ejemplo en el *Manual Diagnóstico y Estadístico de los Trastornos Mentales de la Asociación Psiquiátrica Americana* (1) y en la *Clasificación Internacional de Enfermedades* publicada por la Organización Mundial de la Salud (2). En términos generales, las adicciones sin sustancia (también denominadas adicciones comportamentales) se caracterizan por la

falta de control sobre ciertos comportamientos, que tienen un impacto muy significativo en todas las dimensiones de la vida de los sujetos, y que se realizan de forma reiterada a pesar de estas consecuencias negativas. Los efectos de estos trastornos afectan al individuo, pero también a su entorno más próximo (familia, amigos y área laboral) y a la sociedad en general. Algunas actividades que pueden acabar provocando adicciones comportamentales se presentan a la sociedad como una actividad lúdica (como el juego de apuesta o el uso de videojuegos, que encuentran un gran difusión en múltiples plataformas publicitarias), aunque en algunos sujetos pueden provocar serios problemas de salud. El incremento que se ha evidenciado en las cifras de prevalencia para estas adicciones, de forma generalizada en todos los sectores de la población, ha suscitado un gran interés científico debido a la necesidad de instrumentos de detección precisos y de programas de intervención y prevención eficaces.

Una cuestión inicial en el estudio de las adicciones comportamentales es establecer un marco de referencia adecuado para su definición. Uno de los modelos dominantes supone la existencia de un espectro que incluye los denominados trastornos del control de impulsos, o también trastornos del espectro impulsivo-compulsivo (3). Este modelo supone que la impulsividad es un concepto psicopatológico central que caracteriza las conductas adictivas, que se caracterizarían por ser comportamientos irreflexivos, precoces y con frecuencia arriesgados. Este concepto estaría implicado en múltiples aspectos de los comportamientos adictivos, desde el grado de vulnerabilidad (o riesgo) de los sujetos, el inicio, el curso e incluso los resultados de las intervenciones. Se debe tener presente que este planteamiento no contempla la impulsividad como un rasgo de personalidad unifactorial, sino como un constructo multidimensional en el que participan mecanismos conductuales, emocionales y también cognitivos.

En cualquier caso, la clasificación de las adicciones basada en el valor central de la impulsividad en su génesis y progresión supone que un grupo de trastornos puede ser clasificado en un espectro *impulsivo-compulsivo* según la posición que ocupa en un continuo (4,5): a) en un extremo se situarían los trastornos relacionados con la evitación del daño y la aversión al riesgo; b) en el otro extremo se encuentran los trastornos asociados a la impulsividad o al gusto por el riesgo. Así en el primero, se ubicaría la compulsividad, incluyendo trastornos como el obsesivo-compulsivo, el dismórfico corporal y la anorexia nerviosa (6). Todos ellos caracterizados por el hecho de que el individuo utilizaría la compulsión como una estrategia para reducir la ansiedad o la amenaza percibida. En el extremo contrario estaría la impulsividad como eje central, y

se incluirían un grupo de condiciones clínicas caracterizadas por una grave incapacidad de autocontrol sobre ciertos comportamientos (por ejemplo el trastorno de juego (TJ), la compra compulsiva (CC), la adicción a videojuegos (AV), la adicción al sexo (AS), la bulimia nerviosa y el trastorno por atracón) Los pacientes que presentan trastornos del espectro impulsivo-compulsivo perciben las conductas problemáticas como "irresistibles", de manera que acaban por realizarlas de forma impulsiva como respuesta a la tensión emocional que experimentan antes de llevarlas a cabo y la sensación placentera-liberadora durante la realización de las mismas (los síntomas de arrepentimiento y vergüenza son también característicos) (7). Existen múltiples correlatos de los comportamientos impulsivos, como la urgencia por repetirlos, y los síntomas de ansiedad ante la imposibilidad de llevar a cabo las conductas.

La penúltima edición del DSM (8) incluía una categoría específica bajo la etiqueta de *"Trastornos del Control de Impulsos (no clasificados en otros apartados)"* en la que se agrupaban diferentes condiciones clínicas caracterizadas por sus similitudes en factores de riesgo y endofenotipos (como el trastorno explosivo intermitente, la cleptomanía, la piromanía, el TJ, la tricotilomanía y el trastorno del control de los impulsos no especificado). Esta taxonomía definía estas condiciones clínicas en base a la falta de capacidad de las personas para resistir el impulso de realizar ciertas acciones, que al final acababan siendo nocivas tanto para el sujeto como para su entorno. Se consideraba también que la sintomatología tenía un componente intrusivo, llegando a afectar la dimensión emocional con síntomas de ansiedad y estrés. Atendiendo a la definición clínica que realiza el DSM-IV, estos trastornos cursan con múltiples síntomas además de la impulsividad-compulsión (que pueden ser de tipo físico, conductual, cognitivo y psicosocial).

Estudios empíricos posteriores a la publicación del DSM-IV sugerían la posibilidad de que algunos trastornos en los cuales la impulsividad juega un papel central también pudieran incluirse en este grupo, como la adicción a sustancias, la CC, la AS, la AV y algunos trastornos de la conducta alimentaria, como la bulimia nerviosa o el trastorno por atracón. En esta línea de investigación, uno de los hallazgos recientes en la literatura es la relación entre las conductas impulsivo-compulsivas, características de estos trastornos, con un déficit en las funciones ejecutivas, término propuesto en 1982 por Muriel Lezak (9). Las funciones ejecutivas son actividades complejas responsables de autorregular la propia conducta (organizar e inhibir las respuestas) con objeto de lograr una adaptación adecuada al entorno y sus demandas. Estas funciones

incluyen múltiples procesos, entre los cuales se incluyen el razonamiento, la planificación, la toma de decisiones, la organización, la flexibilidad, la inhibición, la memoria de trabajo y la monitorización. Estas funciones se relacionan con la ejecución de los lóbulos prefrontales y de sus conexiones subcorticales, y parece que las personas que muestran problemas del control de impulsos (9).

Pero la última edición del DSM (1) continúa manteniendo categorías diferentes en las que se incluyen trastornos que cursan con problemas graves en impulsividad y compulsividad, por ejemplo el grupo de "trastornos obsesivo-compulsivo y trastornos relacionados" (en la que se agregan el trastorno dismórfico corporal y el trastorno de acumulación) y los "trastornos relacionados con sustancias y trastornos adictivos" (que agrupa el TJ junto a los trastornos por consumo de sustancias). Una de las novedades más destacables de esta re-organización es la inclusión del TJ en esta categoría diagnóstica. Esta decisión se ha basado en las numerosas evidencias empíricas que constatan la elevada comorbilidad de esta condición clínica con los trastornos por uso-abuso de sustancias (10–13) y en las similitudes clínicas (en cuanto a la etiología, fenomenología, mecanismos neurobiológicos y respuesta al tratamiento) (14,15).

Esta tesis incluye cuatro artículos de investigación dentro del área de estudio de los trastornos del control de impulsos, concretamente para diferentes formas de adicciones comportamentales. Este grupo de adicciones incluyen un grupo de condiciones mentales que comparten características endofenotípicas, particularmente en los patrones de disregulación emocional y comportamental (5,16,17). Estas adicciones, que son objeto de creciente interés en el área científica y social, (18,19) presentan prevalencias con una acusada tendencia creciente durante los últimos años, siendo las más frecuentes el TJ, la CC, la AS y la AV. Las adicciones comportamentales se presentan en personas de ambos sexos, aunque las prevalencias difieren dependiendo del tipo: el TJ, la AV y la AS son más habituales entre los hombres y la CC alcanza mayor frecuencia entre las mujeres (20). En relación con la edad, estos trastornos se presentan a lo largo de todo el ciclo vital, pero dos etapas parecen tener mayor vulnerabilidad: la adolescencia (e inicios de la edad adulta) y la vejez (21). Una de las contribuciones de esta tesis es el estudio de cómo el sexo y la edad contribuyen en los perfiles de pacientes con diferentes formas de adicción comportamental.

A continuación se definen brevemente las adicciones comportamentales que se estudian en este proyecto, y los indicadores epidemiológicos obtenidos en estudios recientes.

1.1.1 Trastorno de juego: definición diagnóstica y prevalencia

Según el DSM-5, el TJ está incluido como la única adicción comportamental dentro de la sección de "*Trastornos Relacionados con Sustancias y Trastornos Adictivos",* y se caracteriza por presentar comportamientos incontrolados y persistentes de juego cuya evolución cursa con deterioro clínicamente significativo y con impacto negativo en la calidad de vida de las personas que lo sufren (22). En la Unión Europea, la prevalencias del TJ a lo largo de la vida del sujeto están dentro del rango 0.57% y 1.02% en población general (22,23).

Respecto al perfil clínico, los pacientes que cumplen los criterios de diagnóstico del TJ presentan diferentes síntomas: necesidad de apostar grandes cantidades de dinero (habitualmente de forma progresiva a medida que va avanzando el trastorno), nerviosismo o irritabilidad ante la perspectiva de interrumpir la conducta de juego, dificultad marcada por detener la urgencia por jugar, pensamientos repetitivitos focalizados en la conducta de jugar o en volver a realizar apuestas, utilizar el juego para regular estados de ánimo negativo, volver a jugar para intentar recuperar la pérdida de dinero, mentir con el objetivo de ocultar el grado de implicación en actividades de juego, y deterioro en las relaciones interpersonales, de trabajo, académicas y/o profesionales.

La Tabla 1-1 lista los criterios diagnósticos que la taxonomía DSM-5 define para TJ. Aunque actualmente no está incluido como un criterio en el DSM-5, aproximadamente un 36% de las personas con TJ pueden llegar a cometer actos ilegales con la finalidad de continuar financiando su actividad de juego (24). Los criterios diagnósticos del actual DSM-5 establecen una duración mínima de 12 meses, y el requisito de al menos cuatro de los nueve síntomas posibles presentes. Esta taxonomía, aún estando basada en una fundamentación categorial, facilita una clasificación de la gravedad del TJ de acuerdo con el número de síntomas: leve (presencia de 4 a 5 criterios), moderado (presencia de 6 a 7 criterios) o grave (presencia de 8 a 9 criterios).

Tabla 1-1 Criterios diagnósticos del DSM-5 para el TJ

A. Juego patológico problemático persistente y recurrente, que provoca un deterioro o malestar clínicamente significativo y se manifiesta porque el individuo presenta **cuatro (o más)** de los siguientes criterios durante **un período de 12 meses**:

1. Necesidad de apostar cantidades de dinero cada vez mayores para conseguir la excitación deseada.
2. Está nervioso o irritado cuando intenta reducir o abandonar el juego.
3. Ha hecho esfuerzos repetidos para controlar, reducir o abandonar el juego, siempre sin éxito.
4. A menudo tiene la mente ocupada en las apuestas (p.ej. reviviendo continuamente con la imaginación experiencias de apuestas pasadas, condicionando o planificando su próxima apuesta, pensando en formas de conseguir dinero para apostar).
5. A menudo apuesta cuando siente desasosiego (p.ej. desamparo, culpabilidad, ansiedad, depresión).
6. Después de perder dinero en las apuestas, suele volver otro día para intentar ganar ("recuperar las pérdidas).
7. Miente para ocultar su grado de implicación en el juego.
8. Ha puesto en peligro o ha perdido una relación importante, un empleo o una carrera académica o profesional a causa del juego.
9. Cuenta con los demás para que le den dinero para aliviar su situación financiera desesperada provocada por el juego.

B. Su comportamiento ante el juego no se explica mejor por un episodio maníaco.

Especificar si:

- **Episódico:** Cumple los criterios diagnósticos en más de una ocasión, si bien los síntomas se apaciguan durante varios meses por lo menos entre períodos de juego patológico.
- **Persistente:** Experimenta síntomas continuamente, cumple los criterios diagnósticos durante varios años.

Especificar si:

- **En remisión inicial:** Tras haber cumplido previamente todos los criterios del trastorno, no ha cumplido ninguno de ellos durante un mínimo de 3 meses, pero sin llegar a 12 meses.
- **En remisión continuada:** Tras haber cumplido previamente todos los criterios del trastorno, no ha cumplido ninguno de ellos durante un periodo de 12 meses o más.

Especificar la gravedad actual:

- **Leve:** Cumple 4-5 criterios.
- **Moderado:** Cumple 6-7 criterios.
- **Grave:** Cumple 8-9 criterios.

Existen evidencias empíricas respecto al efecto del sexo y la edad en el perfil clínico y la evolución del TJ. Por un lado se sabe que este trastorno suele presentarse a edades más precoces en hombres (habitualmente a finales de la adolescencia o a inicios de la edad adulta), aunque las mujeres presentan una progresión más rápida entre el inicio de las conductas de juego y la presentación de deterioro asociado (es lo que se conoce como efecto telescópico) (25,26). También es conocido el hecho de que el inicio temprano de TJ en los hombres (en comparación con un inicio tardío) se asocia con una menor prevalencia de trastornos del estado de ánimo, una mayor prevalencia de trastornos de personalidad clúster B, mayores puntuaciones en el rasgo de personalidad búsqueda de sensaciones y puntuaciones más bajas en la autodirección (27,28).

En relación con el papel del sexo en el TJ, se debe destacar que gran parte de las investigaciones realizadas hasta el momento con muestras clínicas se han realizado con hombres, debido en gran medida a la mayor frecuencia de hombres que presentan el diagnóstico de TJ. Sin embargo, durante los ultimos años la tasa de mujeres que cumplen criterios de TJ se ha incrementado en todos los sectores de la población (incluyendo sujetos en edades muy jóvenes y con edad avanzada) (29,30). Se sospecha que este trastorno puede incluso estar infra-diagnosticado debido a las dificultades que ciertos colectivos vulnerables presentan a la hora de reconocer la presencia del problema y de solicitar ayuda para controlarlo (31).

1.1.2 Compra compulsiva: definición diagnóstica y prevalencia

La CC se caracteriza por una urgencia intensa e irrefrenable de comprar, que genera un malestar significativo y que provoca alteraciones funcionales a nivel personal, familiar, social e incluso financiero (32). Generalmente las compras suelen ser de productos innecesarios (o en cantidades muy superiores a las necesarias), y su frecuencia se intensifica con el tiempo como respuesta al deseo de satisfacer la propia urgencia por comprar, mejorar el estado de ánimo o lograr mayor aprobación social. Los pacientes que sufren esta condición clínica fracasan en los repetidos intentos por detener el impulso de adquirir productos a pesar de los sentimientos de culpa, vergüenza, conflictos interpersonales o dificultades financieras como consecuencia de esta conducta.

Durante los últimos años la CC se ha convertido en una de las adicciones comportamentales con mayor interés científico y número de investigaciones publicadas (después del TJ), aunque no ha sido incluida dentro de los manuales de clasificación de trastornos mentales de referencia en el ámbito clínico y de investigación (DSM-5), debido a que requiere un mayor número de evidencias empíricas sobre sus mecanismos subyacentes. En la reciente version del ICD-11 tampoco se ha incluido a pesar de los estudios recientes que muestran altas tasas de prevalencia de CC, su disfuncionalidad e interferencia con el funcionamiento diario, el número creciente de personas que buscan tratamiento y las caracteristicas que tiene en común con los trastornos por uso de sustancias y el trastorno del juego (33). Hasta ahora la investigación muestra que existen múltiples similitudes clínicas entre la CC y otras conductas adictivas, por ejemplo el relevante rol que desempeñan los mecanismos relacionados con el refuerzo positivo para el inicio del problema adictivo, y también los sistemas de refuerzo negativo para la progresión del trastorno (los procedimientos descritos son muy similares a otras adicciones, como el TJ o incluso los trastornos relacionados con el uso-abuso de sustancias) (34–36).

Los estudios epidemiológicos aportan frecuencias muy variables para la CC, con índices de prevalencia que podrían llegar a afectar entre un 1% y un 7% de la población general adulta (siendo los grupos con mayor vulnerabilidad los sujetos en edad más joven, las mujeres, o los sujetos de procedencia clínica) (37–40). La alta variabilidad en las estimaciones de incidencia se ha relacionado con diferentes factores, siendo los más relevantes el origen de las muestras (comunitaria versus clínica), los tamaños muestrales, los contextos socioculturales, la medida temporal del problema (transversal o longitudinal) y los instrumentos de evaluación usados para la medición de este trastorno. La ausencia de una categorización de la CC en los sistemas internacionales de diagnóstico y la falta de consenso sobre los criterios clínicos, que deben emplearse en su definición, se encuentra en la base también de las dificultades inherentes a una estimación más precisa de la frecuencia con que este trastorno se presenta en las diferentes poblaciones y grupos de riesgo.

Respecto a la descripción clínica, se han descrito factores comunes a otros trastornos impulsivos y adictivos, como el uso de refuerzo positivo como mecanismo precipitante al inicio del problema y del refuerzo negativo como elemento explicativo del mantenimiento de los comportamientos problema a largo plazo (41). También se han identifica diversas características de personalidad relacionadas con este trastorno.

Por un lado, altos niveles de extraversión se han interpretado como una forma de utilizar las compras para mantener el estatus social de los pacientes y mantener su atractivo (42). Las puntuaciones elevadas en las escalas de neuroticismo han relacionado la CC como un medio para reducir los estados emocionales negativos (43) y las puntuaciones bajas en auto-conciencia se han asociado con deficiencias en la capacidad de los pacientes para ser estructurados y responsables (44). Otros resultados que involucran rasgos de personalidad han evidenciado que la CC se caracteriza por altos niveles de impulsividad (45,46), de urgencia positiva y negativa (47) y elevada búsqueda de novedad (48), así como bajos niveles en autodirección y cooperación (49).

1.1.3 Adicción a videojuegos: definición diagnóstica y prevalencia

Una de las características de la sociedad tecnológica en la que vivimos es la popularidad de los videojuegos en un amplio sector de la población, especialmente en adolescentes y jóvenes (aunque también en adultos). Los videojuegos adquirieron una popularidad que fue en vertiginoso ascenso desde la década de 1970, siendo en la actualidad considerados por muchas personas de diferentes ámbitos como productos de carácter "cultural". Pero lo que inicialmente se presenta como una actividad lúdica, puede convertirse en un problema, que se manifiesta a través de un uso descontrolado por parte de algunos usuarios. El impacto en población altamente vulnerable (como los menores y los jóvenes) y la revisión de todas las evidencias empíricas publicadas hasta el momento, así como los informes presentados en distintas reuniones realizadas en distintas ciudades desde 2014, llevó a la OMS a incluir la adicción a los videojuegos en su Clasificación Internacional de las Enfermedades (50). Esta decisión ha sido valorada positivamente porque promueve la investigación, especialmente en aspectos referidos a la eficacia de las intervenciones, al desarrollo de programas preventivos, y a identificar mecanismos etiológicos (por ejemplo, factores de personalidad, ambientales y neurobiológicos) que afectan el inicio, mantenimiento y progresión de la condición (51). Es importante destacar que algunos estudios consideran que la AV no es comparable con otras formas de adicción (como la adiccion al alcohol, las metanfetaminas o el TJ), y que debe siempre tenerse presente que para gran parte de la población en edad joven (especialmente adolescentes e inicios de la edad adulta) los videojuegos serán una parte normal de su desarrollo (52).

La AV se caracteriza por un uso excesivo de vídeojuegos a pesar de las consecuencias negativas sobre el funcionamiento de los individuos. Con frecuencia tiene mayor prevalencia en hombres que en mujeres (53,54). La prevalencia mundial de problemas relacionados con los VG se encuentra en 3.5% (55). Se sabe también que se trata de una adicción más frecuente en individuos jóvenes (aproximadamente el triple de la prevalencia en la adolescencia, con valores que pueden alcanzar hasta el 9% en adolescentes o adultos jóvenes de Estados Unidos y la Comunidad Europea (55,56,57). Según un informe de la Industria Americana del Entretenimiento y de la Software Association (2015), el uso de videojuegos difiere en función del sexo (56% varones frente al 44% de mujeres), y la edad media de los jugadores se sitúa en unos 35 años en los varones y los 43 en las mujeres. En España la encuenta ESTUDES del Plan Nacional de drogas señala que el uso de videojuegos se extiende al 96% de los adolescentes varones y al 69% de las mujeres, estimándose la prevalencia de un posible trastorno por uso de videojuegos en torno al 6.1% (58). Entre los múltiples correlatos de la AV destacan altos niveles de comportamientos de riesgo, alta impulsividad, alta sensibilidad al rechazo social, elevados niveles de conflictos interpersonales y la evitación del daño (59–61).

Los datos respecto al uso de videojuegos en España publicados en el informe anual de la Asociación Española de Videojuegos en el año 2019 (62) muestran que la media de horas/semana de los jugadores está en torno a 7, y estima que este valor es inferior a la que se presentan en otros países como Alemania (media de 8.3 horas/semana), Francia (media de 8.6 horas/semana) o Reino Unido (media de 11.6 horas/semana). Otros informes publicados en población española indican que el uso abusivo de los videojuegos representa un problema en población joven, con una cifra cercana al 70% de población es vulnerable a desarrollar uso problemático de VJ y un 6% de sujetos que cumplen criterios de adicción (63,64).

Pero a pesar de la proliferación de estudios que analizan los impactos del uso y abuso de videojuegos en diferentes poblaciones de riesgo, no existe un consenso respecto a la definición operativa y los criterios diagnósticos (65–69). Por un lado, un conjunto de trabajos empíricos define la AV como un trastorno adictivo caracterizado por una conducta de juego persistente, excesiva y descontrolada que comporta deterioro funcional en los sujetos (con habituales conflictos en las relaciones familiares, aislamiento social, disminución del rendimiento académico, e incluso enfermedad física/emocional) (61,70). La AV también se ha planteado desde el modelo dimensional

en base a un continuo, que va desde el uso normativo-recreativo (uso de videojuegos sin problemas asociados), al uso problemático (uso de videojuegos con algunos problemas relacionados) y juego adictivo (uso de videojuegos persistente caracterizado por la pérdida de control y deterioro funcional significativo) (71,72).

La AV no se incluye como un trastorno mental específico en (1) pero sí se considera en la sección III de esta taxonomía como una condición clínica emergente que requiere mayor evidencia empírica para una adecuada categorización. En 2019, la Organización Mundial de la Salud incluyó la AV en la última revisión de la Clasificación Internacional de Enfermedades (50) dentro del apartado de trastornos debidos a conductas adictivas, y definió esta condición como un patrón de comportamiento de videojuego que cursa con falta de control y que prioriza los videojuegos sobre otras actividades e intereses a pesar de las consecuencias negativas que ocasiona (OMS, 2020). Para diagnosticar AV se require deterioro significativo en las áreas personal, familiar, social, educativa, laboral u en otras áreas relevantes del funcionamiento, durante al menos 12 meses (73).

A nivel clínico, se ha observado que la AV correlaciona con altos niveles en ciertos rasgos de personalidad (como el narcisismo, neuroticismo, agresividad/hostilidad, evasión, introversión, búsqueda de sensaciones, tendencia al aislamiento y persistencia), y con niveles bajos en autoestima y autodirección (74–76). Otros síntomas comunes asociados con la AV se puede considerar a nivel emocional: ansiedad y depresión, irritabilidad, agresividad; a nivel fisico: falta de sueño, desnutrición, la irritabilidad, la agresión; a nivel cognitivo la presencia de sesgos cognitivos. Las consecuencias mas frecuentes son: deterioro en las relaciones sociales, y afectación del rendimiento escolar/laboral; conflicto con adultos en el caso de los adolescentes y habituación (63,77). La revisión sistemática realizada por (78) también concluye que la AV puede ser para algunos sujetos el resultado de una estrategia de afrontamiento desadaptativa para escapar de problemas de la vida real, las emociones adversas y los estados mentales negativos. Entre las distorsiones cognitivas observadas en pacientes con AV destacan creencias persistentes que sobrevaloran la recompensa que aportan los videojuegos, reglas disfuncionales e inflexibles sobre el comportamiento relacionado con los videojuegos, sobreestimación del videojuego como medio para logar una mejor autoestima u obtener aceptación social (79–81).

1.1.4 Adicción al sexo: definición diagnóstica y prevalencia

La AS (en ocasiones denominada hipersexualidad) se caracteriza por la falta de control sobre los impulsos sexuales, que son percibidos como irresistibles, lo que lleva a que la actividad sexual se convierta en un elemento central en la vida de la persona, hasta el punto de descuidar aspectos tan relevantes como la salud, el cuidado personal y otras actividades psicosociales (82–84).

Pero la clasificación y definición clínica de la AS no está exenta de controversia. En los últimos años se han desarrollado modelos teóricos parcialmente contradictorios, describiéndose también criterios diagnósticos específicos basados en tres de estos modelos (85): a) como comportamiento adictivo similar a otras adicciones comportamentales; b) como trastorno hipersexual; y c) como un trastorno del comportamiento sexual compulsivo. La AS como diagnóstico clínico se caracteriza por los indicadores genéricos del modelo de las adicciones (preocupación, interferencia negativa del comportamiento sexual con las actividades diarias, continuación a pesar de las consecuencias negativas, tolerancia y síntomas de abstinencia). El trastorno hipersexual se propuso inicialmente como diagnóstico diferenciado para el DSM-5 (aunque luego esta propuesta fue desestimada), incluyendo varios de los criterios de adicción (pero no los de tolerancia y abstinencia). El trastorno de conducta sexual compulsiva corresponde con el diagnóstico recientemente aceptado de la CIE-11, y se diferencia del diagnóstico de AS principalmente en la inclusión de un indicador (que establece la continuación del comportamiento sexual repetitivo a pesar de la pérdida de placer).

Los datos discordantes disponibles hasta el momento entorno a las diferentes conceptualizaciones han supuesto una dificultad para el desarrollo de instrumentos de evaluación precisos, lo cual ha complicado el poder disponer de datos epidemiológicos fiables (86). En cualquier caso, la Organización Mundial de la Salud reconoce la AS como una condición/trastorno mental y estima entre un 1% y un 5% aproximadamente la prevalencia de sujetos con síntomas compatibles con adicción al sexo. Se ha observado que la incidencia de este trastorno es mayor en hombres que en mujeres (87). Generalmente aparece en la adolescencia y presenta un curso progresivo (88). Los niveles socioeconómicos más altos, baja autoestima, puntuaciones altas en los rasgos de personalidad impulsividad y búsqueda de sensaciones y bajas puntuaciones en la evitación del daño son algunos de los principales factores de riesgo (89,90). También

se ha observado que la AS está relacionada con rasgos de personalidad antisocial, ausencia de miedo, baja asertividad, egocentrismo y altos niveles de impulsividad (91).

1.2 Sesgos cognitivos asociados al trastorno de juego

Los sesgos cognitivos relacionados con el comportamiento de juego son un área clásica y en el estudio del TJ. Los sujetos que presentan problemas asociados al juego de apuestas informan de distorsiones cognitivas relevantes que los estudios científicos relacionan tanto con el inicio del juego problemático como con su evolución. Los estudios han demostrado que los pensamientos irracionales son omnipresentes en la mayoría de las formas de juego problemático, y que en gran medida estas creencias erróneas típicas de los pacientes con TJ afectan su capacidad para estimar las posibilidades reales de ganar, condicionando seriamente en los mecanismos de toma de decisiones (92,93). Las distorsiones cognitivas se presentan en forma de esquemas desadaptativos (94) heurísticos (95) errores en el cálculo de las probabilidades de ganar mediante juegos de apuestas y sesgos relacionados con la ilusión de controlar resultados que en realidad dependen en gran medida del azar (96–98). Se han identificado diferentes distorsiones cognitivas asociadas a la conducta de juego, siendo las principales las que se detallan en la siguiente lista (99–102):

- ***Azar autocorrectivo.*** El resultado obtenido en un episodio de juego no se valora de forma independiente, sino que se cree que está encadenado a los anteriores. Por ejemplo, la creencia de que un resultado que no ha salido tras un período de tiempo considerable está a punto de salir.
- ***Representatividad.*** La estimación inicial de que se va a ganar mantiene sucesivas apuestas al margen de posibles resultados negativos continuados.
- ***Accesibilidad.*** El recuerdo de las ocasiones de en que se ha ganado, independientemente de que la ganancia sea del propio sujeto o de otros sirve de base para la estimación de la posibilidad de ganar. Los pacientes tienden a presentar una atención selectiva hacia los episodios de ganacias que a los de pérdidas.
- ***Simulación.*** Si el jugador se imagina jugando y ganando, y al final cree que esto es lo que va a ocurrir realmente (cuanto más juega, más victorias logrará).
- ***"Casi acierto" (near-miss).*** Los jugadores consideran como una señal de que se aproxima el resultado esperado (ganar), cuando se produce un resultado

parecido. Por ejemplo, cuando su boleto de la lotería aparece un número próximo al que realmente ha obtenido el premio.

- ***Ilusión de control.*** Los jugadores pueden creer que son capaces de predecir un resultado (por ejemplo, hallando un patrón de resultados), o influir en el resultado (por ejemplo, si realizan las apuestas de una determinada manera: ayudándose de amuletos, o rituales).
- ***Correlación ilusoria.*** Este sesgo está relacionado con el sesgo de superstición, y consiste en que los jugadores atribuyen un resultado a un estímulo del entorno, presente en el momento de dicho resultado.
- ***Optimismo ilusorio.*** Los jugadores creen que les va a ir mejor que a los demás, que les van a pasar más cosas buenas que a los otros. Esto se traduce muchas veces en creer que si se persiste en el juego al final ganarán.
- ***Sesgo confirmatorio.*** Recordar las veces que se ha ganado y olvidar las pérdidas.
- ***Error fundamental de atribución.*** Atribuir las veces que se gana a factores internos y las veces que se pierde a factores externos.
- ***Personificación.*** Atribuir al dispositivo de juego, voluntad e intenciones sobre los resultados que arroja.
- ***Proximidad.*** Si en una mesa o máquina próxima a la del jugador ha caído un premio, creencia de que va a ocurrir lo mismo en la propia.

Se han propuesto diferentes mecanismos psicológicos para explicar las distorsiones cognitivas relacionadas con la gravedad del TJ. La primera hipótesis se basa en la baja capacidad genérica de muchas personas para procesar estimaciones de probabilidad relacionadas con procesos aleatorios (103,104). La segunda hipótesis se ampara en las propias características estructurales de algunos juegos que podrían promover distorsiones cognitivas (por ejemplo, los estímulos de luces intermitentes brillantes y ruidos fuertes de máquinas tragaperras que acompañan a cada victoria). (105). Y en tercer lugar, desde el ámbito de la psicobiología se explica que los sesgos cognitivos propios del TJ podrían ser el resultado de las funciones de recompensa del cerebro: a) la investigación neuroquímica ha relacionado la desregulación de las funciones de serotonina, noradrenalina y glutamato con un desempeño deficiente en la toma de decisiones (106); y b) los estudios de neuroimagen funcional y las mediciones

neuropsicológicas de la impulsividad y la toma de decisiones arriesgadas han revelado daños en la función cerebral de los pacientes con TJ (principalmente en la corteza prefrontal ventromedial y el estriado), así como deficiencias en las funciones ejecutivas (107).

1.3 Impulsividad asociada al trastorno de juego

Un gran número de trabajos que valoran diferentes componentes sintomatológicos de las adicciones comportamentales han destacado el importante rol de la impulsividad en estos trastornos, fundamentalmente en el TJ (108,109). La evidencia empírica constata que niveles elevados de impulsividad rasgo contribuyen en la etiología y el mantenimiento de este trastorno adictivo (110). Se sabe que los sujetos con problemas de juego que son más impulsivos presentan un mayor número de síntomas asociados al juego de apuestas, mayor la frecuencia de la actividad de juego, apuestas más altas e incluso mayor volumen de deudas acumuladas debidas a las prácticas de juego e incluso conductas delictivas con propósito de financiar el juego (111–113). Varios estudios longitudinales también han sugerido que los niveles de impulsividad durante la infancia pueden tener una capacidad predictiva sobre el juego problemático en la edad adulta (114). Los altos niveles de impulsividad relacionados con la toma de decisiones (principalmente inhibición motora, inhibición de la atención o tareas de toma de decisiones) también se han relacionado con la aparición y la evolución del TJ (115).

Pero es importante tener presente cómo se define la impulsividad en el ámbito de estudio del TJ. En términos generales, la impulsividad se asimila a un estilo de conducta que se realiza con escasa previsión, muchas veces sin tener en cuenta las potenciales consecuencias negativas de los actos impulsivos (116). Se trata de un constructo multifactorial (117) aunque no hay consenso sobre su definición y en la actualidad co-existen diferentes modelos que conceptualizan este constructo y sus diferentes componentes (algunos basados en análisis factorial, otros elaborados en base a los fundamentos de la psicobiología y otros integrados en diferentes teorías de la personalidad) (118). De hecho, es posible que en la literatura se encuentren resultados que en apariencia son contradictorios simplemente por haber sido obtenidos bajo líneas teóricas distintas (119).

Los modelos recientes de impulsividad que se aplican al estudio del TJ abordan tanto sus manifestaciones conductuales como los mecanismos cerebrales subyacentes, y posicionan a este trastorno junto a otras condiciones psicopatológicas en las cuales la impulsividad representa un mecanismo central (120–122). En este sentido, el TJ se incluye en el espectro de los trastornos del control de impulsos, en gran parte como consecuencia del alto nivel de rasgos de personalidad relacionados con la impulsividad informados por los pacientes con problemas relacionados con la conducta de juego con apuesta (como búsqueda de novedad/sensaciones, falta de perseverancia/premeditación o urgencia), y por los resultados de los modelos neurobiológicos que miden la relación entre los niveles de impulsividad y la actividad de juego (115,123–125).

Gran parte de los instrumentos de evaluación disponibles más habituales para la medición de los diferentes factores de la impulsividad se basan en modelos generados a partir de análisis factorial, como el *Urgency Persistente Planning Sensation* (UPPS) (126,127). Este instrumento, muy usado en el estudio del TJ, fue inicialmente generado por (128) en base a la teoría de la personalidad NEO-Personality Inventory Revised (129–131) y fue posteriormente revisado para valorar cinco factores diferentes de la impulsividad (128,132): a) búsqueda de sensaciones, que valora la predisposición del sujeto a probar actividades nuevas que son percibidas como estimulantes y atrayentes; b) falta de perseverancia, que refleja la incapacidad de mantener los niveles de esfuerzo durante la realización de tareas exigentes; c) falta de premeditación, que mide la tendencia a la toma de decisiones sin atender a las potenciales consecuencias; d) urgencia positiva, que representa las tendencias del sujeto a responder bajo emociones positivas; y e) urgencia negativa, tendencia a la respuesta bajo emociones negativas. Los estudios que analizan la relación entre los componentes que se miden con el UPPS-P y el TJ han observado que la urgencia negativa y positiva y la búsqueda de sensaciones constituyen las dimensiones que con mayor intensidad se asocian con los niveles clínicos en pacientes que acuden para ser tratados por problemas relacionados con la conducta de juego (133–135).

1.4 Terapia Cognitivo Conductual

La terapia cognitivo conductual (TCC) es un enfoque de intervención caracterizado por promover el cambio de conductas disfuncionales mediante el cambio en la forma en que los sujetos piensan y sienten sobre ciertas conductas que les generan problemas. La TCC integra aspectos de la terapia cognitiva y de las intervenciones

conductuales (suele incluir estrategias de exposición y afrontamiento). De forma general se basa en identificar los signos precipantes de la conducta de juego, y promover y practicar respuestas alternativas al juego. Su orientación temporal se focaliza en el tiempo presente, de manera que se examina el funcionamiento actual (las exploraciones del pasado se realizan para que los sujetos conozcan en qué grado ciertos comportamientos son resultado de procesos de aprendizaje).

1.4.1 Aplicación de la TCC al trastorno de juego

Numerosos estudios han examinado la efectividad de diferentes modalidades de tratamiento para pacientes con TJ, como la terapia cognitivo-conductual (TCC), los grupos de autoayuda, las entrevistas motivacionales, o tratamientos farmacéuticos en ciertos casos (136). Los modelos cognitivos conductuales se han posicionado entre los que mejor evidencia empírica han logrado, hasta el punto que la TCC se considera el estándar de referencia (*gold standard,* en inglés) (137). El procedimiento de aplicación de la TCC para los trastornos adictivos (tanto los que comportan el consumo de sustancias como los comportamentales) identifica y maneja componentes cognitivos, afectivos y conductuales presentes en las diferentes fases del problema objeto de intervención: estímulos antecedentes, elementos desencadenantes internos-externos, emergencia del comportamiento adictivo y estados posteriores (138). En base al modelo general subyacente a la TCC, el TJ se puede representar en forma de círculo recurrente, en el que la etapa final negativa posterior a la conducta de juego genera los estados emocionales que actúan como precipitadores para la repetición de todo el ciclo, lo que supone que la propia conducta de juego con apuesta se convierte en un elemento autorreforzador y regulador del propio problema.

Los programas de TCC que se usan para el tratamiento del TJ se centran en el desarrollo y mantenimiento de estrategias de afrontamiento cuyo objetivo es resolver los problemas actuales y cambiar patrones disfuncionales de regulación cognitiva, conductual y emocional. El sujeto debe aprender a identificar y actuar sobre los elementos que sustentan el círculo recursivo que sustenta el comportamiento de juego. La TCC incluye el desarrollo de habilidades para aprender a controlar y manejar situaciones de alto riesgo, para reducir/detener de forma efectiva la posibilidad de jugar y prevenir las recaídas. El tratamiento se focaliza en el comportamiento de juego adictivo, pero integra sus mecanismos subyacentes (incluidas las cogniciones

irracionales), e intenta mejorar todos los aspectos que tienen que ver con el problema adictivo (incluida la gestión financiera) (139).

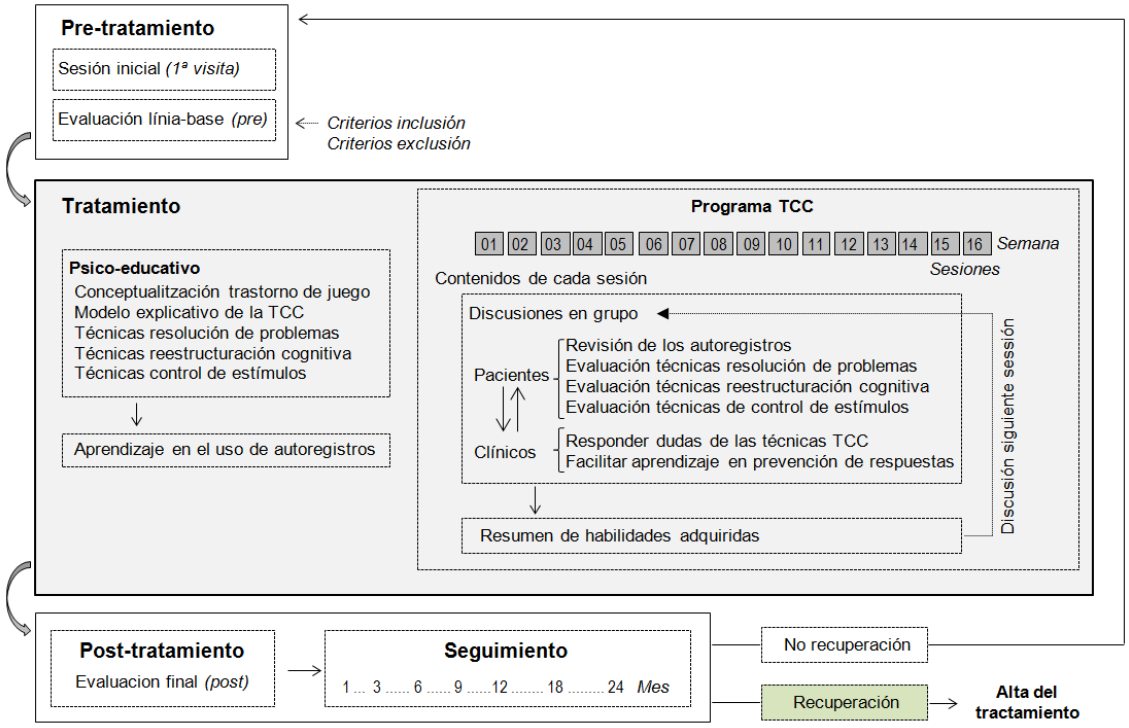
Existen diferentes modalidades para la aplicación de la TCC al tratamiento del TJ. La mayoría incluyen elementos comunes como la desensibilización sistemática, técnicas de control de estímulos, programas psico-educativos, asesoramiento financiero, técnicas cognitivas, como el entrenamiento autoinstruccional, la reestructuración cognitiva o la solución de problemas) y estrategias de prevención de recaídas (identificar situaciones de riesgo y aprender mecanismos alternativos a la recaída). Las revisiones sistemáticas disponibles que miden la efectividad de estos programas evidencian que la TCC es una intervención eficiente para reducir los problemas de juego y los síntomas relacionados a corto plazo (inmediatamente después de la terapia), pero no se dispone de datos suficientes para valorar en qué grado es eficaz a medio y largo plazo (140,141). Tampoco existen datos fiables sobre qué modalidades de la TCC son las más efectivas, dependiendo de las características particulares que presentan los pacientes y de su estado clínico en la línea de base (142,143). Se sabe que el riesgo de abandono y recaída (durante el programa de terapia y en el seguimiento) son relativamente altos en los programas ambulatorios (144,145). Se sabe también que los factores que más contribuyen en la eficiencia terapéutica son la identificación precoz de los problemas relacionados con la conducta de juego, menor gravedad, bajos niveles de impulsividad, baja comorbilidad con otros problemas psicopatológicos y alta motivación por la intervención (146). También se ha observado que ser hombre, sin cuadros depresivos comórbidos, menor número de síntomas de juego, y mejor adherencia terapéutica son predictores de éxito terapéutico para la TCC cuando se consideran resultados a corto y medio plazo. (16,141,147,148). Actualmente, se están valorando programas complementarios a la TCC que se utilizan para mejorar la regulación emocional y disminuir los niveles de impulsividad —como aplicaciones Apps o *serious videogames*, programas basados en realidad virtual, o de neuromodulación (como la estimulación magnética transcraneal)—, obteniendo resultados esperanzadores (149,150).

Diferentes estudios de identificación de subtipos o perfiles fenotípicos específicos han explorado la existencia de sub-grupos empíricos para pacientes con TJ (por ejemplo con análisis de clúster o análisis de clases latentes), ya que ello podría servir de ayuda para el desarrollo de programas de intervención diseñados para las necesidades y características concretas de cada paciente, que contribuyeran a mejorar la

eficiencia terapéutica. El conocido modelo de *pathways* propuesto por Blaszczynski y Nower es uno de los sistemas de clasificación más referenciados, y conceptualiza el TJ en base a tres subtipos (151): conductual condicionado (el inicio del trastorno es la consecuencia de la exposición repetida al juego y el curso de los problemas se explica por las contingencias relacionadas con dicha actividad), emocionalmente vulnerable (los pacientes utilizan la actividad de juego como una forma de aliviar los estados afectivos negativos) y antisocial-impulsivo (incluye pacientes con altos niveles de desregulación emocional, impulsividad y disfunción neurológica). Investigaciones posteriores han examinado la validez de este modelo en muestras con diversa composición y utilizando diferentes instrumentos de medida e indicadores para la definición de posibles clases latentes. Pero la mayoría de los estudios se han realizado en base a los perfiles clínicos de los pacientes al inicio de las intervenciones (o de sujetos procedentes de población general) y hasta donde sabemos pocos estudios han valorado si los subtipos empíricos obtenidos en los análisis de clasificación obtienen resultados distintos tras la TCC. El trabajo pionero de Ledgerwood & Petry obtuvo una categorización empírica inicial basada en las puntuaciones en ansiedad, depresión e impulsividad en la línea base, pero no observó que los tres grupos emergentes diferían en medidas de gravedad del TJ pre-tratamiento (como la frecuencia de juego, distrés emocional o presencia de otros trastornos comórbidos) ni tampoco en los resultados post-tratamiento (152). Sería conveniente que nuevos estudios empíricos de corte longitudinal exploraran la existencia de clústeres latentes de pacientes con TJ, basados en la gravedad del problema de juego y en sus correlatos, tanto al inicio de las intervenciones como durante el curso del tratamiento y en el seguimiento posterior, con objeto de disponer de cuáles son los indicadores principales de los resultados de las intervenciones.

1.4.2 TCC evaluada en este proyecto

La siguiente imagen presenta el esquema de la TCC que se ha empleado en los pacientes con TJ que forman parte de este proyecto. Se ha aplicado un programa grupal, con un total de 16 sesiones (la distribución temporal fue de 1 sesión semanal).



1.5 Justificación de la tesis

Las adicciones comportamentales forman un grupo de trastornos cuya prevalencia durante los últimos años ha presentado índices crecientes, en diferentes sectores de la sociedad. Este tipo de adicciones afectan grupos altamente vulnerables (como la AV, que se presenta en una proporción relativamente alta de adolescentes y adultos jóvenes), y es necesario obtener evidencias empíricas que permitan conocer mejor los perfiles clínicos e identificar variables asociadas a respuesta terapéutica. Estas nuevas evidencias contribuirán a mejorar la definición diagnóstica de estos trastornos, elaborar planes eficaces de detección temprana y programas de intervención personalizados eficientes, que consiguan un adecuado control de l los síntomas en particular y de las adicciones, en general, a corto y largo plazo.

2. Hipótesis

- **1.** Los pacientes más jóvenes, con inicio más precoz de la adicción y con mayor tiempo de evolución presentarán mayor gravedad del trastorno adictivo, mayor psicopatología comórbida y rasgos más disfuncionales de personalidad.
- **2.** El sexo y el subtipo diagnóstico moderará los efectos de la edad cronológica, el inicio y la duración del trastorno, en cada fenotipo.
- **3.** Se identificarán entre 2-3 trayectorias evolutivas basadas en la gravedad del TJ, que podrán interpretarse como evidencia de eficiencia terapéutica.
- **4.** La gravedad inicial del trastorno, mayor psicopatología general comórbida y edad alcanzarán capacidad predictiva para discriminar entre las trayectorias evolutivas.
- **5.** La relación entre la edad cronológica y los niveles de impulsividad y sesgos cognitivos, asociados a la conducta de juego, se ajustarán a un polinomio lineal.
- **6.** Se identificarán asociaciones positivas entre los niveles de impulsividad y de distorsión cognitiva por conducta de juego.
- **7.** Los sesgos cognitivos y la impulsividad serán variables mediadoras entre la edad y la gravedad por conducta de juego.
- **8.** Los pacientes con AV constituyen un grupo heterogéneo en el que será posible identificar grupos latentes empíricos, que representarán diferentes grados de gravedad de la conducta adictiva.

3. Objetivos

- **1.** Estudiar la contribución de la edad cronológica, la edad de inicio y la duración del trastorno en el fenotipo de pacientes que solicitan tratamiento profesional y cumplen criterios clínicos para TJ, AV, CC y AS.
- **2.** Explorar el potencial rol moderador del sexo y del subtipo diagnóstico en el patrón de interrelaciones entre edad cronológica, edad de inicio y duración de la adicción con el fenotipo clínico.
- **3.** Explorar la existencia de trayectorias evolutivas basadas en la gravedad del TJ, durante los 6 meses posteriores a una intervención cognitivo conductual en pacientes jóvenes (con edad entre 18-35 años).
- **4.** Identificar variables sociodemográficas y clínicas al inicio de la intervención con capacidad discriminativa para diferenciar entre las trayectorias evolutivas.
- **5.** Evaluar el papel de la edad cronológica en las relaciones entre la gravedad de los sesgos cognitivos y los niveles de impulsividad en pacientes con TJ con edades entre 18 y 77 años.
- **6.** Ajustar un modelo mediacional (que valore efectos directos e indirectos) que incluya la edad, el perfil de impulsividad, los sesgos cognitivos asociados a la conducta de juego y la gravedad del trastorno de juego.
- **7.** Explorar la existencia de clústeres en pacientes con AV a partir de un amplio conjunto de indicadores que incluyen variables sociodemográficas, psicopatológicas y rasgos de personalidad.

4. Material, métodos y resultados

4.1 Artículo publicado 1

Objetivo/s:

En el artículo se contrastan los objetivos 1 y 2 de la tesis.

> **1.** Estudiar la contribución de la edad cronológica, la edad de inicio y la duración del trastorno en el fenotipo de pacientes que solicitan tratamiento profesional y cumplen criterios clínicos para TJ, AV, CC y AS.
> **2.** Explorar el potencial rol moderador del sexo y del subtipo diagnóstico en el patrón de interrelaciones entre edad cronológica, edad de inicio y duración de la adicción con el fenotipo clínico.

Título del artículo:

The contribution of sex, personality traits, age of onset and disorder duration to behavioral addictions.
Disponible a través de: https://doi.org/10.3389/fpsyt.2018.00497.

Resumen:

En este trabajo se observó que el patrón específico de relaciones fue diferente según el subtipo diagnóstico de adicción conductual. En TJ, el inicio temprano se asoció con mayor gravedad en hombres; en CC, el inicio más temprano se asoció con niveles más graves en mujeres. En el TJ, el inicio temprano también estuvo asociado con una mayor búsqueda de novedades en los hombres. En CC, el inicio temprano se asoció con altos niveles de dependencia de la recompensa y puntuaciones bajas en autotrascendencia en las mujeres, y con puntuaciones bajas en evitación del daño y altos niveles de autodirección y cooperación en los hombres en comparación con mujeres pero siendo bajos igualmente. Para el grupo CC, una mayor duración del trastorno se asoció con una mayor persistencia, autodirección y autotrascendencia. Estas evidencias sugieren que las adicciones comportamentales poseen mecanismos subyacentes y patrones de asociaciones diferenciados según el tipo de adicción. Dichos mecanismos deben tenerse en cuenta a la hora de diseñar instrumentos de evaluación y programas de intervención. La edad de inicio es crucial por su fuerte asociación con el estado clínico y con la gravedad de los problemas por adicción conductual.

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The Contribution of Sex, Personality Traits, Age of Onset and Disorder Duration to Behavioral Addictions

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Background and aims: Increases in the prevalence of behavioral addictions worldwide have led to a growth in the etiological research of the specific contribution of risk/protective factors to these disorders. The objective of this study was to assess the relative role of patients' sex, age of disorder onset and disorder duration on the clinical profile of behavioral addictions.

Methods: Our sample included treatment-seeking patients diagnosed with gambling disorder (GD, $n = 3{,}174$), internet gambling disorder (IGD, $n = 45$), compulsive buying (CB, $n = 113$), and sex addiction (SA, $n = 34$).

Results: The pattern of associations between the independent variables and the outcomes were strongly related to the behavioral addiction subtype: (a) for GD-men early onset of the disorder was related to GD severity, while for GD-women early onset was linked to novelty seeking; (b) for IGD-men, late onset correlated with addiction severity, worse psychopathological state, and high harm avoidance and self-transcendence levels; (c) for CB-women, early onset was related to higher reward-dependence scores and lower self-transcendence levels, and longer duration predicted higher cumulate debts; for CB-men, early onset and long duration correlated with high scores in harm-avoidance, self-directedness, self-transcendence, and cooperativeness; and (d) for SA-men, late onset and longer duration correlated with high disorder severity.

Discussion and Conclusions: These findings are relevant for developing prevention and treatment programs specific to different behavioral addictions.

Keywords: behavioral addictions, compulsive buying, internet gambling disorder, gambling disorder, sex addiction, age

INTRODUCTION

Behavioral addictions include a heterogeneous group of conditions characterized by a compulsion to engage in a short-term rewarding, non-substance-related behavior that may engender persistence despite knowledge of severe adverse consequences (1–3). During the course of these problems, individuals lose control over excessive or problematic behaviors, with consequent significant impairment in the family, work and social areas of their lives (4, 5). In the early stages of the condition, high levels of impulsivity are aimed at obtaining immediate reward (positive reinforcement), but during the course of the condition, the addictive behavior becomes compulsive and is aimed at decreasing negative emotional states (negative reinforcement) (6). Within this line of research, it has also been argued that dimensional and transdiagnosis classifications could better explain the overlap of symptoms and shared clinical features in all these conditions, comorbidity, and even response to treatment (2).

The most prevalent subtypes of behavioral addictions are gambling disorder (GD), compulsive buying (CB), sex addiction (SA) and internet gaming disorder (IGD). In the latest version of the DSM-5, GD was included in the new diagnostic category named "Substance-related and Addictive Disorders," while the possibility of including other behavioral addictions (such as CB, SA, and IGD) was discussed and excluded due to a lack of empirical evidence.

Behavioral addictions occur in people of both sexes, but prevalence differs depending on the subtype: men report higher percentages in GD, IGD, and SA, while women report higher rates of CB (7). In relation to age, these disorders occur throughout the life cycle, but two stages seem to have higher vulnerability: adolescence/ early adulthood and old age (8).

Studies exploring the contribution of the age of onset suggest that patients with earlier onset form a subgroup with higher levels of antisocial personality traits and impulsivity, whereas patients with later onset constitute a subtype with greater vulnerability to depression and anxiety, who use gambling as a maladaptative mechanism to modulate their negative moods (9, 10). Early onset of GD (compared to a later onset) also seems to be associated with a lower prevalence of mood disorders, a higher prevalence of cluster B personality disorders, higher scores in the personality trait sensation seeking and lower scores in self-directedness (11, 12).

Regarding CB, imprecise and unreliable prevalence results have been reported, ranging from 1 to 20% depending on the origin of the samples, definitions, and measurement instruments (13–17). Existing epidemiological data for CB have also shown that treatment-seeking patients with CB usually suffer from multiple psychiatric conditions, with comorbid alcohol and/or other drugs use, eating disorders, mood disorders, anxiety, and other impulse control disorders being most common (18). Strong sex-dependent differences for CB have been described: the risk, prevalence, and rates of initiation and frequency of misuse are higher for women (1).

Studies centered on IGD indicate that between 3.7 and 13.0% of the adult general population met criteria for problematic internet use (19, 20), and that IGD is more prevalent in young samples (21). Correlates of IGD include high levels of risk-taking behaviors and impulsivity, higher delay discounting, high sensitivity to social rejection and high levels in interpersonal conflict, harm-avoidance and interpersonal conflict (22–24).

Finally, research on SA concludes that prevalence for men is clearly higher compared to women (25–28). Higher socioeconomic levels, high scores in the personality traits sensation seeking and low scores in harm avoidance are risk factors for SA (29, 30). Some etiological studies have indicated that SA is related to antisocial personality traits, absence of fear, interpersonal assertiveness, egocentrism, and high levels in impulsiveness (31).

The fact that currently only GD is included in the DSM-5 derives from the lack of consensus regarding considering behavioral addictions as mental disorders (32). This could partly explain the higher prevalence of this disorder in relation to the other behavioral addictions. It is also challenging to determine the prevalence of conditions that are not accepted as disorders and do not dispose of standardized diagnostic tools (33). Having diagnostic criteria for these addictions would therefore allow for greater knowledge of the etiology, prevention and treatment of other behavioral addictions (34). Likewise, the inclusion of other behavioral addictions could have an impact on provided health services and might help to reduce the reluctance of patients to seek treatment (34).

Objectives

To the best of our knowledge, a limited number of studies have measured the specific contribution of sex, onset and duration of addictive behavior in clinically heterogeneous samples including different behavioral addiction subtypes. Thus, the objective of this study was to assess the specific weight of these variables in the clinical state of treatment seeking patients diagnosed with GD, IGD, CB, and SA.

METHODS

Participants

The sample included $n = 3{,}366$ consecutive treatment-seeking patients that attended a hospital unit specialized in behavioral addictions in Barcelona, Spain. Recruitment took place between January-2005 and Setember-2016. Inclusion criteria included meeting diagnostic criteria for GD, IGD, CB, or SA as the primary reason for consultation and being over 18 years of age. Exclusion criteria were having an intellectual disability or severe mental disorders (such as schizophrenia or other psychotic disorders or bipolar disorder).

The number of participants excluded due to the comorbid presence of different behavioral addictions was low ($n = 5$, 1 patient who reported GD+CB, 1 who presented GD+SA, 2 with CB+SA, and 1 with SA+IGD). On the other hand, since subsamples of IGD and SA included very few women ($n \leq 2$), female participants were excluded from these two groups to avoid potential biases in the results due the extremely low frequency of women in these two subsamples.

Measures

Diagnostic Questionnaire for Pathological Gambling According to DSM Criteria (35)

This 19-item questionnaire allows for the assessment of the DSM-5 (32) diagnostic criteria for GD. Convergent validity with the external gambling scores in the original version was very good ($r = 0.77$ for representative samples and $r = 0.75$ for gambling treatment groups; (35). Internal consistency in the Spanish adaptation used in this study was $\alpha = 0.81$ for the general population and $\alpha = 0.77$ for gambling treatment samples (36). In this study, the total number of DSM-5 criteria for GD was analyzed, and internal consistency was $\alpha = 0.804$ in the sample.

Diagnostic Criteria for Compulsive Buying (37)

These criteria, which have received wide acceptance in the research community, were used to validate the presence of CB in the sample. The list of questions explores "buying attitudes, associated feelings, underlying thoughts, and the extent of preoccupation with buying and shopping" (38).

Diagnostic Criteria for IGD According to Griffiths and Hunt (39, 40)

To assess IGD diagnosis and to establish the level of dependence the disorder, clinical experts conducted a face-to-face interview considering the scale designed by Griffiths and Hunt (39, 40). This interview evaluated aspects such as the frequency of problematic behavior, the interference generated in daily functioning because of maladaptive use of internet games, the presence of tolerance and difficulties in abstinence management, as well as the number of DSM-5 criteria [according to Section III, (32)].

Diagnostic Criteria for Sex Addiction According to DSM-IV-TR (32)

To assess SA, a battery of items was administered, which were based on the proposed definition in the DSM-IV-TR (41) in the Sexual Disorders Not Otherwise Specified section (302.9). In making our assessment, the following clinical description was given special weight: "distress about a pattern of repeated sexual relationship involving a succession of lovers who are experienced by the individual only as things to be used."

Temperament and Character Inventory-Revised (TCI-R) (42)

This is a reliable and valid 240-item questionnaire that measures seven personality dimensions: four temperament (novelty seeking, harm avoidance, reward dependence and persistence) and three character dimensions (self-directedness, cooperativeness, and self-transcendence). All items are measured on a 5-point Likert-type scale. A validated Spanish version was used (43). The scales in the Spanish revised version showed adequate internal consistency (Cronbach's alpha α mean value of 0.87). In the study, consistency indices ranged from good ($\alpha = 0.70$ for novelty seeking subscale) to very good ($\alpha = 0.859$ for persistence subscale).

Symptom Checklist-Revised (44)

This questionnaire evaluates a broad range of psychological problems and psychopathological symptoms. This questionnaire contains 90 items and measures nine primary symptom dimensions: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. It also includes three global composite indices: (1) a global severity index (GSI), designed to measure overall psychological distress; (2) a positive symptom distress index (PSDI), to measure the intensity of the symptoms; and (3) a positive symptom total (PST), which reflects self-reported symptoms. A validated Spanish version was used (45). The Spanish validation scale obtained good psychometrical indexes, with a mean internal consistency of 0.75 (Cronbach's alpha). This study analyzes the GSI global score as a measure of the global psychopathological state (the consistency in our sample is excellent for this scale, $\alpha = 0.981$).

Other Sociodemographic and Clinical Variables

Additional demographic, clinical, and social/family variables were measured using a semi-structured face-to-face clinical interview described elsewhere (46). Covered variables included the age of disorder onset, the accumulated debts due to the addiction and social status measured through the Hollingshead index (a survey designed to measure social status of individuals based on educational attainment and occupational prestige; (47).

Procedure

Experienced psychologists and psychiatrists, with more than 15 years of clinical experience in the field of addictive disorders, conducted two face-to-face clinical interviews in order to collect clinical information and specify the clinical diagnosis of each patient. All the measures analyzed in this study correspond to the assessment at the baseline, previous to the beginning of treatment.

Statistical Analysis

Statistical analysis was carried out with Stata 15 for Windows. Pearson's correlation coefficients measured the association between the age of onset and the duration of the problematic addictive behavior with the personality and clinical profile. The specific contribution of the patients' sex, onset, and duration of the problem on the severity of the addiction and the psychopathological state was measured with negative binomial regression and linear multiple regression (for cumulate debts and SCL-90-R GSI score). These models included and tested the interactions sex-by-onset and sex-by-duration: (a) for relevant interaction parameters, single effects for the participants' age were estimated into three groups defined for the quartiles 1 and 3 of the age of onset [early (onset before 20 years of age), medium (onset between 20 and 35 years) and late (onset after 35 years of age)]; and (b) for non-relevant interaction parameters, main effects were estimated and interpreted. Independent models were obtained for each diagnostic subtype (GD, CB, IGD, and SA). Contribution of sex was not explored for IGD and SA, since no women were included in these subsamples due to their low frequency in the groups.

Ethics

This study was carried out in accordance with the latest version of the Declaration of Helsinki. The Ethics Committee of Bellvitge University Hospital (Barcelona, Spain) approved the study, and signed informed consent was obtained from all final participants.

RESULTS

Characteristics of the Sample

The upper half of **Table 1** includes a description of the study sociodemographic variables. Mean chronological age for the total sample was 42.5 years-old (SD = 13.5, with a range between 18 and 75 years of age), mean age of onset for the behavioral addiction was 29.9 years-old (SD = 11.5) and the mean duration of the disorder was 6.2 years (SD = 5.9).

The bottom half of **Table 1** shows the distribution of the clinical variables and comparison between diagnostic subtypes. The IGD group included the youngest participants, with the lowest age on disorder onset and disorder duration. Regarding personality scores, CB endorsed as a whole the highest scores in novelty seeking, harm avoidance, reward dependence and self-transcendence, followed by GD.

Associations Between Age of Onset and Duration With Clinical and Personality Measures

Table 2 includes the correlation matrix to assess the association between the age of onset (years-old) and the duration (years) of each behavioral addiction with clinical measures. For the GD group, two associations emerged: in the male sub-sample, early onset was linked to a higher number of DSM-5 criteria, and in the female sub-sample, early onset was linked to higher novelty seeking scores.

For women diagnosed with CB, younger age of onset was related to higher reward-dependence scores and lower self-transcendence levels, and the longer duration of the problem was associated with higher cumulate debts. For men in this diagnostic subtype (CB): (a) early age of onset was linked to lower SCL-90R scores and harm-avoidance levels, and high self-directedness and cooperativeness scores; (b) longer duration of the disorder correlated with higher levels in personality traits of persistence, self-directedness and self-transcendence.

For men who met criteria for SA, higher duration was related to higher hostility scores.

Contribution of Sex, Age of Onset, and Duration to Disorder Severity

Table 3 contains the different regression models valuing the specific contribution of sex, age and duration of the disorder on behavioral addiction severity measures. Separate models have been obtained for each disorder (GD, CB, IGD, and SA) and for each severity measure (number of DSM-5 criteria, cumulate debs, and SCL-90R GSI score). For example, Model-1 assess the contribution of the independent variables of the study (sex, age and duration) on the dependent variable number of DSM-5 criteria specifically for the GD subsample. For each regression the non-standardized B-parameters, standard error (SE), 95% confidence interval (95%CI for B), contrast statistics (Wald-chisquare for negative-binomial regression and T for linear regression) and *p*-values are reported.

In the GD group, a higher number of DSM-5 criteria was associated to early age of onset ($B = -0.005$; $p = 0.002$), while no statistical contribution was obtained for the patients' sex or the duration of the disorder, and no interaction between sex and onset and duration was obtained for this criterion (Model-1 in **Table 3**). For this BA subtype, when the cumulate debts criterion is considered (Model-2 in **Table 3**) this measure is increased for patients with longer duration, and an interaction of sex by age of onset was also retained as relevant: (a) single effects for sex showed that men tended to cumulate more debts, and this difference increased with age of onset; and (b) single effects for age of onset showed that, for women, the earlier the onset, the higher the cumulate debts while for men, the older the onset, the higher the debts.

For the SCL-90-R GSI criterion (Model-3 in **Table 3**), worse psychopathological state was related to higher duration of the disorder, and the interaction sex by onset was also relevant to explain this outcome: (a) single effects for sex evidenced that women always registered higher psychopathological levels compared to men, but effect size for differences depended on the age of onset of the disorder (the highest effect was registered for onset between 20 and 35); and (b) the early age of onset of the disorder was only a statistical predictor of worse psychopathological state for women, while the onset of the disorder was not relevant in explaining GSI levels for men.

For the CB group, cumulate debts due to buying (Model-4 in **Table 3**) increased for women with a long duration and an early age of onset. No interaction between sex and age and duration emerged. The model adjusted for the global psychopathological level in CB (Model-5 in **Table 3**) retained the interaction sex by onset, and the results of this regression showed that worse mental state were registered for women compared to men, but only for patients who reported medium age of onset for the disorder (between 20 and 35 years old).

For the IGD and SA subsamples, sex was not included into the models since no women were included in these groups. For IGD, no statistical contribution of duration and onset emerged to explain the number of the DSM-5 criteria (Model-6 in **Table 3**) and the global psychopathological levels (Model-7 in **Table 3**). For men in the SA group, the cumulate debts increased for patients with younger age of onset (Model-8 in **Table 3**), while duration and onset were not contributors to psychological state (Model-9 in **Table 3**).

DISCUSSION AND CONCLUSIONS

This study assessed the association between patient sex, age of onset and behavioral addiction duration on clinical phenotype (including the severity of the disorder, psychopathological status and personality traits). Differences between GD, IGD, CB, and SA were tested, with the aim of shedding light on the potential moderating role of behavioral addiction subtype.

TABLE 1 | Sample description: sociodemographic and clinical variables.

	GD; *n* = 3,174		IGD; *n* = 45		CB; *n* = 113		SA; *n* = 34			
	n	%	*n*	%	*n*	%	*n*	%	χ^2	*p*
GENDER										
Females	283	8.9	0	0	85	75.2	0	0	502.6	<0.001
Males	2891	91.1	45	100	28	24.8	34	100		
ORIGIN										
Spain	2934	92.4	39	86.7	111	98.2	33	97.1	8.65	0.034
Immigrant	240	7.6	6	13.3	2	1.8	1	2.9		
EDUCATION										
Primary	1905	60.0	24	53.3	43	38.1	9	26.5	85.40	<0.001
Secondary	1092	34.4	20	44.4	46	40.7	16	47.1		
University	177	5.6	1	2.2	24	21.2	9	26.5		
CIVIL STATUS										
Single	1212	38.2	41	91.1	43	38.1	9	26.5	57.43	<0.001
Married - partner	1534	48.3	3	6.7	51	45.1	17	50.0		
Divorced - separated	428	13.5	1	2.2	19	16.8	8	23.5		
SOCIAL INDEX										
High	46	1.4	1	2.2	4	3.5	2	5.9	53.27	<0.001
Medium-high	138	4.3	0	0.0	18	15.9	4	11.8		
Medium	339	10.7	6	13.3	14	12.4	4	11.8		
Medium-low	967	30.5	12	26.7	32	28.3	14	41.2		
Low	1684	53.1	26	57.8	45	39.8	10	29.4		
EMPLOYMENT										
Unemployed	1414	44.5	36	80.0	53	46.9	15	44.1	22.69	<0.001
Employed	1760	55.5	9	20.0	60	53.1	19	55.9		
[a]PREVIOUS CONSULTATIONS										
No	374	11.8	2	4.4	13	11.5	2	5.9	3.43	0.330
Yes	2800	88.2	43	95.6	100	88.5	32	94.1		
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***	***Mean***	***SD***	***F***	***P***
AGE, ONSET AND DURATION										
Age (years-old)	42.8	13.5	22.6	8.4	42.6	11.5	42.6	11.9	33.76	<0.001
Onset disorder (years-old)	29.9	11.5	19.3	8.1	32.9	12.0	33.7	13.0	16.82	<0.001
Duration disorder (yrs)	6.2	6.0	3.3	2.5	6.8	5.8	6.0	5.7	3.90	0.009
PSYCHOLOGY: SCL-90R										
GSI score	1.05	0.72	0.86	0.76	1.58	0.91	1.25	0.78	20.21	<0.001
PERSONALITY TRAITS: TCI-R										
Novelty seeking	108.9	14.3	103.7	13.1	114.9	14.4	110.8	14.3	7.85	<0.001
Harm avoidance	101.1	17.0	102.6	22.8	111.0	19.7	102.1	17.5	10.80	<0.001
Reward dependence	98.5	14.8	92.3	17.1	103.2	17.0	100.5	15.2	5.84	0.001
Persistence	108.5	20.1	93.6	20.8	106.8	18.8	103.6	21.1	8.20	<0.001
Self-directedness	127.0	21.1	127.1	25.7	124.1	23.9	116.9	19.6	2.91	0.033
Cooperativeness	130.4	16.3	126.8	18.5	133.9	15.7	127.4	15.1	2.57	0.053
Self-transcendence	64.0	15.3	57.2	14.1	65.4	16.5	63.1	14.0	2.97	0.031

Note. [a]Previous consultations due behavioral addictions related problems.
GD: gambling disorder. IGD: internet gaming disorder. CB: compulsive buying. SA: sex addiction.
SD: standard deviation. — This measure was not available for this group.

TABLE 2 | Association between age of onset and duration of the BA with clinical and personality traits.

	GD				IGD		CB				SA	
	Women *n = 283*		Men *n = 2,891*		Men *n = 45*		Women *n = 85*		Men *n = 28*		Men *n = 34*	
	Onset	**Durat.**	**Onset**	**Durat.**	**Onset**	**Durat.**	**Onset**	**Durat.**	**Onset**	**Durat.**	**Onset**	**Durat.**
DSM-5 total criteria	**−0.24**	0.10	**−0.19**	0.05	**0.44**	**−0.05**	–	–	–	–	–	–
Cumulate debts	**−0.14**	0.00	**−0.01**	0.04	–	–	**−0.15**	**0.25**	0.03	0.18	**−0.59**	**0.50**
PSYCHOLOGY: SCL-90R												
GSI score	**−0.11**	0.04	**−0.04**	0.10	**0.25**	0.11	**−0.03**	0.06	**0.36**	**−0.11**	**−0.18**	0.07
PERSONALITY TRAITS: TCI-R												
Novelty seeking	**−0.18**	0.15	**−0.25**	0.02	0.01	−0.05	**−0.19**	**−0.04**	**−0.05**	0.23	0.16	**−0.14**
Harm avoidance	−0.15	−0.06	0.07	0.07	**0.26**	0.08	−0.12	−0.12	**0.34**	−0.21	−0.08	0.07
Reward dependence	0.02	0.06	0.04	−0.07	−0.10	−0.11	**−0.27**	0.07	−0.07	0.17	0.17	−0.06
Persistence	−0.02	−0.06	−0.03	−0.07	−0.10	0.02	0.02	0.12	−0.01	**0.27**	−0.18	0.09
Self-directedness	0.06	−0.04	0.06	−0.09	−0.23	−0.15	0.07	0.09	**−0.25**	**0.25**	−0.03	0.14
Cooperativeness	0.01	0.00	0.09	−0.07	−0.13	−0.06	−0.05	0.13	**−0.28**	0.01	0.02	0.24
Self–transcendence	0.19	−0.03	0.16	0.05	**0.35**	0.22	**0.29**	0.08	0.19	**0.31**	0.01	0.08

Note. GD, gambling disorder; IGD, internet gaming disorder; CB, compulsive buying; SA, sex addiction.
Note. Bold: correlation into the moderate (|r|>0.24) to good range (|r|>0.37). — Not available for this group.

Association of Sex, Onset and Duration With Severity, and Psychopathological State

Our results indicate that, as a whole, the specific pattern of relationships was different depending on the behavioral addiction diagnosis. As a whole, our work provides new empirical evidence about the multidimensional component of behavioral addictions, for which the contribution of variables such as age of onset, duration of the disorder or personality traits play a differential role depending on the diagnostic subtype and the patients' sex. Previous studies had already found similar results regarding individual differences in behavioral addictions, noting that they must be conceptualized as a heterogeneous set of clinical conditions (1, 48).

The specific correlates of the age of onset also seem to be dependent on the diagnostic subtype and the patients' sex. This potential interaction is particularly notable for GD and CB: a) in GD, early onset correlated with greater severity in males and b) in CB, earlier onset correlated with higher levels of severity of the addictive problem in women (who presented higher prevalence of this diagnostic subtype compared to men, which is in accordance with previously reported clustering studies and latent profile analyses (18, 49).

Association of Sex, Onset and Duration With Personality Dimensions

The pattern of relationships between onset and duration of the behavioral addiction with personality is also different depending on the diagnostic subtype and the participants' sex. In GD, earlier age of onset has been associated with higher novelty seeking in men, which seems congruent with etiological research in male samples which consider age of onset as a mediating mechanism between novelty seeking levels with GD correlates (such as the disorder severity and psychopathology (11).

In CB, early onset was associated with high levels of reward dependence and low scores in self-transcendence in women, and with low scores in harm avoidance and high levels of self-directedness and cooperation in men. These results could indicate that women who met this condition could be more predisposed to seeking greater approval and to expressing more difficulties in coping with troubles or stressful situations, while men would be more goal-oriented, effective and self-confident. In addition, for the CB group, longer duration of the disorder was associated with higher persistence, self-directedness, and self-transcendence, which seems consistent with observations in previous studies (50, 51). Given our lack of females in the SA group, it is not possible to make associations between personality dimensions and sex in patients with this behavioral addiction. It would be beneficial for future studies to include more diverse and balanced samples. Still, we did identify that our SA sample endorsed higher levels of novelty seeking compared to GD patients, and importantly, low levels of self-directedness.

Limitations and Strengths

Despite having an overall large sample size (which provides a large statistical power for most analyzes and comparisons), the number of patients in some groups was relatively small. Likewise, due to the close relationship between the prevalence of each behavioral addiction and sex, the distribution of men and women was very unequal between the groups. It should be argued, however, that the sample included all patients who consecutively attended a reference treatment unit and met the inclusion/exclusion criteria, and therefore the gender distribution corresponds to the frequency with which these

TABLE 3 | Contribution of sex, onset and duration on the different BA subtypes.

	B	SE	95%CI(B)	[c]Statistic	*p*	
GAMBLING DISORDER; *n = 3,174*						
[Model-1] [a]Criterion: DSM-5 criteria						
(Intercept)	*2.126*	*0.095*	*1.94*	*2.31*	*505.20*	*0.001*
Sex (0: women; 1:male)	−0.075	0.070	−0.21	0.06	1.16	0.282
Duration (years)	0.002	0.003	0.00	0.01	0.44	0.508
Age of onset (years-old)	−0.005	0.002	−0.01	0.00	9.18	**0.002**
[Model-2] [a]Criterion: cumulate debts						
(Intercept)	*10.068*	*0.256*	*9.57*	*10.57*	*1543.67*	*0.001*
Duration (years)	0.012	0.004	0.01	0.02	10.58	**0.001**
[d]Sex (into early onset)	0.579	0.304	−0.02	1.18	3.63	0.057
[d]Sex (into medium onset)	0.323	0.106	0.12	0.53	9.29	**0.002**
[d]Sex (into late onset)	0.950	0.108	0.74	1.16	77.35	**<0.001**
Age of onset (into women)	−0.027	0.007	−0.04	−0.01	16.28	**<0.001**
Age of onset (into men)	0.023	0.002	0.02	0.03	106.92	**<0.001**
Interaction: Sex by onset	*0.050*	*0.007*	*0.04*	*0.06*	*50.62*	*0.001*
[Model-3] [b]Criterion: SCL-90R GSI						
(Intercept)	*1.703*	*0.158*	*1.39*	*2.01*	*10.74*	*0.001*
Duration (years)	0.011	0.002	0.01	0.02	5.08	**<0.001**
[d]Sex (into early onset)	−0.433	0.163	−0.75	−0.11	−2.65	**0.008**
[d]Sex (into medium onset)	−0.634	0.074	−0.78	−0.49	−8.63	**<0.001**
[d]Sex (into late onset)	−0.422	0.073	−0.57	−0.28	−5.76	**<0.001**
Age of onset (into women)	−0.007	0.004	−0.02	0.00	−1.76	**0.048**
Age of onset (into men)	−0.002	0.001	0.00	0.00	−1.46	0.143
Interaction: Sex by onset	*0.005*	*0.004*	*0.00*	*0.01*	*-1.82*	*0.068*
COMPULSIVE BUYING; *n = 113*						
[Model-4] [a]Criterion: cumulate debts						
(Intercept)	*11.149*	*0.437*	*10.29*	*12.00*	*652.20*	*0.001*
Sex (0: women; 1:male)	−0.497	0.246	−0.98	−0.01	4.07	**0.044**
Duration (years)	0.064	0.019	0.03	0.10	11.39	**0.001**
Age of onset (years-old)	−0.022	0.012	−0.05	−0.00	3.64	**0.050**
[Model-5] [b]Criterion: SCL-90R GSI						
(Intercept)	*1.861*	*0.342*	*1.18*	*2.54*	*5.44*	*0.001*
Duration (years)	−0.010	0.016	−0.04	0.02	−0.66	0.508
[d]Sex (into early onset)	−0.430	0.572	−1.56	0.70	−0.75	0.453
[d]Sex (into medium onset)	−0.735	0.284	−1.30	−0.17	−2.59	**0.011**
[d]Sex (into late onset)	0.043	0.318	−0.59	0.67	0.13	0.893
Age of onset (into women)	−0.003	0.009	−0.02	0.01	−0.36	0.719
Age of onset (into men)	0.024	0.015	−0.01	0.05	1.61	0.112
Interaction: Sex by onset	−0.733	0.406	−1.54	0.07	−1.81	0.074
INTERNET GAMBLING DISORDER; *n = 45 (ONLY MEN)*						
[Model-6] [a]Criterion: DSM-5 criteria						
(Intercept)	*0.752*	*0.540*	*-0.31*	*1.81*	*1.94*	*0.164*
Duration (years)	0.005	0.072	−0.14	0.15	0.01	0.940
Age of onset (years-old)	0.020	0.021	−0.02	0.06	0.93	0.335
[Model-7] [b]Criterion: SCL-90R GSI						
(Intercept)	*0.231*	*0.372*	*-0.52*	*0.983*	*0.62*	*0.539*
Duration (years)	0.051	0.049	−0.05	0.150	1.05	0.298
Age of onset (years-old)	0.023	0.014	−0.01	0.052	1.63	0.110
SEX ADDICTION; *n = 34 (ONLY MEN)*						
[Model-8] [a]Criterion: cumulate debts						
(Intercept)	*14.942*	*1.237*	*12.52*	*17.37*	*145.88*	*0.001*
Duration (years)	0.151	0.193	−0.23	0.53	0.62	0.432
Age of onset (years-old)	−0.259	0.045	−0.35	−0.17	32.84	**<0.001**
[Model-9] [b]Criterion: SCL-90R GSI						
(Intercept)	1.651	0.449	0.74	2.57	3.68	0.001
Duration (years)	−0.005	0.025	−0.06	0.05	−0.18	0.856
Age of onset (years-old)	−0.011	0.011	−0.03	0.01	−1.01	0.321

[a]*Negative-binomial regression.*

[b]*Linear multiple regression.*

[c]*Wald-chisquare for negative-binomial regression and T for linear regression.*

[d]*Due to the relevant interaction sex by onset, single effects for the sex were obtained into three groups defined by the age of onset: early (onset before 20 years-old), medium (onset between 20 and 35 years-old), and late (onset after 35 years-old). Bold: significant predictor (0.05 level).*

problems occur in our country (52), which gives high external validity to our results.

On the other hand, this work is aimed in knowing patients' sex, age, and duration of the disorder contribute *specifically* to the behavioral addiction which register the highest prevalence at a specialized healthcare unit in Spain, and therefore mutually exclusive groups have been analyzed. Future research must be designed to analyze the contribution of these variables on the clinical profile of patients who present concurrent-comorbid behavioral addictions.

Two strengths of our research are the large sample size and the inclusion of different groups of subjects who meet diagnostic criteria for different BA. Another relevant strength is the inclusion and analysis of multiple psychological measures, which cover severity of the BA, overall psychological state and personality traits.

Implications

The results of this study provide new empirical evidence about the multidimensional component of behavioral addictions, for which the contribution of variables such as age of onset, duration of the disorder or personality traits should play a differential role depending on the diagnostic subtype and the patients' sex. Our results could be useful for future studies testing an integrative model for describing the underlying mechanisms which lead to the onset and development of each behavioral addiction diagnosis. As with most complex, multifaceted-multidimensional processes, further studies in different areas are needed: etiological research (for example neurological studies to recognize what specific regions, networks, and executive/cognitive functions are involved), and clinical studies (to identify the complete phenotypes and developmental trajectories of each diagnostic condition). Ultimately, a detailed understanding of the etiologically and the course of the behavioral addiction construct, as well as the underlying causes of its variability, will allow for improving prevention and treatment efforts. Special attention must be paid to the contribution of the socio-demographical features, and particularly to sex which seems have a complex contribution to the patients' clinical state depending on other external variables. Mental health preventive and intervention services will be benefit to undertake routine screening and assessment tools with high discriminative capacity for each diagnostic subtype, and to provide effective intervention programs that adequately manage the specific phenotypes. This is especially relevant for some types of behavioral addiction, for which there are few measuring tools and limited standard therapy plans exist (such as CB or SA).

AUTHOR CONTRIBUTIONS

SV-S, RG, FF-A, JM, and SJ-M designed the experiment based on previous results and the clinical experience of NM-B, NA, MG-P, AdP-G, MB, and LM. SV-S, RG, VM-R, GM-B, TS, FF-A, and SJ-M conducted the experiment, analyzed the data, and wrote a first draft of the manuscript. SJ-M, TS, GM-B, RG, and FF-A further modified the manuscript.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

4.2 Artículo publicado 2

Objetivo/s:

En el artículo se contrastan los objetivos 3 y 4 de la tesis.

3. Explorar la existencia de trayectorias evolutivas basadas en la gravedad del TJ, durante los 6 meses posteriores a una intervención cognitivo conductual en pacientes jóvenes (con edad entre 18-35 años).

4. Identificar variables sociodemográficas y clínicas al inicio de la intervención con capacidad discriminativa para diferenciar entre las trayectorias evolutivas.

Título del artículo:

Response trajectories of gambling severity after cognitive behavioral therapy in young-adult pathological gamblers.

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Resumen:

En este trabajo se identificaron tres trayectorias evolutivas para la gravedad del TJ (desde la línea base hasta 6 meses después de la intervención con TCC). Dos trayectorias agruparon pacientes con adicción moderada a grave al inicio, y con buena respuesta terapéutica hasta la recuperación (T1 y T2, que incluyeron el mayor número de sujetos, n = 250, 93.7% de toda la muestra). Una trayectoria agrupó pacientes con alta gravedad de TJ inicial y resultado pobre para la TCC (T3, que incluyó n = 12, 6.3% de la muestra). La posición socioeconómica, la gravedad del TJ al inicio del estudio, el estado psicopatológico y los rasgos de personalidad alcanzaron capacidad discriminativa para diferenciar entre las trayectorias evolutivas. El perfil de personalidad que define la trayectoria de respuesta pobre a la TCC (T3) se caracterizó por elevada evitación del daño y baja autodirección.

El perfil que caracteriza la trayectoria T3 con respuesta más pobre a la TCC incluye pacientes con excesiva preocupación, marcadas tendencias al pesimismo y aprensión, falta de control de impulsos para responder a las circunstancias actuales y a las necesidades inmediatas, falta de autodirección hacia metas y objetivos, ineficacia en la resolución de problemas, sentimientos de insatisfacción generalizada, y bajos niveles de motivación.

Los resultados obtenidos tienen implicaciones en las áreas de la evaluación y la intervención.

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FULL-LENGTH REPORT

Response trajectories of gambling severity after cognitive behavioral therapy in young-adult pathological gamblers

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ABSTRACT

Background and aims: The significant increase in the prevalence of gambling disorder (GD) among young adults in recent years has attracted interest in determining therapeutic efficiency in this sector of the population. The aim of this work was to estimate the response trajectories of gambling severity during the six-month follow-up after a cognitive behavioral therapy (CBT) program in young adult patients and to identify the main variables associated with each trajectory. *Methods:* The sample included $n = 192$ patients, aged 19–35 years old, seeking treatment for GD. Response trajectories were identified through latent class growth analysis. *Results:* Three trajectories emerged: T1 ($n = 118$, 61.5%), composed of patients with severe GD at pre-treatment and good evolution to recovery; T2 ($n = 62$, 32.3%), with patients with moderate-high GD affectation at baseline and good evolution to recovery; and T3 ($n = 12$, 6.3%), with participants with severe baseline GD severity and poor evolution after CBT (Abbott, 2019). The highest risk of poor therapeutic outcomes was related to lower social index positions, high emotional distress, high scores in harm avoidance and low scores in self-directedness. *Discussion and conclusions:* Differences in the response trajectories at short-term follow-up after CBT reveal heterogeneity in the samples including young and young-adult GD patients. Patients' phenotype at baseline should be considered when developing efficient, person-centered intervention programs, which should comprise strategies aimed at increasing emotional regulation capacities, self-esteem and self-efficacy, with the aim of avoiding relapses in the medium-long term after therapy.

KEYWORDS

cognitive behavioral therapy, response trajectories, gambling disorder, latent class growth analysis, personality, psychological predictors

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INTRODUCTION

Gambling disorder (GD) is defined as the uncontrollable urge to continue gambling despite adverse consequences for the individuals (including impaired social functioning, financial trouble or even comorbidity of mental and physical diseases) (American Psychiatric Association, 2013). Recent systematic reviews show that GD problem behaviors are present in between 0.12 and 5.8% of the population across different countries worldwide (Calado & Griffiths, 2016). Increasing prevalences have been estimated in recent decades in both sexes, with particularly disturbing incidences at increasingly younger ages (Calado, Alexandre, & Griffiths, 2017; Gainsbury, Russell, Blaszczynski, & Hing, 2015). This epidemiological picture has led researchers to consider GD as an emergent public health issue, with the consequent burgeoning of empirical research in approaches to preventing and treating gambling-related problems.

Similarities in the endophenotypes of substance-use disorders and GD have been systematically described, leading to craving, withdrawal, tolerance and abstinence syndrome (Banz, Yip, Yau, & Potenza, 2016; Zou et al., 2017). Problem gambling is often accompanied by comorbid psychiatric and maladaptative personality traits, as well as dysfunction of cognitive domains regulating impulsive behavior (Ioannidis, Hook, Wickham, Grant, & Chamberlain, 2019). The GD patients usually perceive multiple adverse consequences related to the gambling activity in several areas (biological, psychological, social and financial). Some individuals accept problematic gambling as a lifestyle and are unlikely to seek treatment (Babić et al., 2018), while others realize they have a problem, feel the need to control their urges to gamble and seek help to stop gambling and recover. Considering this scenario, empirical evidence is required for a better understanding of the underlying mechanisms related to the onset of problem gambling and the GD progression, with the aim of developing effective prevention programs addressed to highly vulnerable populations, to design reliable and valid tools to measure the complete profile of the GD, and to apply precise intervention plans focused on individuals' specific needs.

A number of studies to date have examined the effectiveness of different evidence-based treatment approaches for GD, such as cognitive behavioral therapy (CBT), participate in self-help groups, motivational interviewing, mindfulness, pharmaceutical treatments in certain cases, and novel mixed approaches (Petry, Ginley, & Rash, 2017). Cognitive behavioral models have achieved good evidence explaining and managing GD related problems, and CBT is considered a "gold standard" for the treatment of GD (Abbott, 2019). A number of studies describe the model/procedure of applying CBT in the field of substance-related disorders and behavioral addictions, such as the study by An and colleagues, which integrates key cognitive, affective and behavioral factors in differentiating phases/stages: antecedents, internal-external triggers, the act of the addictive behavior (such as gambling), and post-purchase states (An, He, Zheng, & Tao, 2017). Based on this model, GD can be depicted in the form of a vicious circle, whereby the final negative post-purchase stage generates the emotional triggers for the repetition of the whole cycle, which allows for GD to become self-reinforcing/regulating over time. CBT programs are focused on the development and maintenance of coping strategies that target solving current problems and changing unhelpful patterns in cognitive, behavioral and emotional regulation, with the aim of identifying and acting on the elements supporting the vicious circle around the gambling behavior. Accordingly, CBT includes the development of skills for learning to control and manage high-risk situations to effectively reduce the probability of gambling in the future and to prevent relapses. Compared to substance addictions, the CBT treatment adapted to GD may target the addictive behavior, its underlying mechanisms (including irrational cognitions), and financial management (including potential financial problems) (Rash & Petry, 2014).

A wide variety of CBT programs have been developed for GD. Most of them include common elements, such as systematic desensitization, stimulus control, psychoeducation, financial counseling, cognitive restructuring techniques, and relapse prevention. As a whole, recent systematic reviews measuring the effectiveness of these programs maintain that CBT is an efficient intervention plan at reducing gambling problems and related symptoms immediately following therapy, while the durability of the therapeutic usefulness is unknown (Cowlishaw et al., 2012; Merkouris, Thomas, Browning, & Dowling, 2016). But research gaps exist, as well as controversies regarding how CBT works in the treatment of problem gambling, which particular CBT programs are the most effective, and what is the real usefulness of the different CBT modalities depending on the GD profiles at baseline (Gooding & Tarrier, 2009; Tolchard, 2017). Studies focused on identifying the main factors contributing to both the effectiveness and poor outcome of CBT in GD patients have also obtained varied results. As a whole, high dropout and relapse rates (during the therapy program and in the follow-up), as well as non-compliance issues, are common in outpatient programs (Aragay et al., 2015; Challet-Bouju, Bruneau, IGNACE Group, Victorri-Vigneau, & Grall-Bronnec, 2017). The most significant contributors to limiting long-term adverse consequences and improving outcome appear to be early identification, low severity of gambling at baseline, low severity of psychopathological comorbidity, high motivation, and some personality domains related to impulsivity (Dunn, Delfabbro, & Harvey, 2012). Male gender, low comorbid depression levels, lower gambling symptom severity and higher treatment session attendance have also been found to be the most likely and consistent predictors of successful treatment outcomes across multiple time points (post-treatment, short term, medium term and long term) (Gómez-Peña et al., 2012; S. Jiménez-Murcia et al., 2016, 2015; Merkouris et al., 2016). The resistance to CBT found in many studies has also led to considering the inclusion of supplementary strategies to improve emotional regulation and decrease impulsivity levels in therapeutic plans, with promising therapeutic

effectiveness (Mallorquí-Bagué et al., 2018; Peter et al., 2019; Tárrega et al., 2015).

Parallel to the study of the therapy outcomes, research has focused on the classification of the subtypes of GD and its correlates. It is well known that numerous factors contribute to the risk of developing diverse gambling problems, such as the presence of emotional distress, early wins, cognitive biases related to the gambling activity, impulsivity, personality traits and some sociodemographic features. Different underlying mechanisms have also been related to the onset and courses of the problem gambling. Subtyping GD could also contribute with new valuable evidence toward precise interventions to match individuals' needs. The three pathways model proposed by Blaszczynski and Nower is nowadays one of the most referenced classification systems, considered as a multi-causal framework for conceptualizing GD on the basis of three subtypes of pathological gamblers (Blaszczynski & Nower, 2002): behavioral conditioned (the onset of the disorder resulted from repeated exposure to gambling and the course of the problems was consequence of the contingencies related to the gambling activity), emotionally vulnerable (the patients use the gambling activity as a way to relieve aversive affective states) and antisocial-impulsive (patients with high levels of emotional dysregulation, impulsivity and neurological dysfunction). Subsequent research has examined the validity of this three pathways model in samples with diverse composition and considering different measures for the definition of the latent classes. For example, Milosevic and Ledgerwood identified three GD subtypes (with differences in the psychopathology state, the personality traits and the motivations for gambling) in a comprehensive review of the available empirical literature, and concluded that these profiles were parallel to the three types of gamblers defined in the pathways model (Milosevic & Ledgerwood, 2010). The subsequent study conducted by Moon and colleagues also provided evidence for the validity of the three pathways model as a framework for conceptualizing GD subtypes in a sample comprising both non-treatment-seeking individuals and pathological disordered gamblers, through a hierarchical cluster analysis examining motives for the gambling activity: childhood trauma, boredom proneness, risk-taking, impulsivity, attention-deficit/hyperactivity disorder and antisocial personality (Moon, Lister, Milosevic, & Ledgerwood, 2017). The research by Nower et al. derived three empirical subtypes of disordered gamblers roughly corresponding to the subtypes of the three pathways model, ranging from a subgroup with a lower level of gambling activity and psychopathology to one with high levels of gambling problem severity and comorbid psychiatric disorders (Nower, Martins, Lin, & Blanco, 2013). Finally, the recent study by Devos and colleagues conducting a classification analysis using impulsivity traits and gambling-related cognitions as indicators, also identified three clusters aligned with the three pathways model among a sample composed of gamblers recruited from the community and treatment-seeking pathological gamblers (Devos et al., 2020). But to our knowledge, few studies have examined how the putative subtypes of GD obtain benefits from the CBT programs. The research conducted by Ledgerwood and Petry aimed at obtaining a categorization based on the scores in anxiety, depression and impulsivity observed that although the three pathways types differed in some baseline measures [gambling level, emotional impairment, or the presence of other comorbid disorders (concurrent and lifespan)], this classification did not obtain predictive capacity on the gambling severity after the treatment (Ledgerwood & Petry, 2010). Further studies exploring GD subtypes based on the problem gambling severity through treatments and follow-up should reveal different patterns of recovery and therefore contribute towards identifying the most relevant predictors of the outcomes and the progression of the gambling profiles.

Present study

Despite the available evidence reinforcing the effectiveness of CBT across varied GD patients, increased attention needs to be given to the diverse populations and phenotypes, to the mechanisms of change, medium- and long-term outcomes, and predictors of relapse prevention. In addition, there is no single conceptual/theoretical model of the GD subtyping that adequately accounts for the multiple factors explaining the onset of the gambling problems, its progression and the benefit of the CBT programs.

To our knowledge, no study to date has addressed CBT outcomes in young and young-adult GD patients. The main objective of this study is to use growth curve modeling to estimate response trajectories of the GD progression during the short-term follow-up (6 months) after a group CBT treatment in a sample of young and young-adult GD patients. The secondary objective is to assess the discriminative capacity of sociodemographic and clinical profiles at baseline to differentiate between empirical trajectories.

METHODS

Participants

The sample of this study considered all the consecutive treatment-seeking patients attending one hospital unit specializing in GD and other behavioral addictions in Barcelona (Spain), who fulfilled the following inclusion criteria: fulfill diagnostic criteria for GD, male gender and chronological age within the range of 18 to 35 years old. Exclusion criteria were having an intellectual disability or severe mental disorder (such as schizophrenia or other psychotic disorders or bipolar disorder). Women were also excluded from this work because their low frequency in the treatment unit and the specific GD profiles in women made it more appropriate individual CBT programs (instead the group CBT format analyzed in this work).

The age range from 18 to 35 years was considered as an inclusion criterion since the aim of the study was to obtain empirical trajectories for the therapy response after CBT among middle-age patients. Although there is no complete

consensus regarding the boundary limits for considering young-, middle- and older-age in the health sciences, many studies carried out in the problem gambling area consider that this is the period from late adolescence (age 18 corresponds to legal adulthood) to one's late twenties or early thirties. Prevalence studies internationally have reported that individuals in this age group tend to have the highest rates of problem gambling, and have usually chosen 35 years of age as an upper bound limit (Grande-Gosende, López-Núñez, García-Fernández, Derevensky, & Fernández-Hermida, 2019; Petry, 2002).

The final sample of participants included $n = 192$ participants who completed the CBT program, with a mean chronological age of 29.7 years (SD = 4.1) and a mean age of onset of the GD of 21.1 years (SD = 4.7). Many participants were single ($n = 112$, 58.2%), had a primary ($n = 83$, 43.2%) or secondary ($n = 95$, 49.5%) education level, and held mean-low ($n = 78$, 40.6%) or low ($n = 68$, 35.4%) socioeconomic levels. The first two columns in Table 2 contain the frequency distributions for all the variables analyzed in the study for the whole sample.

The number of dropouts during the follow-up was $n = 55$: risk of dropout = 28.6%, a value consistent with prospective studies carried out in the gambling area (Challet-Bouju et al., 2017). No statistical differences in the sociodemographics and the clinical state at baseline were found comparing patients who completed all the follow-up versus those who dropped out (sex: $\chi^2_{(df = 2)}=2.77$, $P = .251$; education: $\chi^2_{(df = 2)}=1.22$, $P = 0.543$; socioeconomic position index: $\chi^2_{(df = 3)}=2.82$, $P = 0.420$, employment status: $\chi^2_{(df = 2)}=0.03$, $P = 0.863$, chronological age: $F_{(df = 1;190)}=0.76$, $P = 0.385$, age of onset of the gambling problems: $F_{(df = 1;190)}=1.10$, $P = 0.297$, duration of the gambling problems: $F_{(df = 1;190)}=2.07$, $P = 0.152$, number of DSM-5 criteria for GD: $F_{(df = 1;190)}=0.51$, $P = 0.478$, SOGS total score: $F_{(df = 1;190)}=1.54$, $P = 0.216$, and SCL-90R GSI: $F_{(df = 1;190)}=0.57$, $P = 0.540$).

Measures

Diagnostic Questionnaire for Pathological Gambling According to DSM Criteria (Stinchfield, 2003). This is a 19-item tool for assessing DSM-IV (American Psychiatric Association, 2000) criteria for GD, as well as the DSM-5 (American Psychiatric Association, 2013) criteria for this clinical condition. The original version achieved good psychometric properties, as did the Spanish adaptation used in this study (S. Jiménez-Murcia et al., 2009). In our sample, the internal consistency was adequate (Cronbach's alpha $\alpha = 0.75$).

South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987). This instrument is a common tool to assess GD severity, structured in 20 items that measure cognitive, emotional and other behavior strongly related to gambling problems. The Spanish adaptation of this tool showed good high internal consistency (Cronbach's alpha $\alpha = 0.94$) and good test–retest reliability ($r = 0.98$) (Echeburúa, Báez, Fernández, & Páez, 1994). In our sample, internal consistency was adequate ($\alpha = 0.79$).

Symptom Checklist-90 Items-Revised (SCL-90-R) (Derogatis, 1994). This instrument is a self-report tool used for measuring global psychopathology through 90 items structured in nine symptom dimensions (obsessive-compulsive, depression, anxiety, hostility, interpersonal sensitivity, phobic anxiety, somatization, paranoid ideation and psychoticism) and three composite indexes [the global severity index (GSI), the positive symptom total, and the positive symptom distress index]. Good psychometric properties have been reported in Spanish samples (Derogatis, 1997). In our study, the GSI index was employed as a measure of global psychopathology, with an excellent internal consistency in our sample equal to $\alpha = 0.97$.

Temperament and Character Inventory-Revised (TCI-R) (C R Cloninger, 1999). This instrument is a 240-item tool for measuring personality, structured in four temperament dimensions (novelty seeking, harm avoidance, reward dependence and persistence) and three character scales (cooperativeness, self-directedness and self-transcendence). The adapted Spanish version has reported good psychometric indexes (Gutiérrez-Zotes et al., 2004). In our sample, internal consistency ranged from adequate to excellent ($\alpha = 0.72$ for novelty seeking to $\alpha = 0.88$ for persistence).

Other sociodemographic and clinical variables. Additional data were obtained through a semi-structured face-to-face clinical interview (see description in: (Susana Jiménez-Murcia, Aymamí, Gómez-Peña, Álvarez-Moya, & Vallejo, 2006)). The main addictive-related variables analyzed in this study are the age of GD onset, the duration of the addiction, and social status (measured through Hollingshead's index) (Hollingshead, 2011).

CBT program

In the present study, CBT was implemented as a time-limited technique of 16 weekly sessions lasting 90 minutes each, in group (averaging approximately 10 patients per group). The final aims were to achieve full recovery (defined as the definitive abstinence from all types of gambling), to reduce patients' arousal levels in the presence of stimuli that trigger the urge to gamble, to increase their self-control, to regulate their negative emotions and to improve their self-efficacy and their expectations of recovery. The full protocol is available directly from the corresponding author of the manuscript.

Patients received the protocols CBT outpatient program in the Hospital Unit. The program was presented and developed by a qualified CBT, a clinician expert on problematic gambling and GD. Prior to the beginning of the program, patients received group psychoeducation focused on the following topics: a) conceptualization of the GD (providing knowledge about the endophenotype, the onset and course/progression of the disorder, and vulnerability and protective factors); b) explaining the rationale behind CBT; c) patients learning to identify their dysfunctional thoughts and feelings related to the gambling activity; d) explaining problem-solving techniques and cognitive restructuring techniques to generate alternative functional thoughts and feelings of wellbeing (including relaxation procedures); and e) patients learning stimulus control

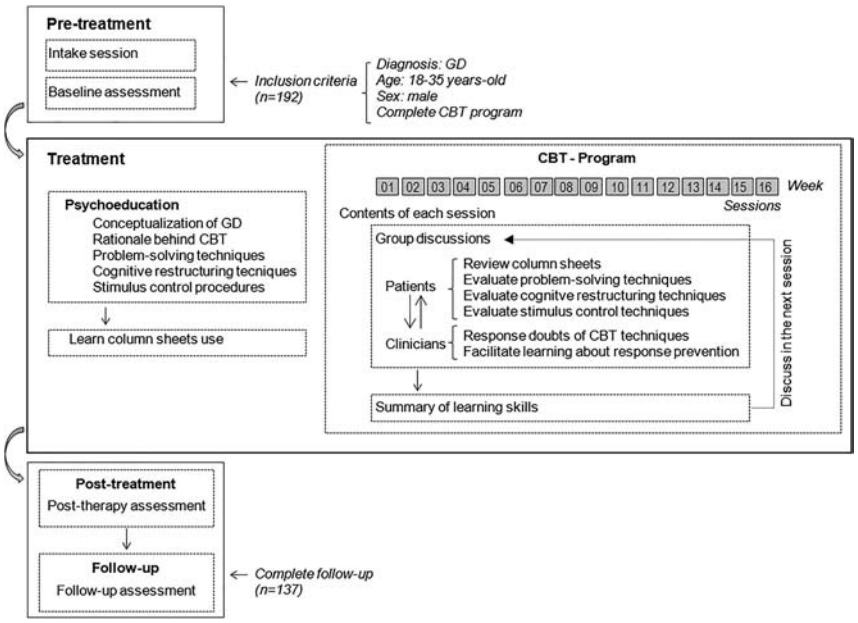

Figure 1. Flowchart/scheme with the CBT program in the study

procedures [such as money management, self-exclusion (from both land-based and online gambling) and avoidance of potential triggers]. Patients were also encouraged to ask a close relative (or significant other) to act as a co-therapist, to help them with all the relapse prevention techniques.

Prior to the CBT program, participants also received column sheets to complete (daily completion is required). Columnar sheets included the following topics: situations where participants felt unwell (sad, anxious, irritable), behaviors related to gambling, automatic thoughts, an objective examination of those automatic thoughts (including counterevidence), adaptive thoughts, and changes in feeling and behavior.

During the 16 treatment sessions, patients applied CBT techniques, completed the column sheets and held group discussions by exchanging questions and opinions regarding the progression of the therapy (mainly, they review the column sheets, evaluate the cognitive restructuring techniques and discussed problem-solving techniques). The clinicians reviewed the column sheets providing contextual explanations and advice on the column methods to complete them during the following weeks. Participants also improved their understanding of the cognitive restructuring and problem-solution techniques by consulting with the CBT clinician expert any doubts regarding response prevention techniques. A summary of the learned skills during CBT was also given in each session. Within approximately four months the CBT program is completed.

After the CBT program, and over the next 6 months, follow-up sessions were held with the patients. The changes in the gambling behavior and in the whole psychological state, as well as the learned skills, were evaluated in the follow-up.

Figure 1 with the flowchart/scheme of the CBT program in the study. Different studies have shown its short- and long-term effectiveness in GD samples (S. Jiménez-Murcia et al., 2017; Susana Jiménez-Murcia et al., 2007, 2016, 2015).

Procedure

Psychological measures were obtained by experienced psychologists with more than 15 years of clinical knowledge of this disorder.

The data analyzed in this work correspond to a longitudinal design comprising the assessment before the start of the CBT program, immediately following CBT, and monthly during the 6 months period following the program.

Statistical analyses

Mplus8 for Windows was used to perform the study's statistical analyses, which combined two different approaches: person-centered and variable-centered procedures. Person-centered methods are typically used to identify groups of individuals who share some specific attributes (characteristics) and to address questions related to group similarities in patterns of development/courses. In contrast, variable-centered approaches are classical methodological procedures used to describe the associations between variables and are suited for addressing the relative contribution of the independent features (predictors) on the dependent outcomes (criteria). In this work, the person-centered approach was implemented through response trajectories analysis and was employed to determine if subgroups of patients exist based on the prospective dynamics of GD severity after the therapeutic intervention and, in such cases, empirically categorizing the individuals into common classes. Next, after establishing the response trajectories, these empirical groups ("latent classes") were compared through variable-centered methods with the aim of assessing how sociodemographic and clinical variables predict GD severity trajectories.

Latent class growth analysis (LCGA) was employed to obtain the empirical GD response trajectories based on gambling severity between post-treatment and 6 months after the final intervention. LCGA is a model included within growth-mixture-modeling (GMM) techniques, characterized by fixing to zero the variance/covariance estimates within a class under the assumption that individuals grouped in the class are homogeneous. Methods used in this study were conducted following GRoLTS guidelines (van de Schoot, Sijbrandij, Winter, Depaoli, & Vermunt, 2017). The trajectories were estimated for the variable SOGS-total score (considered in this research as a measure of gambling problem severity) registered during the first 6 months after completion of the CBT program (seven measurements per participant were used for the grouping: the post-treatment assessment and the next 6 monthly post-evaluations). Because of the strong association between the decreases in problem severity and the initial (baseline) state, the estimation procedure included baseline SOGS-total as a covariate. The GMM was employed (TYPE = MIXTURE, in Mplus syntax), defining the robust maximum likelihood (MLR) estimator in the Analysis command (Enders & Bandalos, 2001; Graham, 2009) and using Lo-Mendell-Rubin (Lo, Mendell, & Rubin, 2001) as a measure to determine the number of classes. The selection of the number of trajectories was based on the following criteria (Nylund, Asparouhov, & Muthén, 2007): a) the lowest Akaike information criterion (AIC), Bayesian information criterion (BIC), Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT) and the bootstrapped likelihood ratio test (BLRT) indexes for the model (compared with other solutions); b) entropy (measure of the model's discriminative capacity, that is, its ability to identify individuals following the different trajectories) above 0.80; c) high on-diagonal average values (around 0.80) in the matrix containing the probabilities of membership (that is, high average latent class probabilities for most likely latent class membership by latent class); d) no less than 5% of participants in a class/trajectory (to allow statistical comparisons); and e) adequate clinical interpretability. The estimation procedure was defined for a linear growth model based on the principle of parsimony (other alternative, more complex quadratic and cubic components were tested and rejected since these other potential solutions did not provide substantively better statistical adjustment and/or models with better clinical interpretation).

Comparison between the empirical latent classes (the response trajectories in this work) was based on chi-square tests for categorical variables (Fisher-exact tests were used for comparisons with cells with low expected frequencies, $e_{ij} < 5$) and analysis of variance (ANOVA) for quantitative variables. Variables compared included measures at baseline (chronological age, age of onset of the gambling, duration of the gambling, DSM-5 criteria for GD, SOGS total score, psychopathological state and personality traits) as well as the presence of relapses during the CBT (relapse was defined as the presence of any gambling episode during which the patients make some kind of bet). The effect size for pairwise comparisons was calculated with Cohen's d for mean differences and Cohen's h for proportion differences (h-coefficients were based on the arcsine transformations for the proportions estimated in the groups). The effect size was considered poor-low for $|d| > 0.20$, mild-moderate for $|d| > 0.50$ and large-high for $|d| > 0.80$ (the same boundary limits were considered in interpreting h-coefficients) (Kelley & Preacher, 2012). Increases in Type-I errors due to multiple statistical comparisons were controlled with Simes' correction method, a familywise error rate stepwise procedure that offers a more powerful test than the classical Bonferroni correction (Simes, 1986).

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The University Hospital of Bellvitge's Ethics Committee of Clinical Research approved the study (reference: PR241/11), and all patients provided signed informed consent.

RESULTS

Table 1 contains the goodness-of-fit indexes for the candidate models obtained in the LCGA, with a number of trajectories between 1 and 4 latent classes (trajectories). Solution models for more than three classes were not considered due to the small group size to allow for subsequent statistical comparisons (the four-classes model defined a group with only two participants).

The final model selected was the three-trajectory solution (Fig. 2 shows the line graph with the shapes for the SOGS evolution from the pre-therapy measure to the 6-month follow-up after the CBT). This model yielded lower AIC-BIC indexes than the two-trajectory solution (AIC = 4159.5, BIC = 4247.4 and adjusted sample-size BIC = 4161.9), good entropy (0.846), very high on-diagonal values in the matrix with the average latent class probabilities (0.951, 0.898, and 0.944 for trajectories T1, T2, and T3), and good clinical interpretability.

Table 2 includes the comparison between trajectories for the variables analyzed in this study (sociodemographic variables are reported in the upper part of the table, baseline state in the middle portion and the risk of relapse during the CBT in the lower part). Trajectory T1 ($n = 118$, 61.5%) included patients with severe GD level at baseline (mean SOGS = 12.5) and good evolution to recovery (mean SOGS = 2.6 at post-therapy and 2.4 at the end of the follow-up).

Trajectory T2 ($n = 62$, 32.3%) represented patients with moderate-high GD affectation at baseline (mean SOGS = 8.7) and good evolution to recovery (mean SOGS = 2.1 at the end of the therapy and 2.3 at the end of the study). The progression of the gambling severity for this response trajectory is quite similar to trajectory T1, and no statistical differences between T1 and T2 emerged comparing sociodemographics, chronological age and age of onset of the gambling problems. However, compared to T1, participants grouped in T2

Table 1. Goodness-of-fit indexes for the LCGA candidate solutions

Model	Fit indexes							Count-size		[d]On-d.
[e]#Traj.	Akaike AIC	Bayes BIC	[a]Adj. BIC	[b]LMR-LRT	[c]Boost.BLRT	Entropy		*n*	%	post.prob.
1-Tr	4397.8	4446.6	4399.1	–	–	1.00	T1	192	100%	1.000
2-Tr	4231.6	4300.0	4233.5	172.7	−2183.9	0.954	T1	179	93.2%	0.994
				(0.073)	(<0.001)		T2	13	6.8%	0.935
3-Tr	4159.5	4247.4	4161.9	81.53	−2094.8	0.846	T1	118	61.5%	0.951
				(0.067)	(<0.001)		T2	62	32.3%	0.898
							T3	12	6.3%	0.944
4-Tr	4063.9	4171.4	4066.8	80.76	−2040.2	0.802	T1	117	60.9%	0.931
				(0.064)	(<0.001)		T2	57	29.8%	0.894
							T3	16	8.3%	0.872
							T4	2	1.0%	0.999

[a]Sample-size adjusted BIC.
[b]Lo-Mendell-Rubin adjusted likelihood ratio test: test value (significance, *P*-value).
[c]Bootstrapped likelihood ratio test (BLRT): Log-likelihood value (significance, *P*-value).
[d]On-diagonal posterior average values in the matrix containing the probability of membership.
[e]Number of trajectories.

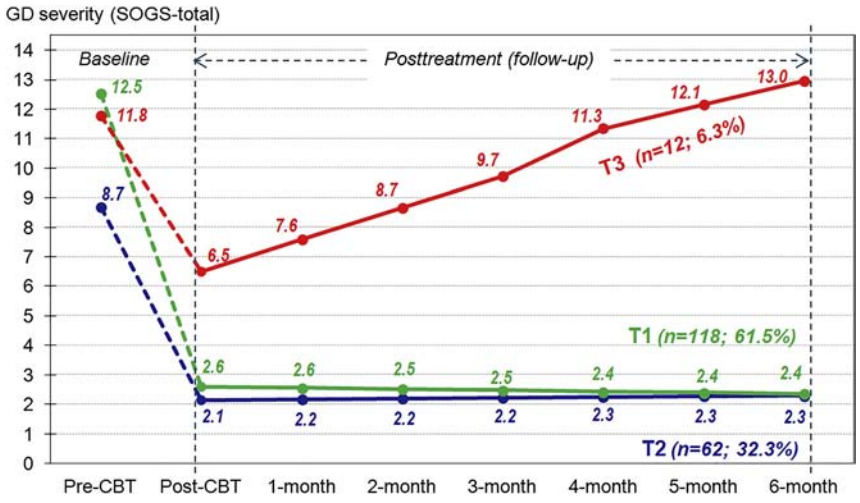

Figure 2. Response trajectories: from pretreatment to 6-month follow-up after therapy ($n = 192$)

registered lower values in novelty seeking and harm avoidance, higher scores in persistence, self-directedness and cooperativeness, more functional psychopathological state (lower SCL-90R GSI score), lower GD severity at pre-treatment and lower evolution of the gambling problems prior to the therapy.

Trajectory T3 ($n = 12$, 6.3%) represented patients with severe GD affectation at baseline (mean SOGS = 11.8) and poor evolution after the CBT (mean SOGS = 6.5 at post-therapy and 13.0 at 6-month follow-up after the treatment). Based on the descriptive estimations, this trajectory included participants with the worst psychopathological state at the beginning of the study (although no significant difference was found between T1 and T3 in the SCL-90R GSI), the highest harm avoidance levels and the lowest self-directedness scores. This trajectory also included a high proportion of participants in the low education levels and low socio-economic status groups, and it registered the highest risk of relapses (calculated as the probability of occurrence of any gambling episode with bets) during the therapy (33.3% versus 16.1% registered for T1 and 14.5% for T2).

DISCUSSION

The main objective of the study was to identify empirical response trajectories for GD severity during the 6-month follow-up after CBT in young and young-adult patients through LCGA. Three trajectories emerged, two of them comprising patients with moderate to severe GD affectation at baseline and good evolution to recovery (T1 and T2 included the largest number of patients, $n = 250$, 93.7% of the whole sample) and one containing patients with severe baseline GD severity and poor CBT outcome (T3 included $n = 12$, 6.3% of the sample). The goodness of fit and the clinical interpretability of the results constitute evidence about the reliability and validity of the response trajectories.

Table 2. Comparison between empirical response trajectories

		Total		T1		T2		T3		Global comparison		Pairwise comparisons					
		N = 192		*n = 118*		*n = 62*		*n = 12*		(Factor group)		T1vsT2		T1vsT3		T2vsT3	
Sociodemographics	α	*n*	%	*n*	%	*n*	%	*n*	%	$\chi^2_{(df)}$	*P*	*P*	|*h*|	*P*	|*h*|	*P*	|*h*|
Marital status																	
Single		112	58.3%	70	59.3%	34	54.8%	8	66.7%	$1.99_{(4)}$	0.738	0.600	0.09	0.537	0.15	0.664	0.24
Married-partner		71	37.0%	44	37.3%	24	38.7%	3	25.0%				0.03		0.27		0.30
Separated-divorce		9	4.7%	4	3.4%	4	6.5%	1	8.3%				0.14		0.21		0.07
Education																	
Primary		83	43.2%	47	39.8%	29	46.8%	7	58.3%	$3.39_{(4)}$	0.080	0.458	0.14	0.333	0.38	0.621	0.23
Secondary		95	49.5%	60	50.8%	30	48.4%	5	41.7%				0.05		0.18		0.14
University		14	7.3%	11	9.3%	3	4.8%	0	0.0%				0.18		**0.51**†		0.32
Social																	
Mean-high + high		17	8.9%	11	9.3%	6	9.7%	0	0.0%	$3.94_{(6)}$	0.214	0.656	0.01	0.488	**0.51**†	0.575	**0.51**†
Mean		29	15.1%	21	17.8%	7	11.3%	1	8.3%				0.19		0.28		0.10
Mean-low		78	40.6%	45	38.1%	28	45.2%	5	41.7%				0.14		0.07		0.07
Low		68	35.4%	41	34.7%	21	33.9%	6	50.0%				0.02		0.31		0.33
Laboral status																	
Unemployed		47	24.5%	28	23.7%	16	25.8%	3	25.0%	$0.10_{(2)}$	0.953	0.758	0.05	0.922	0.03	0.953	0.02
Baseline state		*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	$F_{(df)}$	*P*	*P*	|*d*|	*P*	|*d*|	*P*	|*d*|
Age (years)		29.68	4.07	29.97	3.85	29.10	4.34	29.83	4.82	$0.94_{(2;189)}$	0.394	0.175	0.21	0.914	0.03	0.567	0.16
Age onset (years)		21.10	4.70	20.70	4.36	21.77	5.04	21.62	6.05	$1.06_{(2;189)}$	0.349	0.141	0.23	0.501	**0.18**	0.937	0.03
Duration (years)		9.78	5.30	10.48	5.23	8.54	5.22	9.18	5.67	$2.66_{(2;189)}$	0.073	**0.024***	0.37	0.436	0.24	0.712	0.12
DSM-5 total criteria	0.75	7.14	1.63	8.04	0.85	5.23	1.14	8.17	0.83	$185.3_{(2;189)}$	**<0.001***	**<0.001***	**2.80**†	0.667	0.15	**<0.001***	**2.95**†
SOGS-total score	0.79	11.27	2.98	12.58	2.41	8.70	2.38	11.67	2.12	$52.8_{(2;189)}6$	**<0.001***	**<0.001***	**1.62**†	0.270	0.40	**0.001***	**1.31**†
Psychopology SCL-90R: GSI	0.97	0.87	0.55	0.99	0.56	0.57	0.39	1.21	0.66	15.5	**<0.001***	**<0.001***	**0.88**†	0.219	0.36	**0.001***	**1.18**†
Personality (TCI-R)		*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	$F_{(df)}$	*P*	*P*	|*d*|	*P*	|*d*|	*P*	|*d*|
Novelty seeking	0.72	112.4	13.8	115.1	14.2	106.9	11.6	113.3	12.5	$7.56_{(2;189)}$	**0.001***	**<0.001***	**0.63**†	0.658	0.13	0.129	**0.53**†
Harm avoidance	0.83	97.3	16.9	98.2	16.7	93.2	16.4	109.3	15.1	$5.20_{(2;189)}$	**0.006***	**0.047***	0.30	**0.028***	**0.70**†	**0.002***	**1.02**†
Reward dependence	0.78	98.7	14.3	97.7	14.4	100.9	13.9	97.8	15.6	$1.01_{(2;189)}$	0.364	0.161	0.23	0.969	0.01	0.503	0.21
Persistence	0.88	109.9	19.7	108.2	20.9	114.1	16.2	105.2	21.9	$2.13_{(2;189)}$	0.121	**0.050***	0.31	0.606	0.14	0.152	**0.56**†
Self-directedness	0.86	128.4	20.5	124.5	19.3	139.5	18.8	111.1	13.4	$17.93_{(2;189)}$	**<0.001***	**<0.001***	**0.79**†	**0.020***	**0.80**†	**<0.001***	**1.74**†
Cooperativeness	0.81	130.4	15.5	128.0	15.5	136.4	13.7	123.7	15.9	$7.47_{(2;189)}$	**0.001***	**0.001**	**0.57**†	0.341	0.28	**0.008***	**0.86**†
Self-transcendence	0.80	59.9	12.9	59.5	12.9	59.6	12.7	65.6	13.5	$1.23_{(2;189)}$	0.293	0.986	0.00	0.123	0.45	0.142	0.46
During CBT		*n*	%	*n*	%	*n*	%	*n*	%	$\chi^2_{(df)}$	*P*	*P*	|*h*|	*P*	|*h*|	*P*	|*h*|
[a]Risk of relapses		32	16.7%	19	16.1%	9	14.5%	4	33.3%	$2.63_{(2)}$	0.268	0.780	0.04	0.138	**0.52**†	0.117	**0.51**†

SD= standard deviation; α= Cronbach's alpha in the sample; df= degrees of freedom.

*Significant comparison (0.05 level). †Bold: effect size in the mild-moderate range ($|d| > 0.50$ or $|h| > 0.50$) to high-large range ($|d| > 0.80$ or $|h| > 0.80$).

[a]Relapse was considered for the presence of any gambling episode during which the patients make some kind of bet.

The second objective of this work was to identify variables with the capacity to differentiate between the empirical trajectories, since this finding also provides evidence about the reliability and validity of the latent classes. Our results show that during young adulthood, socioeconomic position, GD severity at baseline, psychopathological state, and specific personality traits achieved discriminative capacity to differentiate between GD response trajectories during the next 6 months after the therapy. As a whole, our results are consistent with previous studies, which found that worse recovery after CBT was related to low education levels, low socioeconomic status, higher gambling symptom severity, or emotional distress (Dunn et al., 2012). These variables related to the resistance to the CBT programs have also been previously related to a higher risk of relapses (Challet-Bouju et al., 2017; Smith et al., 2015), which was also a variable with discriminative capacity on the empirical trajectories.

In our study, the personality profile defining the worst response trajectory to CBT was characterized by high harm avoidance and low self-directedness. This profile would be suggestive of patients with excessive worrying, marked tendencies toward pessimism and apprehension, drive to react to current circumstances and immediate needs, clear lack of self-direction in targets and objectives, ineffectiveness in solving problems, usually with feelings of general dissatisfaction and low levels of motivation. These characteristics have been typically found in subjects more prone to developing increased anxiety and depression during their lives (Bajraktarov, Gudeva-Nikovska, Manuševa, & Arsova, 2017; Kampman, Viikki, Järventausta, & Leinonen, 2014). Moreover, this specific personality profile has been described in most dysfunctional impulsivity-related disorders as well (Claes et al., 2012; del Pino-Gutiérrez et al., 2017), and, in general, these traits have been considered as powerful predictors of the maintenance and continuation of dysfunctional behaviors despite therapeutic interventions (Ociskova, Prasko, Latalova, Kamaradova, & Grambal, 2016). It has been hypothesized that this persistence in behaviors related to high harm avoidance and low self-directedness is due to the patients' reluctance to deal with stressful situations and their affectation in self-perceived wellness and happiness (C. Robert Cloninger & Zohar, 2011). In other words, it would be individuals with difficulties in dealing with their negative emotional states who would self-regulate in a dysfunctional way through strategies of avoidance and escape, such as gambling. Our results related to the relevance of personality traits in defining response trajectories for GD are in line with those of the few follow-up studies examining the long-term effects of treatment programs on such patients, which found the relevance of personality traits for predicting abstinence at six-month and one-year follow-ups (Müller et al., 2017; Ramos-Grille, Gomà-i-Freixanet, Aragay, Valero, & Vallès, 2013). Finally, some studies exploring the association between therapeutic outcomes and personality traits from Cloninger's bio-psychosocial model of personality have concluded that the two traits most significantly connected to self-stigma (high harm avoidance and low self-directedness) are also the most predictive of treatment outcomes (the other five personality traits relate only slightly or not at all to therapy results) (Bajraktarov et al., 2017). These results, however, must be interpreted with caution, since while self-stigma has been widely researched for many mental health conditions (Livingston & Boyd, 2010), few studies have analyzed correlates for self-stigma in the problem gambling area. Available research suggests that fears related to the gambling activity, feelings of shame, guilt, weakness and embarrassment of being perceived as a "problem gambler" could lead to GD patients to keep their activity a secret, avoiding disclosure and considering the results of their behavior as low-efficient (Hing & Russell, 2017), which together can lead to an increase in self-stigma. One would hypothesize that patients with high scores in the temperament trait of harm-avoidance should be characterized by excessive worrying, shyness in social contact, fears, and tendency toward pessimism, which can be directly connected with a predisposition to psychiatric illness (including GD) and the consequent higher levels of stigmatization. Low levels of self-directedness would be characteristic of patients with a low ability to regulate and adapt their behavior to the requirements of the situation and with difficulties in self-acceptance, and this profile is also highly vulnerable to developing mental illness and higher self-stigma.

Finally, the results of our study outlining the predictive capacity of high GD and psychopathological state at baseline on the worst therapeutic trajectory are also consistent with empirical evidence reported in the literature. For example, the study by Merkouris and colleagues found that low levels of gambling problems, accompanied by low depression scores and low scores in novelty seeking, were the baseline factors most strongly related to better outcome at post-therapy and follow-up (Merkouris et al., 2016). The research published by Maniaci and colleagues also outlines that gambling severity and high comorbidity were significant predictors of poor early therapeutic outcomes (Maniaci et al., 2017).

Limitations and strengths

There are three main research limitations in this study that could impact the empirical evidence and results. First, since data correspond to a short-term follow-up time after the therapy (6 months), the response trajectories could be non-representative for a longer period (there is no way of guaranteeing that the empirical classes will persist over time). Second, all the patients who completed the CBT and fulfilled the inclusion criteria were included in the statistical analysis, regardless of the presence of dropouts during the follow-up (the risk of dropping out was 28.6% in the study, which represents a risk consistent with studies in the gambling area). It must be argued, however, that completers and dropouts did not achieve statistical differences in the baseline (sociodemographic and clinical state) and that the procedure used in this study to identify the response trajectories (LCGA in Mplus-8) uses a full information method, which does not replace or impute missing data, but which instead handles incomplete

information within the analysis using all the available information in the data set (this procedure has shown good reliability/validity in producing unbiased parameter estimates for missing data in these types of modeling [which usually treat longitudinal data with a relatively high percentage of missing values]). Third, one of the empirical trajectories included only $n = 12$ participants, which affects the statistical power to assess its potential predictive factors. It must be considered, however, that one of the characteristics of the LCGA is its capacity to identify even groups of patients who represent rare/infrequent clinical conditions with adequate reliability/validity. In this study, the three-class model achieved adequate goodness of fit, and the emergence of this trajectory should be considered of high clinical relevance since it grouped patients with the worst longitudinal recovery. To allow the identification of the potential variables explaining the recovery trajectories, this study includes both significance tests and standardized measures of the effect size that are independent of the sample sizes (Cohen's-*d* and Cohen's-*h* coefficients). Fourth, the results can be generalized only to GD men: women were not considered in this study because the low sample size of gambling disordered females in our treatment unit and the differences in the CBT programs (depending on the patients' sex) could become a source of bias leading to incorrect results and conclusions. Fifth, the lack of a control group in this work does not allow attributing the empirical trajectories of the LCGA to reliable phenotypes/responses to the CBT program. Control groups are needed for discriminating between treatment outcomes from other factors, such as the natural history of a disease or even the researchers' or patients' expectations. It must be stated that a no-treatment group was not ethically reasonable in our work because adequate care for GD has been well clinically established for CBT and potential alternatives (such as waiting-lists) were not possible in our treatment unit. Finally, the comparison between the empirical trajectories was performed for a limited number of measures. Although this study includes all the variables available in the complete sample, considering more characteristics informing on other gambling related variables (such as the neuropsychological functioning and additional features of gambling beyond severity) would have been relevant to provide a complete picture of the empirical classes.

Strengths of this study include the analysis of longitudinal data (from baseline to 6-month follow-up after therapy) in a large sample of young and young-adult GD patients. Strength of this work is its statistical methodological approach, which combines person-centered and variable-level techniques. Traditionally, the study of the effectiveness of the therapeutic plans to treat GD has been focused on variable-centered methods, focused on exploring and describing the relationships between the potential predictors and the therapeutic outcomes, and which have the distinctive feature of considering the patients as a group, isolating the significant clinical features in which individuals differ (these methods operate based on the analysis of the potential correlational structure of the variables, their stability over time, and their predictive capacity for predetermined criteria). Therefore, variable-level approaches do not provide information on person-specific (intra-individual) clinical dynamics states. In contrast, person-centered approaches (such as the identification of response trajectories) start from the grouping of individuals according to their own responses (in our study, the evolution of gambling problem severity) and focus attention on the intra-individual structure of variables (the individual is conceived as a whole and not as the sum of isolated features). The use of LCGA is common in some medical areas, for example, in pediatric studies, which analyze longitudinal data series with the aim of describing courses of children's functioning based on specific childhood outcomes (usually named "developmental trajectories"). The results obtained in these studies provide therapists and families with robust resources to evaluate the clinical deviation of a child's performance/behavior based on the distance observed in relation to other children of similar ages and/or functional ability levels. With the increase in the number and scope of longitudinal research studies, the number of strategies for analyzing prospective data has also expanded, and various medical areas now employ longitudinal analytical techniques such as LCGA. Nonetheless, to our knowledge, few studies have addressed the study of GD based on the identification of response/course trajectories, and the published research employing these techniques has examined the natural history of untreated problem gamblers, largely at young ages. Therefore, gambling severity trajectories obtained in this study should be considered as being well suited for addressing questions that concern individual differences in clinical profiles, their response trajectories and their correlates. These results also put forward future lines of research on gambling progression after therapeutic clinical interventions and about the risk factors for poor response to therapy in young and young-adult gambling samples.

CONCLUSIONS

Our results have implications in both the measurement and the intervention areas. The patient profile most strongly related to poor treatment trajectory in our study includes gambling severity and higher general psychopathology at baseline, as well as harm avoidance and self-directedness traits. Effectiveness measurement and managing of these features could prevent therapy resistance and thereby help prevent individuals from entering the vicious circle of chronic gambling, suffering, and disability.

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4.3 Artículo publicado 3

Objetivo/s:

En el artículo se contrastan los objetivos 5 y 6.

5. Evaluar el papel de la edad cronológica en las relaciones entre la gravedad de los sesgos cognitivos y los niveles de impulsividad en pacientes con TJ con edades entre 18 y 77 años.

6. Ajustar un modelo mediacional (que valore efectos directos e indirectos) que incluya la edad, el perfil de impulsividad, los sesgos cognitivos asociados a la conducta de juego y la gravedad del trastorno de juego.

Título del artículo:

The influence of chronological age on cognitive biases and impulsivity levels in male patients with gambling disorder.

Disponible a través de: https://doi.org/10.1556/2006.2020.00028.

Resumen:

En este trabajo se observó que la impulsividad se asoció a los sesgos cognitivos por conductas de juego. Se identificó tendencia cuadrática entre la edad cronológica y el nivel de sesgo cognitivo relacionado con el juego. No se observó asociación entre impulsividad y edad (excepto en búsqueda de novedad, con tendencia lineal negativa). Mayor sesgo cognitivo predice mayor deterioro cognitivo asociado a juego. Se encontró una contribución directa del nivel de distorsiones cognitivas sobre la probabilidad de preferencia de juego estratégico. No apareció una asociación directa entre los niveles de impulsividad y el subtipo de juego. También se encontraron diferencias entre los grupos de edad en la elección del subtipo de juego preferido (los juegos estratégicos fueron más frecuente entre pacientes más jóvenes).

Las relaciones entre alta impulsividad y mayor grado de sesgos cognitivos con la gravedad de los sintomas de juego halladas en el estudio son consistentes con la evidencia previa, y podrían sugerir, como sucede en las adicciones a sustancias, la implicación de la sensibilizacion por incentivos en los procesos de adiccion, particularmente para explicar el curso de los TJ.

Esta investigación es pionera en valorar cómo la edad contribuye en los niveles de impulsividad y en las distorsiones cognitivas del juego, considerando de forma simultánea ambos constructos.

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FULL-LENGTH REPORT

The influence of chronological age on cognitive biases and impulsivity levels in male patients with gambling disorder

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ABSTRACT

Background and aims: Due to the contribution of age to the etiology of gambling disorder (GD), there is a need to assess the moderator effect of the aging process with other features that are highly related with the clinical profile. The objective of this study is to examine the role of the chronological age into the relationships between cognitive biases, impulsivity levels and gambling preference with the GD profile during adulthood. *Methods:* Sample included $n = 209$ patients aged 18–77 years-old recruited from a Pathological Gambling Outpatients Unit. Orthogonal contrasts explored polynomial patterns in data, and path analysis implemented through structural equation modeling assessed the underlying mechanisms between the study variables. *Results:* Compared to middle-age patients, younger and older age groups reported more impairing irrational beliefs ($P = 0.005$ for interpretative control and $P = 0.043$ for interpretative bias). A linear trend showed that as people get older sensation seeking ($P = 0.006$) and inability to stop gambling ($P = 0.018$) increase. Path analysis showed a direct effect between the cognitive bias and measures of gambling severity (standardized effects [SE] between 0.12 and 0.17) and a direct effect between impulsivity levels and cumulated debts due to gambling (SE = 0.22). *Conclusion:* Screening tools and intervention plans should consider the aging process. Specific programs should be developed for younger and older age groups, since these are highly vulnerable to the consequences of gambling activities and impairment levels of impulsivity and cognitive biases.

KEYWORDS

cognitive biases, gambling disorder, impulsivity, older age, path analysis, younger age

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INTRODUCTION

Epidemiological data for gambling disorder

Systematic reviews of epidemiological studies have shown significant increases in the prevalence of gambling disorder (GD) worldwide during the last decades, with cross-sectional estimates (over the last 12 months) around of 0.1–6% in the general population in developed countries (Calado & Griffiths, 2016). Prevalence studies also warn of a potentially greater risk of problematic gambling in the near future among all sectors of the population as a result of the prevalent ease accessibility to gambling platforms and the increase in the opportunity to gamble (Suissa, 2015). Furthermore, there is an awareness of the high-vulnerability of two age groups for the onset and intensification of the disordered gambling: during adolescence (even at ages when bets on gambling is illegal) and early adulthood stages (Giralt et al., 2018), and among the elderly (Subramaniam et al., 2015; Tse, Hong, Wang, & Cunningham-Williams, 2012). These disturbing reports have led to the appearance of new empirical research in order to provide a comprehensive view of the GD phenotypes. New studies should be focused on the most high-risk groups, and on the analysis of the multivariate relationships between several risk factors (including interaction and mediational effects).

Relevance of cognitive performance on the GD profiles

Cognitive biases related to gambling behavior are a classical and challenging area for the study of GD. Patients with GD systematically report relevant cognitive distortions related with the onset of problematic gambling, its maintenance and the difficulty overcoming this dependence. Studies have shown that irrational thoughts are pervasive in most forms of problematic gambling, and that a number of erroneous beliefs held by GD patients seem to affect their capacity to estimate the real chances of winning, and seriously condition their fallibility of decision making mechanisms (Mallorqui-Bague et al., 2019; Verdejo-Garcia, Alcazar-Corcoles, & Albein-Urios, 2019). The cognitive approach to problematic gambling has identified several types of cognitive biases (Clark, 2010; Clark & Limbrick-Oldfield, 2013; Goodie & Fortune, 2013; Lévesque, Sévigny, Giroux, & Jacques, 2018), which finally give rise to an "illusion of personal control" over the game. Gamblers usually overestimate their capacity of control and can even confuse chance games with games of skill. This results in a perception of expected value of gambling as a positive when expected value is really negative. Studies have systematically observed that GD patients usually overvalue recent results when evaluating the chances of a certain outcome occurring (recency bias). They only seek out information that supports what is called gamblers initial gut decision in ignoring evidence to the contrary that might be a red flag to a given decision (confirmation bias). Likewise, they may believe that a win is necessarily due after a series of loses (gambler's fallacy or near-miss effect [unsuccessful outcome is proximal to a win]). The frequency and intensity of the gambling severity and the continuation of the gambling activity is even justified by gamblers, arguing that they are learning and developing the required skills/abilities to win (Chrétien, Giroux, Goulet, Jacques, & Bouchard, 2017; Emond & Marmurek, 2010; Kovács, Richman, Janka, Maraz, & Ando, 2017; Leonard & Williams, 2016). At a psychological level, it has been postulated that these cognitive distortions related to the gambling severity could be explained by three main mechanisms. The first hypothesis should be the generic poor capacity of humans themselves in processing probability/chance and judging randomness (Williams & Griffiths, 2013; Yu, Gunn, Osherson, & Zhao, 2018). The second hypothesis refers to the specific structural characteristics of some games that could promote cognitive distortions (e.g., the stimuli of bright flashing lights and loud noises of slot-machine that accompany each win) (Myles, Carter, & Yucel, 2019). And thirdly, psychobiological approaches show that cognitive biases in GD could be the result of the brain reward functions: a) neurochemical research has related dysregulation in serotonin, noradrenaline, and glutamate functions with poor decision-making performance (van Timmeren, Daams, van Holst, & Goudriaan, 2018); and b) functional neuroimaging studies and neuropsychological measurements of impulsivity and risky decision-making have revealed damage in the brain function of GD patients (mainly in the ventromedial prefrontal cortex and striatum), as well as impairments in the executive functions (van Holst, van den Brink, Veltman, & Goudriaan, 2010). Research in the cognitive area also evidences that aging is strongly related with declines in cognitive abilities, which could render older adults highly susceptible to many cognitive biases (Miquel et al., 2018). Since these deviations from rationality in judgments could moderate the relationship between age and the final decision-making outcomes (Bangma, Fuermaier, Tucha, Tucha, & Koerts, 2017; Bruine de Bruin, Parker, & Fischhoff, 2012), it has been postulated that aging-related cognitive decline greatly impacts older adults' daily life, including their GD profile (Paolini, Leonardi, Visani, & Rodofili, 2018). But despite the promising results in this area, it remains unclear how chronological age influences the direction, strength/s, and precise mechanisms of the relationships between cognitive styles and problematic gambling-related behaviors.

Relevance of impulsivity as a core mechanism in the GD area

Another core concept to understanding GD profile is impulsivity, currently considered as a complex multidimensional construct explaining behaviors that may be unduly hasty, risky, and/or inappropriate, leading to negative outcomes. Recent models of impulsivity address both its behavioral manifestations and the underlying brain-based mechanisms, and highlight that many psychopathological conditions (including behavioral addictions) require the description of the impulsivity as a core mechanism (Lee, Hoppenbrouwers, & Franken, 2019; Sharma, Markon, & Clark, 2014; Tiego et al., 2019). In fact, GD has been

commonly listed alongside the impulse control disorders, largely as a consequence of the high level of personality traits related to impulsivity reported by GD patients (such as novelty/sensation seeking, lack of perseverance/premeditation, or positive/negative urgency), and by the results of the neurobiological models measuring the relationship between impulsivity levels and gambling activity (Chamberlain, Stochl, Redden, & Grant, 2018; Ioannidis, Hook, Wickham, Grant, & Chamberlain, 2019; Maclaren, Fugelsang, Harrigan, & Dixon, 2011; Rochat, Billieux, Gagnon, & Van der Linden, 2018). Although few studies have addressed the structure of impulsivity in problematic and disordered gambling (Gullo, Loxton, & Dawe, 2014; Hodgins & Holub, 2015; Kräplin et al., 2014; MacKillop et al., 2016), the analysis of the impulsivity levels in different personality domains has received much attention. Along this line, large cross-sectional associations have been found between measurements of impulsivity and gambling severity (including the level of gambling symptoms, frequency of gambling activity, bets per gambling-episodes, or even debts due to the gambling practices) in both clinical and population-based samples (Black et al., 2015; Grall-Bronnec et al., 2012; Yan, Zhang, Lan, Li, & Sui, 2016). Several pioneer longitudinal studies have also suggested that impulsivity levels during childhood may have a predictive capacity on the problematic gambling in emerging adulthood (Dussault, Brendgen, Vitaro, Wanner, & Tremblay, 2011). For example, the literature has highlighted the robust link between behavioral addiction and neurodevelopmental disorders characterized by inattention and hyperactivity-impulsivity, such as the presence of attention-deficit hyperactivity disorder (ADHD) (Brandt & Fischer, 2019). Various hypotheses have been suggested to explain the mechanisms linking ADHD (particularly when it persists in adulthood) with GD (Jacob, Haro, & Koyanagi, 2018), high impulsivity levels being one of the core features (Abouzari, Oberg, Gruber, & Tata, 2015). It has also been postulated that children with ADHD usually report lower intelligence quotient (IQ) than control subjects (Biederman, Fried, Petty, Mahoney, & Faraone, 2012), and the combination of high impulsivity levels with lower IQ could lead to a higher risk of GD (Rai et al., 2014). Moreover, the presence of ADHD during childhood has been defined as a risk of personality disorders (such as borderline, antisocial, avoidant or narcissistic personality) and other psychiatric conditions (the most frequent being anxiety/mood disorders and substance-use disorders), which could play an important role in ADHD, impulsivity and problem gambling (Fatseas et al., 2016). Finally, typical ADHD symptoms have been related to the characteristic cognitive impairments of problem gambling (Chamberlain, Derbyshire, Leppink, & Grant, 2015).

Furthermore, high levels of decision-making impulsivity (largely motor inhibition, attention inhibition or decision-making tasks) have been related to the onset and progression of the GD (Ioannidis et al., 2019). Positive connections between probability discounting (a cognitive bias defined as the subjects' tendency to overvalue reinforcement with lower odds) and gambling have also been reported in the scientific literature in recent years (Kyonka & Schutte, 2018; Steward et al., 2017). As regards the models of impulsivity used to assess the relationships between personality traits and problem gambling, one of the most widely used in the research area nowadays is the UPPS-P scale (Canale, Vieno, Bowden-Jones, & Billieux, 2017), originally based on a multi-faceted conception comprising five impulsive personality traits: lack of premeditation, lack of perseverance, sensation seeking, positive urgency, and negative urgency (Whiteside & Lynam, 2001). This scale was defined based on exploratory factor analysis to identify the personality facets associated with impulsive behaviors from among several other commonly used measurements of impulsivity, and it has shown to have robust correlation with different forms of psychopathology. But despite the extensive literature on GD and its relations to impulsivity, few studies have explored the contribution of chronological age to these associations. The available empirical data show complex underpinnings (Ioannidis et al., 2019; Mitchell & Potenza, 2014). While early impulsivity levels have been proven to increase the risk of impairing gambling behaviors in later life (Dussault et al., 2011), it also seems that regardless of age range gambling activity induces impulsivity levels that evolve into compulsion, chronic forms of addiction and more severe gambling behavior (Hodgins & Holub, 2015; Kovács et al., 2020). This scenario accentuates the need for new research with a special focus on the mechanisms underlying the multidimensional components of impulsivity and age in the GD area.

Consideration of the preferred forms of gambling in the etiology of the GD

Finally, there is currently great interest in the study of preferred forms of gambling. Although most studies published to date have a preference-blind research approach, empirical research suggest that the gambling subtypes could provide an insight into the etiology and treatment of GD, and that taking the specific preferred gambling activity into account could be constraining individuals' phenotype (even about the gambling-related harm) and might offer information about treatment response and disease course (Stevens & Young, 2010; Subramaniam et al., 2016). Two broad categories have been proposed for grouping gambling activity based on the role of chance in the outcome of the game (Odlaug, Marsh, Kim, & Grant, 2011): non-strategic games (also called chance-based games, since little [or no] decision making or skill can be used by gamblers in determining the outcome; e.g., lotteries, slots-machines, bingo) versus strategic games (also called skill-based games, since autonomous decision making skills can be by used by gamblers in determining the outcome; e.g., poker, sports/animals betting, craps, stock market). The study of the correlates of the gambling preference have found multiple reasons that lead individuals to a preferred gambling style, including sociodemographics (gender, age, education level, civil status and social position (Jiménez-Murcia et al., 2019; Kastirke, Rumpf, John, Bischof, & Meyer, 2015), accessibility/availability of the gambling platforms (Moore, Thomas, Kyrios,

Bates, & Meredyth, 2011), certain personality traits (mainly novelty/sensation seeking and impulsivity levels) (Lorains, Stout, Bradshaw, Dowling, & Enticott, 2014b; Navas et al., 2017), and even the psychological state and level of the disordered gambling (Bonnaire et al., 2017; Chamberlain, Stochl, Redden, Odlaug, & Grant, 2017; Ledgerwood & Petry, 2010; Suomi, Dowling, & Jackson, 2014). Regarding the effect of chronological age on the gambling preference, chance-based games are more likelihood selected by older individuals, who tend to select low skill (high chance) gambling activities (Moragas et al., 2015). It has been suggested that age-related vulnerabilities of the brain typical among elderly (in particular the poor neuropsychological performance, which means reasoning slowness, difficulty to gain explicit insight into the rules of decision tasks, and limited ability in assess the real risks in decision making activities), could be a reason why elders select games characterized by lower decision making processes (Mouneyrac et al., 2018; Schiebener & Brand, 2017). On the other hand, lower age, higher levels in different impulsivity domains, and better cognitive performance, have been related to the preference for skill-based games (Jiménez-Murcia, Granero, Fernández-Aranda, & Menchón, 2020). And despite gambling preferences appearing to be relevant to the study of GD phenotypes and evidence existing of variables that may favor a preferred style of gambling, the underlying processes considering simultaneously cognitive biases, impulsivity levels, and chronological age are unknown.

Objectives

In summary, empirical evidence support that cognitive biases and impulsivity levels play a relevant role for both the development and progression of the GD, and it seems that these constructs could be meaningfully interrelated. Studies also suggest that gambling preference may be clinically significant and could contribute towards the phenotype of GD patients. However, few studies have explored how patients' age can modulate the underlying mechanism between this set of variables during the adulthood, and to our knowledge no research has analyzed mediational links through path analysis.

The aim of this study was to assess the role of the aging process in the relationships between impulsivity profile and cognitive bias with gambling preferences and severity. The specific objectives were: a) to explore polynomial trends between patients' chronological age with impulsivity and cognitive distortions; and b) to assess the underlying mechanisms through path analysis (including mediational links) between the study variables: age, impulsivity profile, cognitive biases and gambling severity levels. Analyses were performed in a clinical sample of patients with ages between 18 to 77 years-old treatment seeking due the problematic gambling. Based on the empirical evidence we hypothesized: a) positive linear trends between age and impulsivity and cognitive bias levels; b) positive correlations between cognitive distortions and impulsivity levels; c) a mediational link between age, cognition and impulsivity measures, and gambling severity measures.

METHODS

Participants

The data analyzed in this work correspond to a research project developed at the Pathological Gambling Outpatient Unit at University Hospital of Bellvitge, with the objective to examine risk factors for gambling behavior in the adulthood population of individuals with gambling behavior. The initial sample considered for the study included $n = 227$ patients recruited between July 2016 and October 2016, when they first attended for assessment and before starting treatment. Inclusion criteria in the study were age 18+ years-old, met clinical criteria for GD and education level and cognitive capacity to complete the self-report measurements of the study. Only patients who sought treatment for GD as their primary health concern were admitted to this study.

After accepting to be part of the study and completing the whole assessment, 16 women were excluded, due to the low frequency of this gender in the study and the difference in the age distribution between sexes (in the range 18–77 for men and 37–65 for women). Another two participants were not included in the analysis due to lack of response to the questionnaire measuring cognitive biases. Therefore, the final sample for the study was $n = 209$ patients.

Three groups of age were defined in the study based on the tertiles in the study, with the aim to divide the sample in three parts each containing approximately a third of the participants (3 groups were considered to guarantee sample size enough for the statistical comparison and the remaining analyses). The three groups were labeled in this wok as "younger age" (18–35 years, $n = 73$), "middle age" (36–45 years, $n = 63$), and "older age" (46–77 years, $n = 73$). All the data analyzed in this work correspond to the first assessment before the patients began the therapy.

Measures

Diagnostic Questionnaire for Pathological Gambling (according to DSM criteria) (Stinchfield, 2003). This is a self-report questionnaire including 19 items coded in a binary scale (yes-no), originally developed for diagnosing GD according to the DSM-IV-TR (American Psychiatric Association, 2010). This tool has currently been adapted to assess the DSM-5 criteria for GD (American Psychiatric Association, 2013) by deleting the illegal acts symptom and fixing a cut-off of four symptoms to diagnose GD (five was the cut-off for the DSM-IV-TR criteria). This self-report can obtain different measurements for the GD based on the DSM-5 taxonomy: the presence/absence for each DSM criterion, the presence/absence diagnosis for GD, a dimensional measurement of the gambling severity (total number of DSM criteria, obtained as the sum for the individual criteria), and the GD severity grouped in four levels [non-problematic gambling (for individuals who met 0 criteria), problematic gambling (for 1–3 criteria), moderate-GD (for 4–5 criteria), mild-GD (for 6–7 criteria), and severe-GD (for 8–9

criteria)]. The Spanish adaptation of the questionnaire used in this work obtained very good psychometrical properties (Cronbach's alpha equal to $\alpha = 0.81$ for general population and $\alpha = 0.77$ for clinical sample) (Jiménez-Murcia et al., 2009). The internal consistency obtained in the sample of this work was adequate ($\alpha = 0.76$).

South Oaks Gambling Severity Screen (SOGS) (Lesieur & Blume, 1987). This is a 20-item self-report questionnaire developed with the aim of measuring the symptom level of the problem gambling, as well as the related negative consequences. A total score is generated as the sum of the items, typically considered as a measurement of the GD severity. Good psychometrical properties were obtained for the tool in different clinical and population-based settings (Lesieur & Blume, 1993), as well as for the Spanish validation used in this work (test-retest reliability R = 0.98, internal consistency $\alpha = 0.94$ and convergent validity R = 0.92) (Echeburúa, Báez, Fernández, & Páez, 1994). The internal consistency in the study was $\alpha = 0.712$.

Gambling Related Cognitions Scale (GRCS) (Raylu & Oei, 2004). This is a 23-item self-report questionnaire used to assess gambling-related cognitions in both population-based and clinical disordered gambling samples. Items are structured into five primary cognitive factors: gambling related expectancies, illusion of control, predictive control, perceived inability to stop gambling, and interpretative bias. A total score is also available as the sum of the primary-factor scores. The internal consistency in the study was $\alpha = 0.76$ for expectancies, $\alpha = 0.78$ for illusion of control, $\alpha = 0.77$ for predictive control, $\alpha = 0.81$ for illusion of control, $\alpha = 0.78$ inability to stop gambling, and $\alpha = 0.93$ for the total scale.

Impulsive Behavior Scale (UPPS-P) (Whiteside, Lynam, Miller, & Reynolds, 2005). This is a 59-item self-report questionnaire developed to assess different domains of impulsivity: lack of perseverance, lack of premeditation, sensation seeking, negative urgency, and positive urgency. This tool has obtained satisfactory psychometric properties in the original version and in the Spanish adaptation (Verdejo-Garcia, Lozano, Moya, Alcazar, & Perez-Garcia, 2010). The internal consistency in the study was $\alpha = 0.75$ for lack of premeditation, $\alpha = 0.82$ for lack of perseverance, $\alpha = 0.85$ for sensation seeking, $\alpha = 0.94$ for positive urgency, and $\alpha = 0.87$ for negative urgency.

Other variables. The other variables analyzed in this study were assessed face-to-face with a semi-structured interview, which included socio-demographics (e.g. gender, education, civil status, and employment status), and other gambling problem related variables (age of onset and duration of the gambling behaviors, cumulate debts due to the gambling behaviors, and bets per gambling/episode). This specific tool has been described elsewhere (Jiménez-Murcia, Aymamí, Gómez-Peña, Álvarez-Moya, & Vallejo, 2006). Socioeconomic status was measured with the questionnaire designed by Hollingshead, which generates a position level index based on the education attainment and occupational prestige (Hollingshead, 2011).

Statistical analysis

Statistical analysis was carried out with Stata16 for windows (Stata-Corp, 2019). Firstly, the association between patients' age and cognitive biases (GRCS scales) and impulsivity levels (UPPS-P scales) was estimated with Pearson correlation coefficients (R, also called the Pearson product-moment correlation coefficient). The Curve Estimation Fit procedure (CurveFit) was also used to test goodness-of-fit for functions different to the linear-model (logarithmic, inverse, quadratic, cubic, power, S, growth, exponential and logistic). The resulting non-adequate fit for most of the relationships suggested that a better understanding of the associations between the variables should be provided, categorizing age. Since there is no consensus regarding the bounds for age ranges within the gambling area (bounds substantially vary between studies according to different definitions and criteria), we decided on a classification in three groups based on the tertiles estimated in the sample itself, in this study labeled younger, middle and older age.

Secondly, the comparison of the means registered for the cognitive biases (GRCS scales) and the impulsivity levels (UPPS-P scales) between the age groups (younger, middle, and older) was based on analysis of variance (ANOVA), which included orthogonal polynomial contrasts to assess linear and quadratic trends and post-hoc multiple comparisons with the least significant difference estimation method. For this set of statistical comparisons, Finner's method (a familywise error rate procedure which is more powerful than the classical Bonferroni correction) was used to control increase in Type-I error due to multiple statistical tests (Finner, 1993). The effect size for the mean differences was also measured using Cohen's-*d* (effect size was considered low-poor $|d| > 0.20$, moderate-medium for $|d| > 0.5$, and large-high for $|d| > 0.8$) (Kelley & Preacher, 2012).

The association between the clinical profiles in the study (cognitive biases, impulsivity and other gambling related variables measured) were estimated with Pearson correlations (R), stratified by the age groups. Due to the strong association between the statistical significance of R-coefficients and the sample size, the correlation effect sizes were established as follow: poor-low $|R| > 0.10$, moderate-medium $|R| > 0.24$, and large-high $|R| > 0.37$ (these cut offs corresponded to a Cohen's-*d* of 0.20, 0.50 and 0.80, respectively) (Rosnow & Rosenthal, 1996). Path analysis assessed the magnitude and significance of the relationships between the variables of the study with the gambling severity level, including direct and indirect effects (mediational links). This procedure can be used for both exploratory and confirmatory modeling, and therefore permits theory testing and theory development (MacCallum & Austin, 2000). This analysis was implemented as a case of structural equation modeling (SEM), using the maximum-likelihood estimation (MLE) method of parameter estimation (Kline, 2005). A latent variable was defined as a measure of the impulsivity levels defined by the UPPS-P scores. Goodness-of-fit was evaluated using standard statistical measures: chi-square test (χ^2), the root mean square error of approximation (RMSEA), Bentler's Comparative Fit Index (CFI), the

Tucker-Lewis Index (TLI), and the standardized root mean square residual (SRMR). Adequate model fit was considered for the following criteria (Barrett, 2007): RMSEA < 0.08, TLI > 0.9, CFI > 0.9, and SRMR < 0.1. The global predictive capacity of the model was measured by the coefficient of determination (CD). The variables used in the study as a measurement of the GD severity were the SOGS-total (as indicators of the GD symptom level) and the bets per gambling-episode (other alternative measures were not considered due the lack of fit).

Ethics

Written informed consent was obtained for all the participants in the study. The work was approved by the Ethics Committee of University Hospital of Bellvitge (reference number PR095/16) in accordance with the Helsinki Declaration of 1975 as revised in 1983.

RESULTS

Characteristics of the participants

The first block of Table 1 contains the descriptive parameters for the sociodemographics registered in the sample. Most participants were single (41.1%) or lived with a stable partner (46.9%), achieved primary (61.7%) or secondary education levels (30.1%), and had a low social index status (64.1%). The only differences that emerged between age

Table 1. Descriptive for the sample

		Total		Age 18–35		Age 36–45		Age 46–77		
		(*n* = 209)		(*n* = 73)		(*n* = 63)		(*n* = 73)		
Sociodemographics		*n*	%	*n*	%	*n*	%	*n*	%	*p*
Marital status	Single	86	41.1%	48	65.8%	26	41.3%	12	16.4%	**<0.001***
	Married	98	46.9%	22	30.1%	28	44.4%	48	65.8%	
	Divorced	25	12.0%	3	4.1%	9	14.3%	13	17.8%	
Education	Primary	129	61.7%	43	58.9%	35	55.6%	51	69.9%	0.319
	Secondary	63	30.1%	23	31.5%	24	38.1%	16	21.9%	
	University	17	8.1%	7	9.6%	4	6.3%	6	8.2%	
Social index	Mean-high to high	4	1.9%	0	0.0%	2	3.2%	2	2.7%	0.469
	Mean	20	9.6%	9	12.3%	6	9.5%	5	6.8%	
	Mean-low	51	24.4%	19	26.0%	18	28.6%	14	19.2%	
	Low	134	64.1%	45	61.6%	37	58.7%	52	71.2%	
Employment	Unemployed	67	32.1%	24	32.9%	14	22.2%	29	39.7%	0.091
	Employed	142	67.9%	49	67.1%	49	77.8%	44	60.3%	
Substances use-abuse		*n*	%	*n*	%	*n*	%	*n*	%	*p*
Tobacco		112	53.6%	41	56.2%	38	60.3%	33	45.2%	0.182
Alcohol		54	25.8%	15	20.5%	19	30.2%	20	27.4%	0.412
Other illegal drugs		22	10.5%	6	8.2%	9	14.3%	7	9.6%	0.490
Prevalence of comorbid disorders		*n*	%	*n*	%	*n*	%	*n*	%	*p*
[a]Any other comorbid disorder		62	29.7%	17	23.3%	23	36.5%	22	30.1%	0.241
Depression		14	6.7%	2	2.7%	4	6.3%	8	11.0%	0.138
Anxiety		20	9.6%	3	4.1%	5	7.9%	12	16.4%	**0.035***
Specific Phobic		1	0.5%	0	0.0%	1	1.6%	0	0.0%	0.312
Social Phobia		1	0.5%	0	0.0%	0	0.0%	1	1.4%	0.392
Compulsive-essive		7	3.3%	1	1.4%	1	1.6%	5	6.8%	0.119
Other		20	9.6%	7	9.6%	7	11.1%	6	8.2%	0.849
Gambling variables		*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*p*
Chronological age (years-old)		41.97	13.38	27.94	5.28	40.91	2.84	56.93	7.43	**<0.001***
Age of onset (years-old)		25.62	10.31	20.62	4.37	24.93	8.86	31.22	12.76	**<0.001***
Duration of gambling (years)		16.35	12.57	7.32	5.21	15.98	9.39	25.71	13.50	**<0.001***
DSM-5 total criteria		7.19	1.64	7.12	1.48	7.25	1.67	7.19	1.78	0.899
SOGS total score		14.56	4.29	14.29	4.64	14.90	4.08	14.53	4.15	0.706
Debts due to gambling		4,125	5,636	4,019	5,417	3,786	5,503	4,525	6,006	0.735
Bets mean/episode		67	85	66	81	83	98	54	73	0.131
Bets maximum/episode		587	636	621	637	638	670	508	605	0.417
Gambling preference		*n*	%	*n*	%	*n*	%	*n*	%	*p*
Non-strategic		149	71.3%	46	63.0%	42	66.7%	61	83.6%	**0.014***
Strategic		60	28.7%	27	37.0%	21	33.3%	12	16.4%	

Note. SD: standard deviation. *Bold: significant comparison (0.05).
[a]This variable has been generated to identify the presence of at least one comorbid disorder.

groups was in the civil status (the prevalence of single participants was higher among younger age).

The second and third block of Table 1 contains the prevalence of substances use-abuse and the presence of other comorbid disorders. No differences between groups were found, except for the prevalence of anxiety disorder which showed a higher frequency in older participants.

As regards gambling variables, age of onset was lower with the lower the age of the patients, while duration was higher with the older the age. No differences were found between the groups for the variables measuring the gambling severity (gambling symptoms level, debts due to gambling, and bets per gambling-episode). Differences between the groups also were found for the gambling preferred subtype, with the prevalence for strategic games being most frequent in younger patients.

Association between age with cognitive biases and impulsivity levels

Table S1 (supplementary material) contains the Pearson correlation coefficients and the results of the CurveFit procedure measuring the linear and non-linear functions between chronological age (considered on a continuous scale, in years of age) with the GRCS and UPPS-P scales. No relevant correlation emerged (all coefficients were in the poor-low range) and non-significant results were also obtained for most of the models tested (except for inability to stop gambling [$F = 3.76$, $df = 3/205$, $P = 0.012$] and sensation seeking [$P < 0.005$] for many of the polynomial contrasts).

Table 2 shows the mean scores in the GRCS and UPPS-P scales (see also mean plots in Fig. 1 and radar-chart in Fig. 2), as well as the results of the ANOVA comparing the groups of age (younger, middle and older). As regards the cognitive bias severity, a quadratic trend was found for the predictive control, interpretative bias and the total score (line plots in Fig. 1 seem to be similar polynomial functions to curved parabolas): younger and older groups showed the highest means, while middle-age group showed the lowest mean. A positive linear trend was obtained for the perceived inability to stop gambling: as the higher the age the higher was the mean level in the scale. Considering the impulsivity levels, No differences between the groups of age were found in the impulsivity levels, except for the sensation seeking scale, which showed a negative linear trend: the older the age the lower was the mean score in this scale.

Contribution of the age on the associations between cognitive and impulsivity with gambling

Table 3 contains the correlation matrix with the variables measuring cognitive bias, impulsivity levels and gambling severity, stratified by the groups of age. Italic font is used for the correlations obtained between scales of the same questionnaire or construct (which tended to be relevant in the three groups of the study, excepting for the association between the GD severity measures). As a whole, the pattern of relationships was different depending on the participants' age. Among younger age patients: a) cognitive bias severity tended to show positive associations with the impulsivity levels (mainly with the positive and negative urgency scales); b) higher level in cognitive bias (except for gambling related expectancies and illusion of control) positively correlated with the GD symptom level and the cumulate debts due to the gambling activity; and c) the impulsivity levels did not

Table 2. Differences between groups of age on the cognitive biases related to gambling and impulsivity levels

	Age 18–35		Age 36–45		Age 46–77		Polynomial		Pairwise comparisons					
	Y-Young		M-Middle		O-Old		Trends		(post-hoc contrasts)					
	($n = 73$)		($n = 63$)		($n = 73$)		LT	QT	Y vs. M		Y vs. O		M vs. O	
Cognitive bias (GRCS)	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*p*	*p*	*p*	$\|d\|$	*p*	$\|d\|$	*p*	$\|d\|$
Expectancies	12.38	7.20	11.00	7.31	12.40	7.64	0.991	0.213	0.278	0.19	0.991	0.00	0.273	0.19
Illusion of control	7.89	4.80	6.89	4.77	8.55	6.16	0.455	0.098	0.274	0.21	0.455	0.12	0.070	0.30
Predictive control	17.29	8.68	13.89	7.28	17.64	8.82	0.796	**0.005***	**0.019***	0.42	0.796	0.04	**0.009***	0.46
Inability stop gambling	15.78	7.71	16.52	7.77	19.07	9.25	**0.018***	0.472	0.603	0.10	**0.018***	0.39	0.076	0.30
Interpretive bias	13.51	7.22	11.78	6.53	14.38	7.38	0.455	**0.043***	0.157	0.25	0.455	0.12	**0.033***	0.37
Total score	66.85	30.12	60.11	27.18	71.99	31.59	0.299	**0.040***	0.190	0.23	0.299	0.17	**0.021***	0.40
Impulsivity (UPPS-P)	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*p*	*p*	*p*	$\|d\|$	*p*	$\|d\|$	*p*	$\|d\|$
Lack of premeditation	24.01	7.42	24.59	6.97	24.67	8.37	0.604	0.832	0.663	0.08	0.604	0.08	0.949	0.01
Lack of perseverance	21.49	5.61	22.62	5.19	22.18	6.95	0.491	0.387	0.277	0.21	0.491	0.11	0.670	0.07
Sensation seeking	29.21	7.53	26.03	8.87	25.42	8.17	**0.006***	0.299	**0.025***	0.39	**0.006***	**0.51**†	0.666	0.07
Positive urgency	31.16	10.95	31.25	11.01	31.70	11.56	0.773	0.916	0.963	0.01	0.773	0.05	0.817	0.04
Negative urgency	31.21	8.35	32.38	7.71	32.75	8.11	0.248	0.742	0.398	0.15	0.248	0.19	0.789	0.05

Note. SD: standard deviation. LT: linear trend. QT: quadratic trend.
*Bold: significant comparison (0.05). †Bold: effect size into the mean-moderate ($|d| > 0.50$) to high-large ($|d| > 0.80$) range.

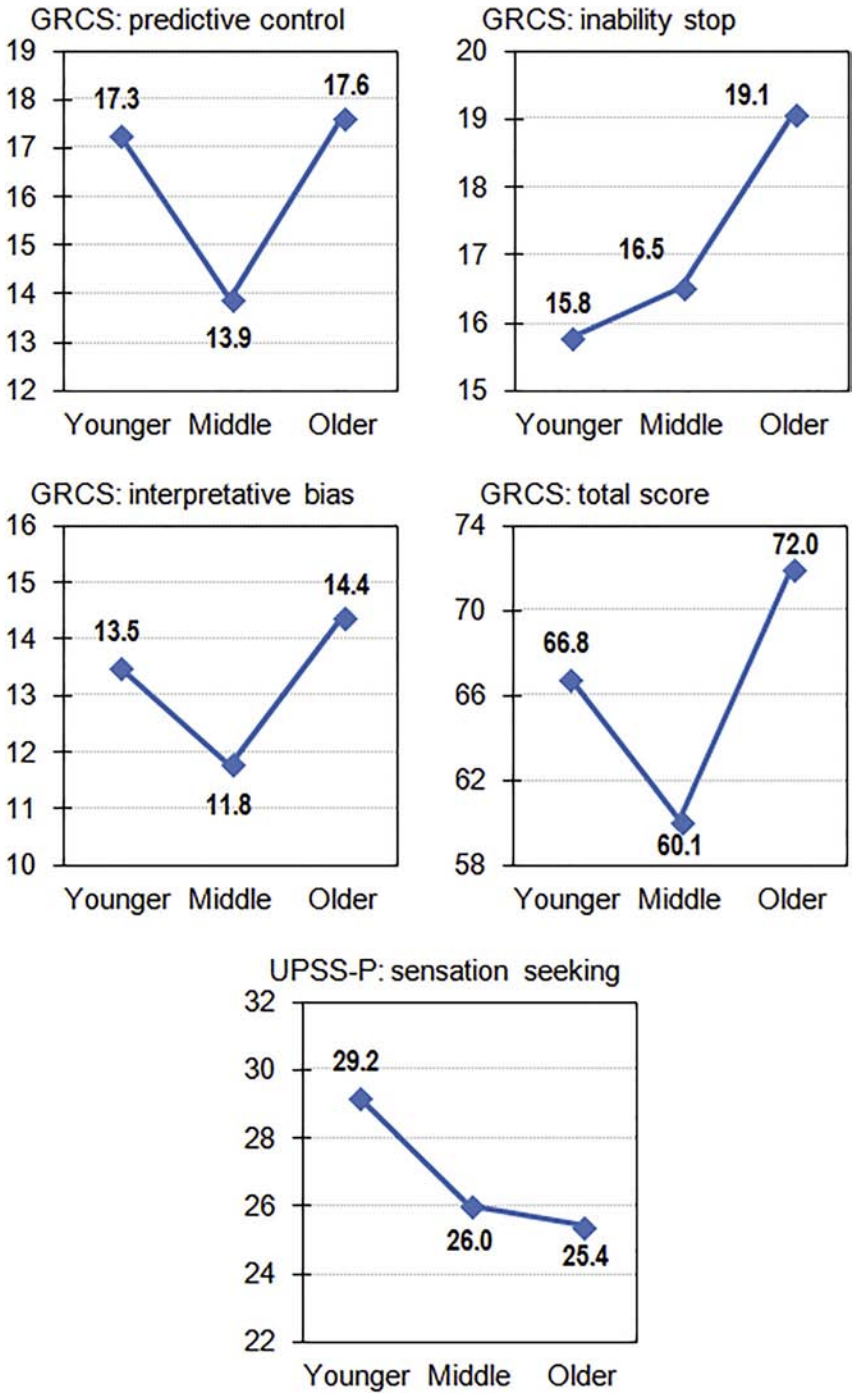

Fig. 1. Mean plots (n = 209)

relate to the gambling severity. Among older age patients: a) cognitive bias also tended to correlate with impulsivity levels (especially with lack of premeditation and lack of perseverance scales); b) regarding cognitive bias severity, gambling-related expectancies correlated with the debts due to the gambling activity, while inability to stop gambling correlated with the bets per gambling/episode; c) lack of premeditation and lack of perseverance related to the cumulate debts due to gambling, and negative urgency correlated with the bets per gambling-episode; and d) no association was found between the GD symptom level with cognitive bias or impulsivity levels. And among middle age patients: a) a few number of associations emerged between cognitive bias severity and impulsivity levels (and effect size was also lower than correlations obtained in the other two groups); b) GD symptom levels correlated with both cognitive bias severity and impulsivity levels (except for lack of premeditation and lack of perseverance); c) the bets per gambling-episode correlated with the cognitive bias severity in the predictive of control, interpretative bias and total score.

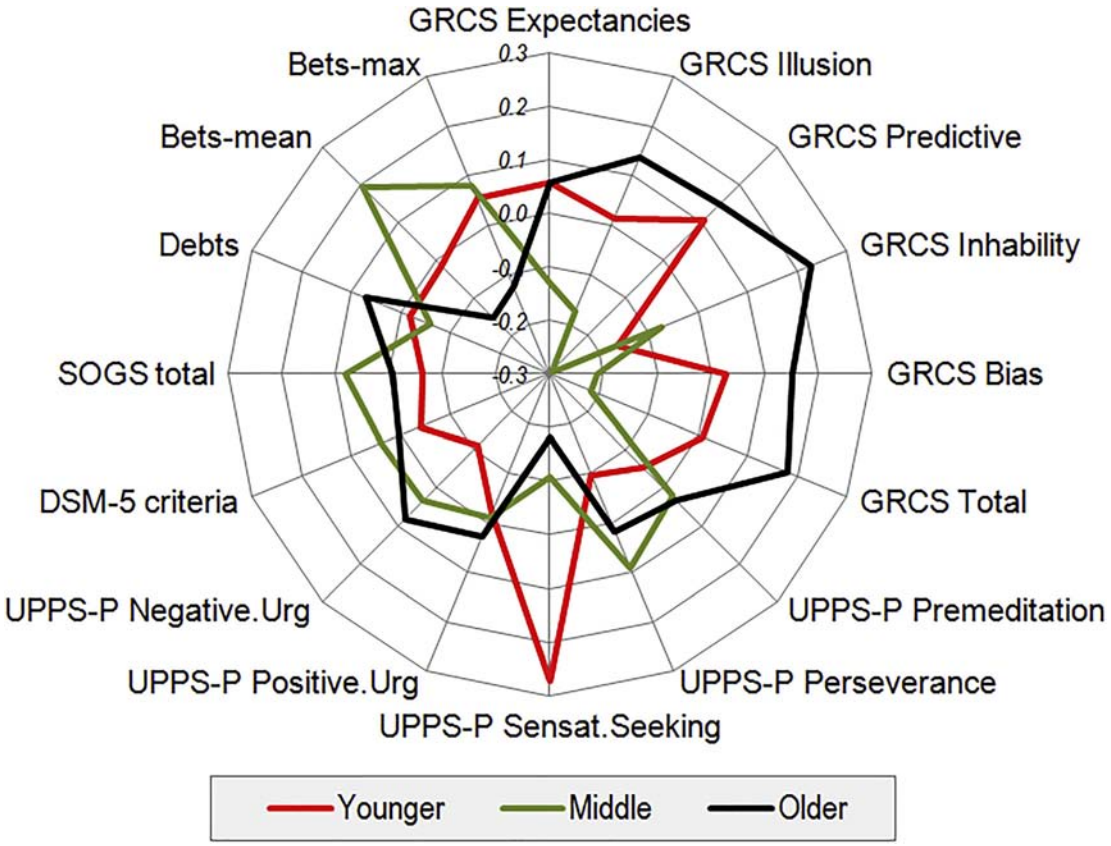

Fig. 2. Radar-chart with the z-standardized means based on the groups of age (n = 209)

Path analysis

Figure 3 contains the path-diagram with the standardized coefficients obtained in the SEM. This model included the participants' age (defined as a continuous variable, in years of age), impulsivity level (a latent variable defined by the UPPS-P scores), global cognitive bias level, gambling related variables (preferred subtype and measures of severity), and the variables that had achieved a significant relationship with the patients' age (marital status, comorbidity with psychiatric disorders and duration of the gambling behavior). Age of onset was not considered a predictor or a potential confounding variable in the SEM since it is generated as the difference between chronological age and the duration of the problematic gambling, with the consequence of lack of fit due to the collinearity among predictors.

Only significant parameters were retained in the model, which was adjusted for the GD duration. The latent variable defining the impulsivity levels was positively and significantly defined by all the UPPS-P scales. Adequate goodness-of-fit was obtained: χ^2 = 71.39 (P = 0.171), RMSEA = 0.029 (95% CI: 0.001–0.053), CFI = 0.980, TLI = 0.972 and SRMR = 0.046. The global predictive capacity was CD = 0.726. The results of the SEM indicate that higher impulsivity levels directly explained the cumulate debts due to the gambling activity. Higher cognitive bias severity showed a direct effect increasing the likelihood of strategic gambling preference, higher GD symptom level, and higher bets per gambling-episode. Age also contributed in the gambling profile: a) a direct effect related younger ages with strategic gambling preference; b) a mediational link related older age with higher likelihood of a comorbid depression-anxiety disorder, which presence increased the GD symptom level. Civil status also contributed in the model: being unmarried (single, divorced-separated or widowed) increased the bets per gambling episode, as well as in the mediational link of increasing the likelihood of comorbidity with depression-anxiety and therefore the GD symptom severity.

DISCUSSION

This study assessed the role of chronological age in the underlying mechanism between cognitive biases, impulsivity levels, and preferred forms of gambling with the GD severity measures. The results obtained evidenced a higher impairing cognitive functioning among younger and older patients, while similar impulsivity levels were achieved by the different age groups (except for sensation seeking, with higher scores among younger ages). Moreover, path analysis showed a direct contribution of cognitive bias to strategic gambling preference, GD symptom level and bets per gambling-episode, a direct effect of impulsivity levels on debts due to the gambling activity, a negative direct effect of age on gambling preference, and a mediational link between

Table 3. Association between cognitive biases with impulsivity and gambling severity: Pearson correlation coefficients

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Age: 18–35 (n = 73)															
1. GRCS Expectancies	**0.48**†	**0.66**†	**0.70**†	**0.64**†	**0.84**†	**0.32**†	**0.36**†	0.15	**0.32**†	**0.34**†	0.07	0.16	0.12	0.16	0.15
2. GRCS Illusion of control	–	**0.65**†	**0.49**†	**0.54**†	**0.72**†	**0.33**†	0.22	0.13	**0.35**†	**0.30**†	0.16	0.15	0.08	0.11	0.15
3. GRCS Predictive control		–	**0.68**†	**0.75**†	**0.90**†	0.09	**0.24**†	0.05	**0.24**†	**0.28**†	0.16	0.22	**0.26**†	0.12	0.08
4. GRCS Inability stop			–	**0.67**†	**0.86**†	0.14	**0.34**†	0.17	**0.39**†	**0.38**†	0.22	**0.29**†	0.09	0.12	0.13
5. GRCS Interpretive bias				–	**0.86**†	**0.24**†	0.17	0.06	**0.35**†	**0.41**†	**0.28**†	**0.27**†	**0.25**†	0.12	0.19
6. GRCS Total score					–	**0.25**†	**0.32**†	0.13	**0.39**†	**0.41**†	0.21	**0.27**†	0.20	0.15	0.16
7. UPPS-P Premeditation						–	**0.52**†	0.05	**0.39**†	**0.42**†	0.15	−0.06	−0.02	−0.08	0.06
8. UPPS-P Perseverance							–	−0.01	**0.35**†	**0.34**†	0.12	0.10	0.03	−0.12	−0.18
9. UPPS-P Sens.seeking								–	**0.45**†	**0.39**†	0.05	−0.05	−0.11	−0.15	−0.12
10. UPPS-P Posit.urgency									–	**0.85**†	0.20	0.20	−0.02	0.00	0.02
11. UPPS-P Negat.urgency										–	0.13	0.13	−0.04	0.01	−0.08
12. DSM-5 criteria for GD											–	**0.41**†	−0.06	0.09	0.08
13. SOGS total score												–	0.08	0.10	0.01
14. Debts due to gambling													–	**0.37**†	**0.36**†
15. Bets mean/episode														–	**0.50**†
16. Bets max/episode															–
Age: 36–45 (n = 63)															
1. GRCS Expectancies	**0.52**†	**0.73**†	**0.48**†	**0.67**†	**0.86**†	**0.26**†	0.18	0.19	0.22	0.14	**0.42**†	0.17	0.18	−0.11	0.11
2. GRCS Illusion of control	–	**0.49**†	0.20	**0.56**†	**0.63**†	−0.03	0.08	0.03	0.16	0.14	**0.34**†	0.00	0.20	−0.06	0.12
3. GRCS Predictive control		–	**0.54**†	**0.74**†	**0.89**†	0.16	0.15	0.08	0.12	0.12	**0.37**†	−0.09	0.10	0.09	**0.34**†
4. GRCS Inability stop			–	**0.56**†	**0.73**†	**0.28**†	**0.42**†	0.19	0.17	**0.29**†	**0.27**†	0.02	0.14	0.00	0.11
5. GRCS Interpretive bias				–	**0.88**†	0.16	**0.28**†	0.15	0.18	**0.27**†	**0.44**†	0.06	0.19	0.05	**0.31**†
6. GRCS Total score					–	0.23	**0.29**†	0.17	0.21	**0.24**†	**0.43**†	0.04	0.19	0.00	**0.25**†
7. UPPS-P Premeditation						–	**0.67**†	0.22	0.21	**0.28**†	0.07	−0.01	0.18	−0.09	−0.01
8. UPPS-P Perseverance							–	−0.02	**0.25**†	**0.40**†	0.04	−0.06	0.21	−0.22	0.03
9. UPPS-P Sens.seeking								–	**0.53**†	**0.49**†	**0.29**†	−0.07	−0.20	0.06	0.06
10. UPPS-P Posit.urgency									–	**0.71**†	**0.25**†	0.00	0.07	−0.04	−0.07
11. UPPS-P Negat.urgency										–	**0.25**†	−0.01	−0.10	0.00	0.07
12. DSM-5 criteria for GD											–	**0.26**†	−0.04	−0.20	−0.06
13. SOGS total score												–	−0.09	−0.22	−**0.36**†
14. Debts due to gambling													–	−0.04	0.04
15. Bets mean/episode														–	**0.35**†
16. Bets max/episode															–
Age: 46–77 (n = 73)															
1. GRCS Expectancies	**0.60**†	**0.64**†	**0.41**†	**0.59**†	**0.79**†	**0.43**†	**0.48**†	**0.35**†	**0.33**†	**0.27**†	0.11	0.14	**0.24**†	0.15	0.23
2. GRCS Illusion of control	–	**0.69**†	**0.45**†	**0.54**†	**0.79**†	0.22	**0.24**†	0.19	0.12	0.11	0.17	0.04	0.13	0.09	0.08
3. GRCS Predictive control		–	**0.48**†	**0.62**†	**0.85**†	**0.32**†	**0.33**†	0.22	0.17	0.14	0.04	0.10	0.03	0.04	0.11
4. GRCS Inability stop			–	**0.62**†	**0.76**†	**0.42**†	**0.29**†	0.18	0.18	**0.33**†	0.07	0.00	−0.02	0.14	**0.28**†
5. GRCS Interpretive bias				–	**0.84**†	**0.30**†	**0.31**†	0.18	0.15	0.18	0.15	0.13	0.08	−0.02	0.06
6. GRCS Total score					–	**0.43**†	**0.41**†	**0.28**†	**0.24**†	**0.27**†	0.13	0.10	0.10	0.10	0.20
7. UPPS-P Premeditation						–	**0.75**†	**0.25**†	**0.33**†	**0.53**†	0.07	0.03	**0.33**†	0.19	0.23

(continued)

Table 3. Continued

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
8. UPPS-P Perseverance							–	0.22	**0.31**†	**0.45**†	0.04	0.07	**0.31**†	0.18	0.15
9. UPPS-P Sens.seeking								–	**0.51**†	**0.34**†	−0.06	−0.05	0.09	−0.03	0.21
10. UPPS-P Posit.urgency									–	**0.66**†	0.07	−0.01	0.19	0.04	0.17
11. UPPS-P Negat.urgency										–	−0.09	0.06	0.21	**0.29**†	0.23
12. DSM-5 criteria for GD											–	**0.36**†	0.11	−0.02	−0.13
13. SOGS total score												–	−0.02	0.20	0.03
14. Debts due to gambling													–	**0.27**†	0.23
15. Bets mean/episode														–	**0.54**†
16. Bets max/episode															–

Note. †Bold: effect size into the mean-moderate ($|R| > 0.24$) to high-large ($|R| > 0.37$) range.

age and the presence of a comorbid depressive-anxiety disorder and GD symptom level.

The results obtained in this work showing the relationships between high impulsivity and strong cognitive biases with the gambling symptoms level are consistent with previous evidence reported in scientific literature (Del Prete et al., 2017; Michalczuk, Bowden-Jones, Verdejo-Garcia, & Clark, 2011; Ruiz de Lara, Navas, & Perales, 2019). It has been postulated that impulsivity behavior in decision making tasks could predispose individuals to accept erroneous beliefs without questioning in GD in at-risk (problem) gambling (Ioannidis et al., 2019). A recent meta-analysis has also demonstrated the existence of a synergistic relationship of different measures and components of impulsivity with cognitive distortions related to substance addictions (which seem independent of moderator influences), which could be compatible with incentive sensitization theory of addiction processes (Leung et al., 2017). Our results could suggest an expansion of this theory to the behavioral addictions area, particularly to explain the development course of the GD.

But still more relevant: in this study a quadratic trend has emerged between patient age and gambling related cognitive bias level, while there was no association between impulsivity levels and age, except for sensation seeking (which adjusted to a negative linear trend). These are novel findings, and seemingly contradictory to the evidence previously reported in literature. Neurocognitive studies have shown that age is a key factor for changes in negatively biased information-processing, and many studies in this area have thoroughly identified and described the sharp decline in several cognitive tasks performance with advancing age (Harada, Natelson Love, & Triebel, 2013). Based on these studies, cognitive abilities related to reasoning, memory, and processing performance decline gradually over time, which could make us hypothesized (at least) a positive linear trend between age and cognitive bias (and depending on the processing speed with which cognitive activities performed, also a quadratic trend describing the slowing/rapidity of the processes among the groups of age) (Salthouse, 2010). However, most of the published studies have been interpreted comparing cognitive bias profiles with standardized age-related trajectories in a typically developing population, which makes it difficult to compare this evidence with the results obtained in our sample (consisting exclusively of GD treatment-seeking patients). And although it is very important to find out what are the cognitive changes of individuals who met clinical criteria for a psychopathological condition compared to the normal process accompanying aging (to evaluate how these unhealthy processes affect daily functioning, and to identify structural and functional alterations in brain) (Salthouse, 2012), it is also of increasingly importance to understand the cognitive changes that accompany aging in samples with mental health conditions. This was a primary novel objective of this work, and our results are also pioneering in this area.

As regards the changes in impulsivity levels with age, a similar process can be considered: since it is 'normal' for

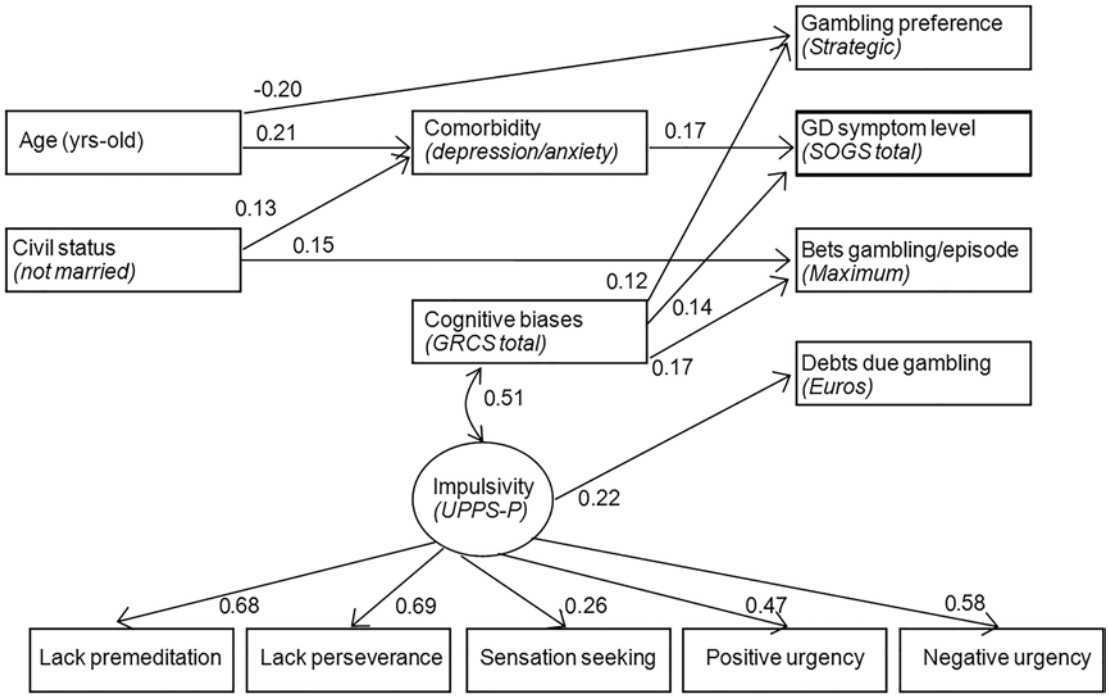

Fig. 3. Path-diagram with the results of the SEM (n = 209). *Note.* Only significant coefficients were retained in the model. Results adjusted by the duration of the GD

impulsivity to decline as people grow older, we had hypothesized a decrease in the means for the UPPS-P scales when comparing younger, middle and older age. However, this pattern was only identified for one of the impulsivity components analyzed in the study: sensation seeking scale reported lower scores as the patient age increased. To understand this apparent discrepant result, it must be realized that our study analyzes a clinical sample of patients treatment-seeking for an addictive disorder (GD) that occurs throughout the life cycle, and that is characterized by a strong lifespan impulsivity-related pattern. It is therefore not surprising that impulsivity becomes decreasingly less frequent with aging among patients with problem gambling, and that poor impulsive control should be reported independent of the chronological age. This result outlines the relevance of impulsivity in all GD groups, including younger and older groups.

On the other hand, the pattern of associations between cognitive distortions and impulsivity with the gambling severity obtained in this work was moderated by patient age. Most studies evaluating the contribution of impulsivity and cognitive bias on the gambling related behaviors have obtained strong associations, independent of age. But again, most of these studies only measured these constructs at a single point-in-time, and therefore the links between the manifestation of impulsivity and cognitive performance in GD patients of different age groups was unclear. Our results outline that although impulsivity and cognitive bias should be (strongly) related with GD and problem/at-risk gambling, age seems to be moderating the frequency and effect size of these relationships. This evidence may have implications for the development of reliable/valid assessment tools and effective therapeutic plans, which should consider the particular cognitive style and the impulsivity profiles expected within different age groups.

The results of the SEM in this study indicate that higher cognition bias is predictive of higher impairment due to the gambling activity, and it demonstrates the existence of a mediational link between age, depression-anxiety and the GD severity. A number of studies have reported that problem and disordered gambling showed higher cognitive distortions, and perceived experiencing higher levels of negative affective states than recreational gambling and control samples (Tang & Oei, 2011; Yang, Tang, Gu, Luo, & Luo, 2015). Studies have also reported that the poorer performance in decision-making tasks correlates with the higher gambling severity (Cosenza, Ciccarelli, & Nigro, 2019). Our study contributes in this area, since it shows that, although gambling severity might seem independent of the chronological age in clinical samples of GD treatment-seeking patients, a mediational/indirect effect is observed through the presence of a comorbid depressive-anxiety disorder: older subjects are particularly vulnerable to increase the gambling impairment if they have a comorbid mental problem. Moreover, according to the SEM obtained in this study sample, civil status was also a variable to be considered in this mechanism: being unmarried (single, divorced or widowed) not only shows a direct effect on the bets per gambling-episode, but also increases the risk of a comorbid depressive-anxiety problems and, therefore, is an indirect variable explaining the GD severity. This result is consistent with previous etiological studies focused on the

identification of the variables related with the onset of the GD and the severity of the gambling behaviors, which outline that having a stable partner is a preventive factor (Elton-Marshall et al., 2018). Furthermore, the global results of the SEM add the novel evidence that older age and being unmarried increase the odds of depressed-anxious problems, and that this is precisely a profile highly vulnerable to present with the most severe consequences of the GD. It must be noted that older adults usually experience financial difficulties or insecurity, loss of physical ability (particularly mobility), as well as a loss of relationships with relatives and friends. Furthermore, subjects are likely to lose their partner during later life, and since unpartnered older adults tend to be more socially isolated (with the consequence of increasing depression and anxiety levels), the risk of severe problematic gambling due to loneliness and its consequences is predictable (Botterill, Gill, McLaren, & Gomez, 2016; Parke, Griffiths, Pattinson, & Keatley, 2018).

Path analysis in this study showed a direct contribution of cognitive distortions level on the likelihood of strategic gambling preference, which is consistent with other previous empirical studies (Levésque, Sévigny, Giroux, & Jacques, 2017; Navas et al., 2017). However, our SEM did not retain a direct association between the impulsivity levels and the gambling subtype, as was suggested by previous studies that concluded that higher levels of impulsivity behavior may increase likelihood of strategic gambling, as well as a higher risk of accumulating losses (Lorains, Dowling, et al., 2014a; Lorains, Stout, et al., 2014b; Worhunsky, Potenza, & Rogers, 2017). It must be noted, however, that our study includes simultaneously the cognitive bias severity and the impulsivity levels in the path analysis, which allows obtaining the specific contribution of each construct on the gambling type. Indeed, the path in our work show a correlation between impulsivity and disturbed thoughts (higher impulsivity levels are related to worse cognitive reasoning performance), and therefore it would also be possible to consider both a direct effect of cognitive bias on the gambling preference, and also that cognitive style could act as a mediational variable in the relationship between the impulsivity levels and the preferred gambling style. On the other hand, considering that strategic gambling in the sample of this work was directly related to younger age, the results of the SEM seem consistent with a new phenotype described in the GD profile characterized by strong gambling-related cognitive distortions, young age, and the preference for skill-based games (Mallorquí-Bagué, Mestre-Bach et al., 2018a; Mallorquí-Bagué, Tolosa-Sola et al., 2018b; Myrseth, Brunborg, & Eidem, 2010; Perales, Navas, Ruiz de Lara, Maldonado, & Catena, 2017). Evidence published to date suggest that this phenotype may be explained by heightened sensitivity to the rewarding features of gambling activities, greater disinhibition and sensation seeking, and therefore, with a higher risk for progression and escalating the disordered gambling, and could be even related to the new forms of gambling activities (such as online gambling) (Jiménez-Murcia et al., 2019).

Limitations, strengths and implications

Three main limitations should be taken into account when interpreting the results of this work. Firstly, because the patients in our sample are all men, extrapolation of the results to women is not possible. Secondly, the data analyzed are from a cross-sectional study, which does not allow the longitudinal changes in the measures to be determined (a repeated measures design should allow developmental trajectories of individual facets of cognitive bias and impulsivity to be examined, as well as its relationship with the GD profile). And thirdly, although a number of constructs strongly related to the GD severity and the gambling preference were analyzed in the study (age, cognitive biases, impulsivity, sociodemographic features and comorbid psychopathological state), other variables that could also be involved in the GD mechanism were not addressed.

Some strengths should also be noted. The sample of this study included patients from a large range of ages (between 18 to 77 years-old), and therefore results may be extrapolated to a substantial proportion of GD treatment-seeking patients. The multivariate analysis of two constructs strongly related to the GD (cognitive bias and age) is another relevant strength, since it allows obtaining the specific contribution of each domain in the gambling profile, as well as the potential moderator role of the patients' age.

This study has clinically relevant implications in the area of the development of assessment tools with high reliability to identify the core components of the GD, as well as for the advance in effective and precise therapeutic programs focused on the specific characteristics of problematic and disordered gambling patients.

Authors' contribution: Conceptualization, Susana Jiménez-Murcia; Data curation, Roser Granero and Susana Valero Solis; Funding acquisition, Susana Jiménez-Murcia and Fernando Fernández-Aranda; Investigation, Amparo del Pino-Gutiérrez, Gemma Mestre-Bach, Isabel Baenas, S.Fabrizio Contaldo, Mónica Gómez-Peña, Neus Aymamí, Laura Moragas, Cristina Vintró, Teresa Mena-Moreno, Eduardo Valenciano-Mendoza and Bernat Mora-Maltas; Project administration, José M. Menchón and Susana Jiménez-Murcia; Supervision, Susana Jiménez-Murcia; Writing – original draft, Roser Granero and Susana Jiménez-Murcia; Writing – review & editing, Fernando Fernández-Aranda and Roser Granero.

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APPENDIX A. SUPPLEMENTARY DATA

Supplementary data to this article can be found online at https://doi.org/10.1556/2006.2020.00028.

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4.4 Artículo publicado 4

Objetivo/s:

En el artículo se contrasta el objetivo 7 de la tesis

> **7.** Explorar la existencia de clústeres en pacientes con AV a partir de un amplio conjunto de indicadores que incluyen variables sociodemográficas, psicopatológicas y rasgos de personalidad.

Título del artículo:

Subtyping Treatment-Seeking Gaming Disorder Patients.

Disponible a través de: https://doi.org/10.1016/j.addbeh.2021.10708.

Resumen:

En este trabajo se identificaron dos perfiles/clústeres de pacientes con adicción a videojuegos, con diferencias en variables sociodemográficas y clínicas. El grupo 1, con un funcionamiento desadaptativo moderado, se asoció a edades más jóvenes, edad de inicio más temprana en el uso de videojuegos y menor duración de la conducta adictiva, sexo masculino, estado civil soltero, situación laboral inactiva, mejor estado psicopatológico y rasgos de personalidad más funcionales. El grupo 2, con un funcionamiento más grave y desadaptativo, se asoció con estado civil casado o con pareja situación laboral inactiva, mayor proporción de mujeres, edad más avanzada, inicio más tardío del uso de videojuegos y mayor duración de los problemas relacionados con la conducta adictiva, mayor número de síntomas a nivel psicopatológico y perfil de personalidad más disfuncional. Apareció una asociación entre la gravedad del uso de los videojuegos y la comorbilidad (los pacientes dentro del perfil grave/desadaptativo mostraron más problemas comórbidos).

Los dos grupos identificados en este trabajo podrían contribuir al estudio del efecto moderador de las diferencias individuales y los tipos de juego, en la aparición y progresión del trastorno.

Por otro lado, conocer la variabilidad que existe en muestras de pacientes que comparten un mismo diagnóstico clínico (en este caso, adicción a videojuegos) podría contribuir al desarrollo de herramientas de evaluación y detección estandarizadas adecuadas y fiables basadas en la evidencia, así como intervenciones personalizadas centradas en las necesidades específicas del paciente.

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Subtyping treatment-seeking gaming disorder patients

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ABSTRACT

Background and aims: Gaming Disorder (GD) is characterized by a pattern of persistent and uncontrolled gaming behavior that causes a marked impairment in important areas of functioning. The evolution of the worldwide incidence of this disorder warrants further studies focused on examining the existence of different subtypes within clinical samples, in order to tailor treatment. This study explored the existence of different profiles of patients seeking treatment for GD through a data-driven approach.

Methods: The sample included $n = 107$ patients receiving treatment for GD (92% men and 8% women) ranging between 14 and 60 years old (mean age = 24.1, $SD = 10$). A two-step clustering analysis approach explored the existence of different underlying GD profiles based on a broad set of indicators, including sociodemographic features, clinical course of the condition (e.g., onset or evolution), psychopathological symptoms, and personality traits.

Results: Two GD profiles emerged. The first cluster grouped together patients who presented with a lower psychological impact ($n = 72$, 66.1%), whereas the second cluster comprised patients with a higher psychological impact ($n = 35$, 32.7%). Cluster comparisons revealed that those patients presenting the higher impact were older, with a later onset of pathological gaming patterns, and more pronounced psychopathological symptoms and dysfunctional personality profiles.

Conclusions: GD severity is influenced by specific demographic, clinical, and psychopathological factors. The identification of two separate profiles provides empirical evidence that contributes to the conceptualization of

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this disorder, as well as to the development of reliable and valid screening tools and effective intervention plans focused on the precise characteristics of the treatment-seeking patients.

1. Introduction

For most people, video games constitute a healthy leisure activity. What was previously used as a hobby (sometimes, with little social acceptance), has today been socially normalized to the point that there is a subculture that has turned this type of entertainment into a way of life (John et al., 2019). Parallel to this increased popularity, experts have emphasized the risks of the inappropriate use of video games (King, 2018), particularly among adolescents and young people, who are at increased risk of developing addictive-like symptoms (Sugaya et al., 2019). While research shows that video game involvement is for the great majority a playful and non-problematic activity (Chung, Vanderbilt, & Soares, 2015; Pallavicini, Ferrari, & Mantovani, 2018), a subgroup of vulnerable gamers with low social skills, low self-esteem, and self-efficacy may find in these games a way to avoid psychological distress (Blasi et al., 2019; Cudo et al., 2019). Among this vulnerable group, the preoccupation with gaming and the inability to set limits on how much time is spent gaming could lead to poor performance at school, work or household responsibilities, the neglect of other hobbies or friendships, and even a decline in personal hygiene or grooming (Chen & Chang, 2019).

In the progression from occasional gaming to problematic gaming, individuals demonstrate irritability, anxiety or anger when forced to stop gaming, as well as withdrawal-like physical and psychological symptoms (Mathews et al., 2019). When this scenario results in functional impairment, people usually require mental health counseling, and the first step of treatment is to identify the specific patient's characteristics with the aim of selecting the most effective interventions. Depending on the severity and course of the pathological gaming pattern, the associated psychiatric comorbidities, the severity of functional impairment, the personality profile, and the socio-contextual characteristics, some patients may require more intensive treatment programs (with increased supervision in a highly-structured environment) (Zajac et al., 2020). Unfortunately, studies conducted on treatment-seeking gamers are relatively scarce to date (Stevens et al., 2019).

Despite the proliferation of research investigating the effects of video games, there is a lack of consensus on the appropriate diagnostic framework (operational definition and diagnostic criteria) for the conceptualization of excessive and problematic gaming as a mental disorder (Kardefelt-Winther et al., 2017; A. Musetti et al., 2019; Alessandro Musetti et al., 2016; Saunders, Degenhardt, & Farrell, 2017; van Rooij, Van Looy, & Billieux, 2017; Castro-Calvo et al., 2021). Previous research generally considered gaming disorder (GD) as an addictive disorder characterized by persistent, excessive, and uncontrolled gaming that results in significant functional impairment and psychological distress (causing conflict in family relationships, social isolation, declining academic performance, and even physical/emotional illness) (Rumpf et al., 2018; Saunders, Hao, et al., 2017; Weinstein, 2010). GD has also been approached from an understanding of a disorder based on a continuum, ranging from normative-recreational use (gaming behavior without related problems), to problematic use (gaming with some related problems) and pathological gaming (persistent gaming characterized by loss of control and significant functional impairment) (Starcevic & Billieux, 2017). From this perspective, it is crucial to distinguish between persistent but not problematic gaming and problematic gaming, in order to avoid over-diagnosis and pathologization of normal behavior (Billieux, Flayelle, Rumpf, & Stein, 2019). In fact, the lack of clear diagnostic boundaries is an important feature characterizing GD (André et al., 2020), but also much internet-based problematic behavior (which require to differentiate between engagement, problematic use, and addiction) (di Carlo et al., 2021; Pettorruso et al., 2020). Further studies remain necessary to improve the assessment and diagnosis of GD (reliable screening and assessment tools) (King et al., 2020), as well as to develop and validate adequate-efficient treatment protocols (Costa & Kuss, 2019; King et al., 2017).

Although GD was not classified as a specific mental disorder in the DSM-5 (American Psychiatric Association, 2013), Internet Gaming Disorder is included in its section III ("Emerging Measures and Models"). In 2019, The World Health Organization included Gaming Disorder (GD) in the last revision of the International Classification of Diseases (ICD-11) within the section of disorders due to addictive behaviors. GD is defined as a "pattern of gaming behavior ("digital-gaming" or "video-gaming") characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences" (WHO, 2020). For GD to be diagnosed, significant impairment in personal, family, social, educational, occupation or other relevant areas of functioning is required, for at least 12 months (Billieux et al., 2017). According to a recent international Delphi study in which 29 GD experts rated the diagnostic validity, clinical utility, and prognostic value of the DSM-5 Internet Gaming Disorder criteria and the ICD-11 GD clinical guidelines (Castro-Calvo et al., 2021), the latter were reported to adequately diagnose GD. In contrast, some DSM-5 criteria (e.g., escapism/mood regulation, tolerance) were regarded as incapable of distinguishing between problematic and non-problematic gaming, which could result in pathologizing intensive but non-problematic gaming patterns.

Regarding the presence of GD, recent systematic epidemiological reviews have reported a global incidence estimate in a broad range (between 0.2% and 25%, depending on the composition of the samples and the assessment tools used) (Darvesh et al., 2020; Feng et al., 2017), with higher rates in Central Eastern Europe and lower rates in Northern and Western Europe (Chia et al., 2020). A recent *meta*-analysis reported that the worldwide rate of problematic gaming can be estimated to be 1–2% (Stevens et al., 2021). Individuals with higher vulnerability/risk for the onset and progression of GD have also been identified (Pan et al., 2020; Stevens et al., 2021): male gender, adolescence and young adulthood stages, poorer subjective and environmental conditions, high computer skills, higher accessibility to the internet and/or gaming devices, and difficulties in social and school/work performance (Gentile, 2009; Griffiths & Meredith, 2009; Haagsma et al., 2012; Mentzoni et al., 2011; Mihara & Higuchi, 2017; Rehbein & Baier, 2013; Weinstein & Lejoyeux, 2010).

As regards the risk factors for GD, there is a large body of research illustrating the links between this condition and multiple bio-psycho-social features. The review by Griffiths and colleagues identified high levels of certain personality traits (e.g., narcissism, neuroticism, aggressiveness/hostility, avoidance, introversion and sensation seeking), low self-esteem, and social isolation as the main risk factors related to the onset and the course of this disorder (Griffiths, Kuss, & King, 2012). Other studies focused on personality traits also observed that patients with GD had higher levels of persistence and low levels of self-directedness (Jiménez-Murcia et al., 2014; Musetti et al., 2019), as well as a whole maladaptive personality profile (Gervasi et al., 2017). Past research also provided evidence of specific neural and cognitive impairment in GD (Palaus, Marron, Viejo-Sobera, & Redolar-Ripoll, 2017).

Other common aspects typically associated with GD include sleep deprivation, malnutrition, irritability, physical aggression, emotional disturbances, dysfunctional cognitions, and a range of social and school/

work problems (Przybylski, Weinstein, & Murayama, 2017). The systematic review conducted by Guglielmucci et al. (2019) also concluded that GD can be, for some patients, the result of a maladaptive coping strategy to escape from real-life problems, adverse emotions and disturbing mental states, with the consequence of dissociative symptoms reflecting the side effects of an alteration in consciousness. Cognitive distortions have also been reported among GD patients (Forrest et al., 2016; Hamonniere & Varescon, 2018), including persistent beliefs overvaluing game reward and tangibility, dysfunctional and inflexible rules about gaming behavior, over-reliance on gaming to perceive satisfactory self-esteem, and gaming as a way to obtain social acceptance (King & Delfabbro, 2014). In terms of psychopathological comorbidity, it has been observed that patients diagnosed with GD usually report problems in different domains, with the most typical being the presence of concurrent attention-deficit-hyperactivity (Dullur et al., 2021), depression (Colder Carras et al., 2020; Ostinelli et al., 2021), conduct problems (Richard et al., 2020), and other multiple psychopathological conditions (Männikkö et al., 2020; Stockdale & Coyne, 2018; Weinstein et al., 2014). However, the direction of these associations between GD and psychopathological symptoms has not yet been established (Laconi et al., 2017; Lee et al., 2017), mainly because the designs used to assess the presence and intensity of the comorbid relationships are cross-sectional in nature (González-Bueso et al., 2018).

Studies that aimed to determine the psychosocial and sociodemographic variables associated to problem gaming have been usually conducted on population-based samples. However, the significant increase in the demands for treatment due to the problems related to the excessive use of video games during the last decade has resulted in the publication of new studies within clinical samples, that aimed to assess the GD profile at baseline (prior to the treatment interventions). Male sex is one central characteristic of the GD profile (Chen, Oliffe, & Kelly, 2018), probably due to the fact that traditionally video games were designed by men for men, the marked male gamer stereotypes (negatively reflected on females), and highly visible figures in gaming culture related to male attributes (Lopez-Fernandez, Williams, & Kuss, 2019; Palaus, Marron, Viejo-Sobera, & Redolar-Ripoll, 2017; Vermeulen, Van Bauwel, & Van Looy, 2017). A number of studies also suggested that younger age (adolescence and emergent adults) is a key feature among GD patients (Adams et al., 2019). Treatment-seeking patients who met criteria for GD are also characterized by the presence of comorbid psychiatric conditions, including internalizing symptoms (around 45%, being the most frequent depression, social anxiety and generalized anxiety) and externalizing symptoms (around 50%, mostly ADHD and aggressive behaviors) (Martín-Fernández et al., 2016; van Rooij et al., 2014). A substantial part of GD patients consider that their involvement in videogames is a way to alleviate the negative affect and the discomfort arising from other psychological symptoms, and also from their problems with peer relationships (Király, Nagygyörgy, Griffiths, & Demetrovics, 2014). Some player vulnerabilities have been shown to increase the severity and the worse progression of the GD, including impulsivity, risk taking, and stronger gaming motivations (such as escapism and/or achievement) (King et al., 2019). Other characteristics of the GD profile are a high level of loneliness (potentially as a consequence of the long time frames of physical confinement at home), poor socio-familial functioning, deterioration of performance in the academic/working spheres, reduced self-satisfaction outside the video games (Bender & Gentile, 2019; Yau & Potenza, 2014).

To date, few studies have explored the existence of distinctive empirical profiles of GD treatment-seeking patients with different levels of psychological impact. A study by Billieux and colleagues tried to determine the existence of reliable subtypes of problematic videogaming in a large community-based sample of Massively Multi-Player Online Role-Playing Games (MMORPG) gamers based on candidate psychological risk factors, and identified five subgroups presenting varying degrees of problematic gaming impact (Billieux et al., 2015). Another study performed a cluster analysis with the aim of identifying different subtypes of gamers in a population-based sample, considering the time spent using video games and their responses to a screening GD tool (Musetti et al., 2019). These authors identified four clusters ordered according to the intensity of the gaming activity (occasional, passionate, preoccupied, and disordered gamers), with differences in the expression of certain personality traits and psychopathological symptoms (the higher the gaming frequency and impairing gaming pattern the worse the psychopathological state). A recent study also aimed to explore sleep quality related to the video game activity, to determine the role of sociodemographic features, gaming duration and intensity, and mental and physical health, in a population-based sample through hierarchical clustering (Altintas et al., 2019). This last research identified two profiles of individuals based on the sleep quality (high versus low), which also differed in the intensity of the gaming behavior and the health outcomes. Finally, González-Bueso and colleagues identified two profiles through clustering analysis, using as predictor variables multiple personality domains within a sample of GD patients (González-Bueso et al., 2020). These two separate clusters were characterized by the personality traits, but also by the comorbid concurrence of general psychological symptoms.

On the whole, it thus appears that there is a paucity of evidence allowing researchers and clinicians to grasp a solid understanding of the differential subtypes of GD, particularly within clinical samples using data-driven classification approaches. In such a context, the aim of the present study was to determine the existence of empirical clusters in a sample of treatment-seeking GD patients who attended a hospital unit specialized in the treatment of behavioral addictions, using a large set of indicator-variables including sociodemographic features, psychopathological symptoms, and personality traits. Based on the available empirical evidence, we hypothesized that GD patients constitute a heterogeneous group in which separate profiles can be identified with different levels of gaming impact.

2. Method

2.1. Participants

The participants in this study were recruited from the Pathological Gambling Unit located in the Bellvitge University Hospital. A consecutive sampling was considered, including all patients who had sought treatment specifically in relation to their problematic gaming behavior in our unit between January 2005 and April 2019. Exclusion criteria were the presence of a concurrent neurological disorder (e.g., traumatic brain injury, neurodegenerative disorder such as Parkinson's disease) or intellectual disability (these conditions did not allow the use of the standardized assessment).

The sample included $n = 107$ patients (98 men, 91.6%), most of them with primary ($n = 50$, 46.7%) or secondary ($n = 49$, 45.8%) education levels, single ($n = 95$, 88.8%), unemployed ($n = 81$, 75.7%) and in mean-low to low socioeconomic position groups ($n = 90$, 84.1%). Patients were aged between 14 and 60 years old ($M = 24.1$, $SD = 10$), and the mean duration of gaming-related problems was 3.7 years ($SD = 2.9$).

This study included patients recruited for a long period of time. This was justified by the low frequency of patients attended in the treatment unit due to GD related problems compared to other behavioral addictions (such as gambling disorder). An extended period of time was needed to achieve a large enough sample for the segmentation statistical analyses. It must be outlined that the variables analyzed in this study were measured with the same assessment tools, and that all patients of the study met criteria for GD according to the same diagnostic framework (DSM). In addition, no differences were found comparing patients attended during three specific time frames (2005 to 2009, 2010 to 2014 and 2015 to 2019) with regard to sociodemographic features [sex ($\chi^2 = 1.02$, $p = .602$), education level ($\chi^2 = 6.92$, $p = .140$), marital status ($\chi^2 = 3.05$, $p = .550$), socioeconomic position ($\chi^2 = 6.09$, $p = .413$), employment status ($\chi^2 = 1.26$, $p = .533$), and age ($F = 0.02$, $p = .984$)]

and main clinical variables [age of onset of the GD ($F = 0.20$, $p = .821$), duration of the GD ($F = 0.09$, $p = .917$) and psychological distress (SCL-90R GSI, $F = 1.78$, $p = .174$)].

2.2. Measures

All the questionnaires used in the study had been previously translated and validated in Spanish-speaking samples. Table 1 briefly describes the psychometric scales used, as well as their internal consistency (Cronbach's alpha) in the current sample.

Symptom Checklist-Revised (SCL-90-R) (Derogatis, 1997), Spanish version (Gonzalez De Rivera et al., 1989). This self-report instrument measures the global psychological state through 90 items structured in nine primary (first order) dimensions (somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) and three global indices (global severity index [GSI], total positive symptoms [PST], and positive symptoms discomfort index [PSDI]). It is a widely-used and relatively brief questionnaire for screening current status in multiple dimensions of psychopathology and psychological distress. The internal reliability (Cronbach's alpha) in our sample was good to excellent (from $\alpha = 0.81$ for obsessive–compulsive scale to $\alpha = 0.98$ for the global indices).

Temperament and Character Inventory-Revised (TCI-R) (Cloninger et al., 1994), Spanish version (Gutiérrez-Zotes et al., 2004). This self-report questionnaire serves to measure personality traits through 240 items based on the Cloninger's multidimensional model. The model comprises 7 personality dimensions: 4 for temperament (novelty seeking, harm avoidance, reward dependence, and persistence) and 3 for character (self-directedness, cooperation, and self-transcendence). The internal consistency in the sample of the study was between adequate and good (from $\alpha = 0.70$ for reward dependence to $\alpha = 0.89$ for persistence).

Clinical criteria for GD. A semi-structured face-to-face clinical interview was used to assess the presence/absence of the nine proposed criteria for GD included in Section 3 (emerging conditions) of the DSM-5 (American Psychiatric Association, 2013; Petry et al., 2014): preoccupation or obsession, withdrawal, tolerance, loss of control, loss of interest, continued overuse, deceiving, escape from negative feelings and functional impairment. Rather than using the tentative cut-off proposed in the DSM-5 (5 out of 9 criteria are required to endorse the condition), we applied a more stringent approach where all 9 criteria are to be endorsed within a 12-month period to establish the diagnosis. This approach is consistent with recent research showing that laxer criteria are susceptible to pathologizing normal or persistent but not problematic gaming patterns (Billieux, Flayelle, Rumpf, & Stein, 2019; Deleuze et al., 2017). For cases assessed between 2005 and 2013 (i.e. before the releasing of DSM-5), GD was identified through a semi-structured interview adapted from DSM-III-R pathological gambling criteria (Griffiths & Hunt, 1998). As for DSM-5 criteria, a stringent approach was used where all criteria are to be endorsed within a 12-month period to establish the diagnosis.

Diagnostic Questionnaire for Pathological Gambling (according to DSM criteria) (Stinchfield, 2003), Spanish version (Jiménez-Murcia et al., 2009). This questionnaire was developed as a self-report tool with 19 items coded in a binary scale (yes–no), with the aim of assessing the diagnosis of GD according to the DSM-IV-TR (American Psychiatric Association, 2010). From 2013 onwards, this DSM-IV measure has been adapted to measure DSM-5 diagnostic criteria for GD (American Psychiatric Association, 2013) by removing the illegal acts criterion and using the cutoff score of 4 symptoms-criteria. This instrument was used to assess the comorbid presence of gambling disorder in the study. The internal consistency for this scale in the study sample was very good ($\alpha = 0.92$).

Other variables. A complementary semi-structured interview was used to collect additional data, including sociodemographic features (sex, education level, employment status and marital status), the socioeconomic position index according to Hollingshead's scale (which provides a global measurement based on the participant's profession and level of education) (Hollingshead, 2011), and other GD-related

Table 1
Description of the psychometrical scales used in the study.

Scale		Description	α
SCL-90R questionnaire			
Somatization		Bodily perceptions of complaints reflecting potential physical illness, focused on cardiovascular, gastrointestinal, respiratory and other systems with automatic mediation	0.895
Obsessive-compulsive		Thoughts, impulses and actions perceived as irresistible but of unwanted nature	0.811
Interpersonal sensitivity		Feelings of personal inadequacy and inferiority in comparison with others, and discomfort during interpersonal interactions	0.894
Depression		Dysphoric mood and affect, signs of withdrawal, lack of motivation, and loss of vital energy	0.929
Anxiety		Nervousness, tension, trembling, terror, panic and somatic correlates of anxiety	0.873
Hostility		Behaviors related to negative state of anger, such as aggression, irritability, rage and resentment	0.865
Phobic anxiety		Persistent fear response to specific places, objects, situations, leading to avoidance/escape beh.	0.837
Paranoid ideation		Projective thinking, hostility, suspiciousness, grandiosity, centrality, loss of autonomy and delusions	0.830
Psychotic		Schizoid lifestyle, first-rank schizophrenia symptoms, withdrawal and isolation	0.843
Global severity Index (GSI)		Psychopathological distress status	0.979
Positive Symptom Total (PST)		Number of total symptoms endorsed to any degree	0.979
Positive Symptom Distress (PSDI)		Intensity measure and distress style	0.979
TCI-R questionnaire			
Novelty seeking	Low score	Rigid, frugal, reserved, stoical	0.713
	High score	Impulsive decision making, exploratory, thrill seeking, novelty preference	
Harm avoidance	Low score	Vigorous, daring, optimistic, outgoing	0.724
	High score	Fearful, doubtful, pessimistic, fatigable, shy, excessive worrying	
Reward dependence	Low score	Independent, critical, detached	0.704
	High score	Warm, open, sentimental, sympathetic	
Persistence	Low score	Underachiever, pragmatist, apathetic, spoiled,	0.889
	High score	Enthusiasm, perfectionist, work hardened, ambitious, diligent, determined	
Self-directedness	Low score	Aimless, blaming, inept, lack of goal direction, inertia, self-striving, incongruent	0.838
	High score	Purposefulness, resourceful, self-accepting, congruent, responsible, purposefulness	
Cooperativeness	Low score	Intolerant, hostile, social disinterest, revengeful, prejudiced, insensitive	0.711
	High score	Helpful, empathic, compassionate, reasonable, empathic	
Self-transcendence	Low score	Practical, objective, undiscerning, empirical, unimaginative, self-isolation	0.812
	High score	Transpersonal identification, spiritual, intuitive, inventive, idealistic, self-forgetful	

Note. SCL-90R: Symptom Checklist-Revised.
TCI-R: Temperament and Character Inventory-Revised.
α: Cronbach-alpha in the study.

variables (such as age of onset of the gaming activity and duration of gaming-related problems). The presence of substance use (tobacco, alcohol and other illegal drugs) was also clinically assessed. This tool was developed by the research team, and it has been routinely used in the treatment unit for the assessment at baseline. This instrument has been described elsewhere (Jiménez-Murcia et al., 2006) and it is available on request from the corresponding author (the Spanish version is available).

2.3. Procedure

The study was approved by the Ethics Committee of the Bellvitge University Hospital (Barcelona) (Ref: PR241/11), and patients who agreed to participate in the study were asked to provide signed informed consent. Participants did not receive financial compensation for their participation. All data were collected by qualified clinical psychologists. Data were collected through a single assessment session of approximately 90 min.

2.4. Statistical analysis

The statistical analysis was carried out with SPSS24 for windows (IBM-Corp, 2016). We decided to rely on data clustering analysis to identify profiles of GD patients. Data grouping was accomplished through a two-step cluster analysis. This procedure serves to explore the existence of natural groupings within a dataset which includes both categorical and continuous variables, using an agglomerative hierarchical clustering algorithm with automatic selection of the optimal number of groups. In this study, the log-likelihood distance and the Schwarz Bayesian Information Criterion (BIC) were employed to determine the optimal model (based on choosing a solution with a reasonably large ratio of Schwarz Bayesian Information Criterion and a large ratio of distance measures). The variables used to create the clusters included sociodemographic variables registered in the study, age of onset of the gaming-related problems, psychopathological distress (SCL-90R GSI), personality traits (TCI-R scores), and the presence of a comorbid diagnosis of gambling disorder. The Silhouette index was used to assess the global consistency of the cluster solution. This index ranges from -1 to $+1$, and is considered as a measure of cohesion/separation (i.e., how similar individuals are to their own cluster compared to other clusters) (Rousseeuw, 1987): values lower than 0.30 are considered as poor fits, between 0.30 and 0.50 as fair, and higher than 0.50 as good (in practice, fair and good indexed are interpreted as adequate matching in one's own cluster and of poor matching in other clusters).

Chi-square tests (χ^2) were used to compare categorical variables between the empirical clusters, and T-tests were employed to compare quantitative measures. The effect sizes for the mean differences were measured with the standardized Cohen's-*d* coefficient, considering poor-low effect size for $|d|>0.20$, moderate-medium for $|d|>0.5$ and large-high for $|d|>0.80$ (Kelley & Preacher, 2012). For the proportion differences, the effect size was estimated through Cohen's-*h* coefficient (Cohen, 1988), which is interpreted similar to Cohen's-*d* measure and calculated as the difference of the arcsine transformation for the two proportions estimated in each group [with the transformation being: 2*arcsin*square_root(p)]. In addition, an increase in the Type-I error due to the multiple statistical procedures was controlled for with Finner's method (a stepwise familywise error rate procedure which provides a more powerful test than the classical Bonferroni correction) (Finner, 1993).

3. Results

3.1. Clustering procedure

The auto-clustering results are displayed in Table 2, with the fitting coefficients used to automatically select the optimal model. The number of clusters chosen by the system was two: this solution achieved the highest measure of cohesion/separation (Silhouette = 0.40) and the largest ratio of distance measures (1.853). This solution was selected as the most suitable for our study since it also obtained good clinical interpretation (other candidate solutions with a higher number of clusters were rejected since they achieved poorer fitting indexes and did not facilitate better clinical interpretation).

Fig. 1 displays the ordered bar-chart with the relative relevance weight of each predictor (indicator variable) in the clustering process. The relative relevance ranges between 1 (maximum relevance) and 0 (minimum relevance), and each predictor is interpreted as a measure of the discriminative capacity of the variable (the greater the relevance of the indicator, the less likely it is that changes between clusters for said variable are attributable to chance). In this study, the variable with the largest discriminative relevance was psychopathological distress (SCL-90R GSI), while the poorest discriminative capacity was achieved by reward dependence, novelty seeking, self-transcendence, social position index, education level, and persistence.

3.2. Comparison between clusters

Table 3 displays the results of the sociodemographic comparison between clusters, while Table 4 shows the comparison for the clinical profiles. Cluster 1 comprised two quarters of the sample ($n = 72$, 66.1%). This group included mostly single (97.2%) and unemployed (86.1%) men (98.6%). The patients within this cluster were younger (M age = 21 years), reported an earlier onset age of the problematic gaming (M = 17.8 years), a shorter duration of the disorder (M = 3.5 years), better psychopathological state (all the means in the SCL-90R scales were lower), and more functional personality traits (participants in this cluster scored lower in sensation seeking, harm avoidance, and self-transcendence, and higher in reward-dependence, self-directedness, and cooperativeness).

Cluster 2 (n = 35, 32.7%) included a higher proportion of women,

Table 2
Results of the auto-clustering.

Number of clusters	BIC	[a]BIC Change	[b]Ratio BIC Changes	[c]Ratio Distance	n Participants-by-cluster	Silhouette	
1	2451.825						
2	2300.583	−151.242	1.000	1.853	72;35	0.40	(fair)
3	2320.033	19.450	-0.129	1.371	66;22;19	0.30	(fair)
4	2393.645	73.612	-0.487	1.851	36;32;20;19	0.20	(poor)
5	2534.371	140.725	-0.930	1.007	32;24;19;18;14	0.20	(poor)
6	2675.621	141.251	-0.934	1.266	31;24;19;13;10;10	0.20	(poor)
7	2833.359	157.738	−1.043	1.170	31;24;17;13;10;10;2	0.20	(poor)
8	3000.086	166.726	−1.102	1.082	24;20;17;13;11;10;10;2	0.20	(poor)

Note. BIC: Schwarz's Bayesian Criterion.
[a] The changes are from the previous number of clusters in the table.
[b] The ratios of changes are relative to the change for the two cluster solution.
[c] The ratios of distance measures are based on the current number of clusters against the previous number of clusters

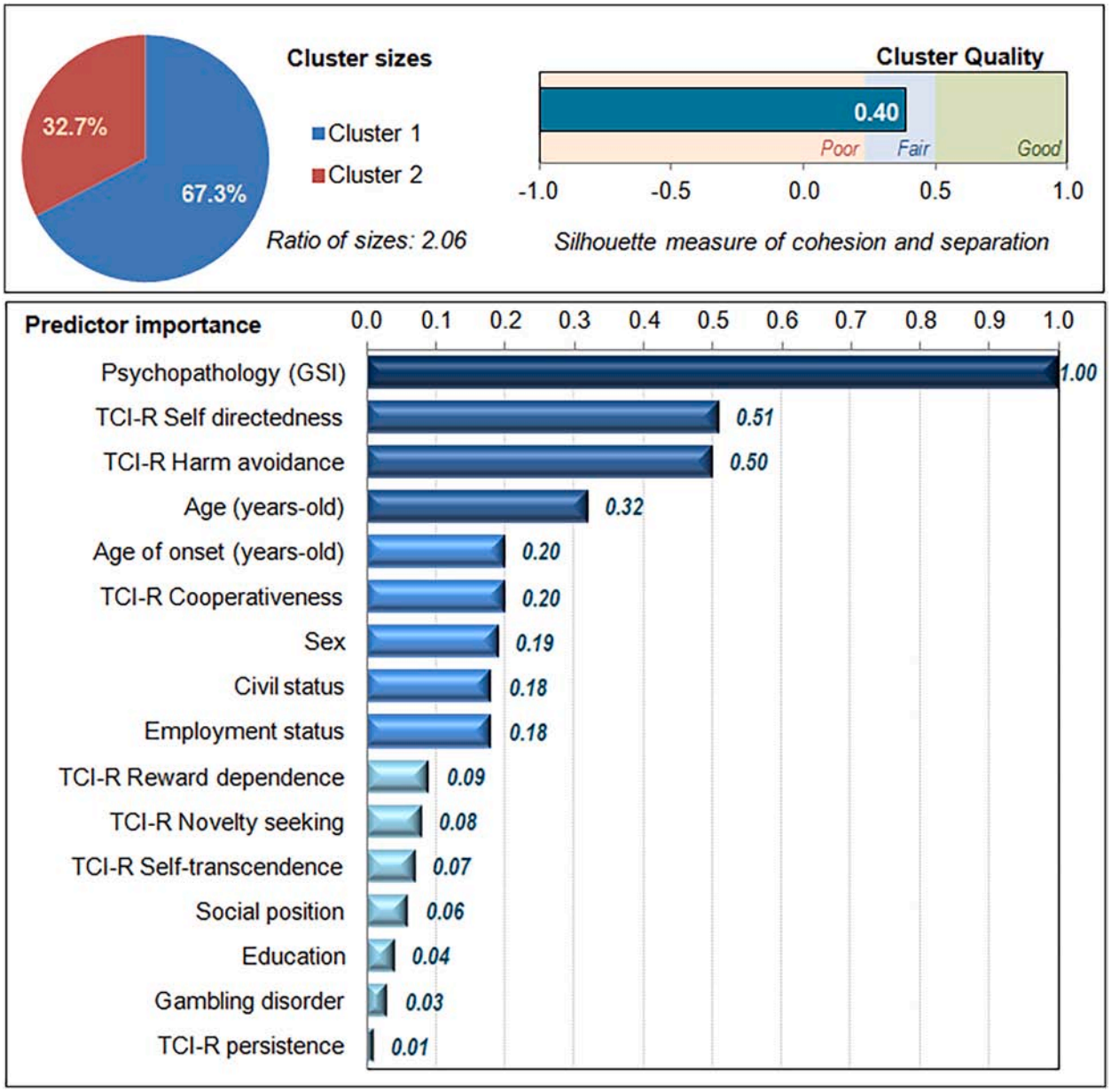

Fig. 1. Results of the clustering procedure.

not-single, and employed. Participants in this cluster were also older (*M* age = 30.7 years), reported a later age of onset of the gaming-related problems (*M* = 24.5 years) and a longer progression of the problematic behaviors (*M* = 4.1 years). These patients also reported worse psychopathological and more maladaptive personality traits (higher means in sensation seeking, harm avoidance and self-transcendence, and lower means in reward-dependence, self-directedness, and cooperativeness). This cluster was also related to higher risk of alcohol use-abuse. Differences between both clusters in these variables (in particular, for psychopathological variables measured by the SCL-90-R) reached extremely large effect sizes ($|d|$ between 0.70 and 2.41).

The main differences between the clusters are plotted in the radar-chart displayed in Fig. 2, which represents a visual summary of the composition of the clusters obtained. This chart (also known as spider-chart or star-chart) is particularly useful for displaying multivariate data, and it consists in a sequence of axes (radii, each one representing a concrete variable) and a plot of polygonal shapes over all the axes (each one representing a concrete group). Proportions for the categorical variables and z-standardized means for the quantitative variables are plotted (z-standardized values are shown, since the original scale differs for each variable and makes interpretation difficult). Based on the set of results in this study, cluster 1 was labeled *"lower psychological impact"* and cluster 2 was labeled "*higher psychological impact*". Note that the labels "*lower*" versus "*higher*" are used in the basis of the composition of the two empirical groups identified in this work (no comparison with an external criteria such as normative data from a population-based sample was conducted). In addition, the label is based on the clinical profile related to each cluster, and not on the sociodemographic features associated to each empirical group.

4. Discussion

In the present study, we explored GD heterogeneity in treatment-seeking patients through clustering analysis considering a large set of indicators (including sociodemographic features, clinical course of the condition, psychological state, and personality traits). Two patient profiles were identified, the reliability of which was based on a cohesion-separation rate within the fair/moderate range and with a

Table 3
Comparison between clusters for the sociodemographics.

	Cluster 1 ; n = 72(lower psychological impact)		Cluster 2; n = 35 (higher psychological impact)			
	n	%	*n*	%	*p*	|*h*|
Sex						
Female	1	1.4%	8	22.9%	**<0.001***	**0.70**†
Male	71	98.6%	27	77.1%		
Education						
Primary or less	38	52.8%	12	34.3%	0.163	0.38
Secondary	30	41.7%	19	54.3%		0.25
University	4	5.6%	4	11.4%		0.21
Civil status						
Single	70	97.2%	25	71.4%	**<0.001***	**0.76**†
Married – couple	2	2.8%	7	20.0%		**0.56**†
Divorced – separated	0	0.0%	3	8.6%		0.43
Social status						
Mean-high to high	1	1.4%	2	5.7%	0.080	0.24
Mean	6	8.3%	8	22.9%		0.41
Mean-low	23	31.9%	7	20.0%		0.27
Low	42	58.3%	18	51.4%		0.14
Employment						
Unemployed	62	86.1%	19	54.3%	**<0.001***	**0.74**†
Employed	10	13.9%	16	45.7%		

Note. *Bold: significant comparison (0.05 level).
† Bold: effect size into the mean-moderate (|*h*|>0.50) to high-large (|*h*|>0.80) range.

Table 4
Comparison between clusters for the clinical profile.

	Cluster 1 ; n = 72 (lower psychological impact)		Cluster 2; n = 35 (higher psychological impact)			
Age and evolution	*Mean*	*SD*	*Mean*	*SD*	*p*	|*d*|
Age (years-old)	20.96	5.16	30.69	13.73	**<0.001***	**0.94**†
Age of onset (years-old)	17.78	4.07	24.46	12.90	**<0.001***	**0.70**†
Duration addiction (years)	3.52	2.54	4.07	3.60	0.360	0.18
Psychopathloogy (SCL-90-R)	*Mean*	*SD*	*Mean*	*SD*	*p*	|*d*|
Somatization	0.35	0.32	1.26	0.89	**<0.001***	**1.38**†
Obsessive-compulsive	0.76	0.47	1.73	0.76	**<0.001***	**1.54**†
Interpersonal sensitivity	0.64	0.51	2.04	0.88	**<0.001***	**1.95**†
Depression	0.63	0.50	2.13	0.86	**<0.001***	**2.13**†
Anxiety	0.39	0.33	1.45	0.78	**<0.001***	**1.78**†
Hostility	0.63	0.61	1.70	1.03	**<0.001***	**1.27**†
Phobic anxiety	0.15	0.22	0.99	0.93	**<0.001***	**1.23**†
Paranoid ideation	0.62	0.54	1.91	0.99	**<0.001***	**1.63**†
Psychotic	0.30	0.31	1.39	0.77	**<0.001***	**1.87**†
Global severity Index (GSI)	0.45	0.30	1.65	0.64	**<0.001***	**2.41**†
Positive Symptom Total (PST)	28.78	14.47	58.94	14.46	**<0.001***	**2.09**†
Positive Symptom Distress Index (PSDI)	1.39	0.52	2.45	0.59	**<0.001***	**1.91**†
Personality (TCI-R)	*Mean*	*SD*	*Mean*	*SD*	*p*	|*d*|
Novelty seeking	101.71	12.11	108.11	16.87	**0.027***	0.44
Harm avoidance	95.53	12.92	117.60	19.28	**<0.001***	**1.34**†
Reward dependence	95.93	15.91	87.66	18.84	**0.019***	0.47
Persistence	94.99	15.72	93.74	26.70	0.763	0.06
Self-directedness	137.68	18.24	109.94	19.88	**<0.001***	**1.45**†
Cooperativeness	134.22	14.69	120.31	21.24	**<0.001***	**0.76**†
Self-transcendence	57.18	13.50	63.31	16.06	**0.041***	0.41
Other comorbid addictions	*n*	*%*	*n*	*%*	*p*	|*h*|
Gambling disorder	8	11.1%	7	20.0%	0.214	0.25
Tobacco	21	29.2%	7	20.0%	0.312	0.21
Alcohol	0	0.0%	2	5.7%	**0.041***	0.35
Other illegal drugs	4	5.6%	1	2.9%	0.535	0.13

Note. SD: standard deviation.
*Bold: significant comparison (0.05 level).
† Bold: effect size into the range mean-moderate (|*d*|>0.50 or |*h*|>0.50) to high-large (|*d*|>0.80 or |*h*|>0.80).

suitable clinical interpretation. The differences in the mental distress and other psychological measures between the empirical profiles have implications for the etiology, conceptualization, assessment, and treatment of this clinical condition.

The two profiles identified in this study displayed differences in sociodemographic and clinical features. Cluster 1, with a lower psychological impact, was associated to younger age, earlier age of onset and shorter duration of the addictive disorder, male sex, being single, unemployed status, better psychopathological state, and less dysfunctional personality traits. Cluster 2, with a higher psychological impact, was more strongly related to not-single status, being employed, female sex, older age, later onset and a longer duration of the gaming-related problems, worse psychopathological symptoms and more dysfunctional personality profile. As a whole, these results are consistent with previous research, which also obtained two separate profiles in problematic gamers samples, characterized by different levels of comorbid symptoms and personality functioning (Gervasi et al., 2017; González-Bueso et al., 2020; Griffiths, Kuss, & King, 2012; Musetti et al., 2019). Latent class analysis and regression procedures within population-based samples have also identified distinct groups of gamers with different severity in gaming-related problems (Colder Carras & Kardefelt-Winther, 2018).

Regarding sociodemographic characteristics and clinical course of the condition, chronological age and duration of problematic gaming, the results obtained in our study suggest that the impact of the GD may be less severe in younger patients (for example, in the 20 s), single and unemployed (or studying) than in older patients, married and employed. This is expected since, in married and/or employed people, spending a high number of hours playing video games will have a greater impact on family and/or job productivity. The link between age of initiation into gaming and GD has not been clearly established, but available studies suggest that more years playing games may be associated with increased severity of the disorder (Mihara & Higuchi, 2017), which appears to converge with the results obtained here. In this same vein, since we found individuals with the longest duration of GD tend to be the oldest patients, it is not surprising that older age was also related to the most impairing profile. In any case, results should be considered with caution, since previous studies have noted that GD severity is positively related to younger ages (Anand et al., 2018; Tang, Koh, & Gan, 2017), while others suggest that age may only indirectly affect problem gaming severity via other factors including psychological distress or even the frequency of other online activities (ElSalhy et al., 2019; López-Fernández, Williams, Griffiths, & Kuss, 2019; López-Fernández, Williams, & Kuss, 2019; Stockdale & Coyne, 2018).

The percentage of women in our study was very low compared to men. This is consistent with epidemiological and clinical data, which show that GD is traditionally more common among males (López-Fernández, Williams, & Kuss, 2019). In fact, numerous video games have been developed based on stereotypical male characteristics, such as being overly self-confident and aggressive (Paaßen, Morgenroth, & Stratemeyer, 2017), and it seems that women are less encouraged to play video games due to the social negative expectations based on gender (Kaye & Pennington, 2016). Nevertheless, females were over-represented in the cluster with worse psychology state. This result is consistent with a narrative literature review suggesting that female problematic gamers tend to experience more severe psychopathological symptoms than male ones, which might be driven by a gender imbalance regarding work-life balance and roles (López-Fernández, Williams, Griffiths, & Kuss, 2019; Wang et al., 2019). Other studies have also stated that multiple interactive reasons could contribute to this

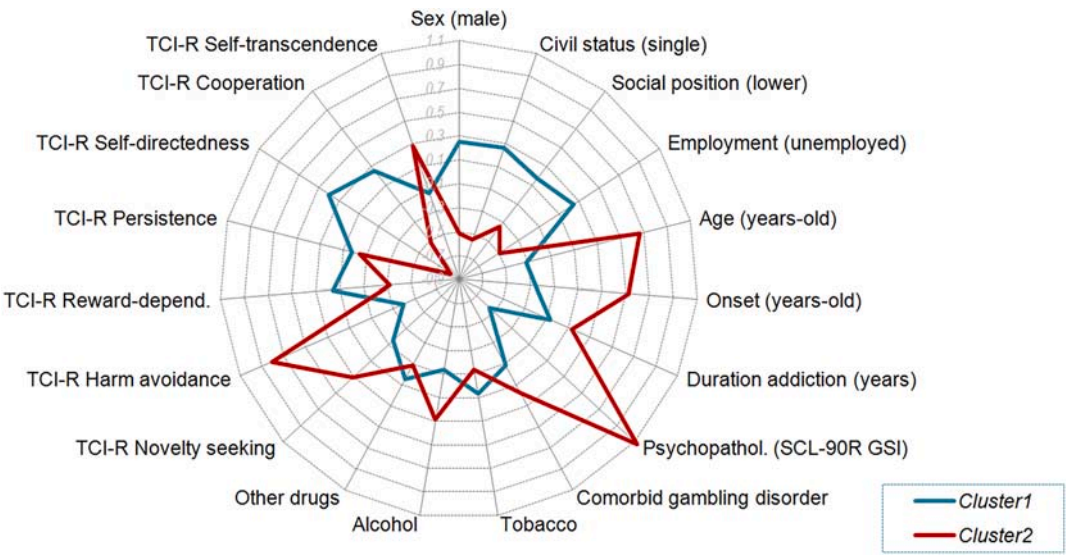

Fig. 2. Radar-chart with the main variables which achieved differences between the clusters.

association, such as the fact that women are interested in things which are not necessarily included in game designs, which might contribute to their frustration (Gestos, Smith-Merry, & Campbell, 2018; McLean & Griffiths, 2019). Furthermore, studies on the neuro-biological mechanisms underlying problematic gaming have also reported cortical thickness abnormalities combined with higher addiction severity in women, suggesting that females might be more vulnerable to GD than men (Wang et al., 2016). Gender-related neurocognitive differences have also been found in the study by Dong and colleagues (2018), who observed that women with recreational gaming display better executive control than men, but with the progression of GD, the executive control is more impaired in women (Dong et al., 2018).

The personality profile associated to the cluster with higher impact (higher novelty seeking, harm avoidance and self-transcendence, lower reward dependence, lower self-directedness and cooperativeness) is typical of patients with higher negative affectivity and disinhibition, impulsive behavior and with a preference for immediate rewards. These aspects have been identified as core features of addictive disorders (like gambling disorder) and constitute precipitants and maintaining factors (Brand et al., 2019). Although the relationships between behavioral addictions and maladaptive personality traits have been evidenced, few studies have investigated how a specific maladaptive profile (integrating multiple domains) impacts on the onset and evolution of GD within clinical samples, or how it could affect the results of treatment. Published studies have observed that these relationships seem complex, with additional factors moderating or mediating the associations (Kayiş et al., 2016; Laier, Wegmann, & Brand, 2018). It has been reported that maladaptive personality traits could be linked to the risk of neurological soft signs, defined as minor neurological abnormalities (including diverse expressions of simple sensory integration, motor coordination, disinhibition signs, and complex motor sequencing) (Galindo et al., 2016; Mechri et al., 2010; Zhao et al., 2014). In relation with the impact of personality traits on GD, our results are consistent with previous empirical studies, which have suggested that maladaptive personality traits could represent a vulnerability risk factors for the onset and progression of problematic and disordered gaming (Gervasi et al., 2017; Mallorquí-Bagué et al., 2017; Müller, Beutel, Egloff, & Wölfling, 2014; Musetti et al., 2019; Seong, Hong, Kim, Kim, & Han, 2019). The specific presence of GD has been related to higher levels of impulsivity, sensation seeking and self-transcendence (Billieux et al., 2015; Laier, Wegmann, & Brand, 2018; Norbury & Husain, 2015; Starcevic & Aboujaoude, 2017), and to lower levels of extraversion, conscientiousness, and openness (Müller et al., 2015; Wang et al., 2015). Studies have also linked the severity of gaming problems to maladaptive personality traits (Braun et al., 2016). The role of personality traits in the etiology of GD is however complex, and mixed results have been obtained regarding the mediational links between the different personality domains/levels, gaming motivations, gaming preferences, and the onset/progression/severity of the GD (Tang et al., 2020; Throuvala et al., 2019). To date there is no robust theoretical understanding as to whether GD is the consequence of a dysfunctional emotion-focused strategy to avoid negative emotional states, or on the contrary, the disorder is the result of a more generally comprised emotional-social functioning. In either case, based on the studies reporting that maladaptive personality traits are associated to poor quality of life among GD (Müller, Werthmann, Beutel, Wölfling, & Egloff, 2021; Wölfling et al., 2019), the development of intervention plans for these patients need to be tailored accordingly. Concretely, specific intervention strategies targeting cognitive restructuring of biased beliefs might be useful in correcting dysfunctional learning experiences regarding the expected effects of the gaming activity. Strategies that aim to improve emotion regulation skills and affective skills trainings seem also particularly desirable for GD patients presenting with heightened scores of detachment and negative affectivity.

Finally, this study outlines the strong association between GD impact and the comorbid psychopathological symptoms: patients within the higher psychological impact reported a worse mental state with higher mean scores in all the SCL-90R scales (effect sizes were in the large range for all these measures). This result is also consistent with previous research supporting the association between GD and psychopathological symptoms (González-Bueso et al., 2018). Previous studies have also evidenced moderate to large relationships using different questionnaires [such as the SCL-90R or the Brief Symptom Inventory (BSI)] (Jiménez-Murcia et al., 2014; Kim et al., 2016; Laconi, Pirès, & Chabrol, 2017; Na, Lee, Choi, & Kim, 2017; Panagiotidi, 2017; Pearcy, McEvoy, & Roberts, 2017; Yen et al., 2017). Studies have also observed that co-occurrence between GD symptoms and mental health states can be attributed to common underlying factors (including genetics, personality characteristics, and social competence) (Hygen et al., 2020; Wichstrøm, Stenseng, Belsky, von Soest, & Hygen, 2019). The associations between the intrinsic features of GD and their multiple correlates (including comorbid psychopathologies) are however complex, and the pathways of the multiple relationships are not obvious (mainly due to disproportionate reliance on cross-sectional designs). Future longitudinal studies should contribute towards clarifying the temporal linearity of GD and comorbid disorders, to unveil whether the presence of

psychopathological symptoms leads to the onset of GD, or if an individual with GD later develops comorbid disorders as a consequence of the negative gaming-related impairments. In fact, there may be a reciprocal association in which the presence of one of the conditions exacerbates the occurrence of the other. For example, difficulties in social relationships, loneliness or the need to escape from negative affect can contribute to the onset and/or intensification of the gaming activity, and the subsequent increasing gaming behaviors reciprocally promote various negative consequences and increase the d global psychological distress (Wartberg, Kriston, Zieglmeier, Lincoln, & Kammerl, 2019; Wichstrøm, Stenseng, Belsky, von Soest, & Hygen, 2019).

Regarding the concurrence of psychological conditions with GD, it must be outlined that previous studies have related the presence and severity of the comorbid symptoms with worse treatment outcomes in GD (Stevens et al., 2019; Zajac et al., 2017). Therefore, it is crucial that clinical settings assess the presence of diverse symptoms among patients with GD and tailor treatment accordingly. Compared to treatment targeting a single disorder, evidence-based integrative interventions have proved to contribute towards alleviating both primary psychopathologies and secondary concurrent psychiatric conditions with the result of impacting in multiple functional areas (Krueger & Eaton, 2015). These healing-oriented holistic programs specifically developed for GD should include strategies to increase self-control and reduce impulsivity (such as training in working memory and response inhibition), to improve emotional regulation, to increase social skills, to prevent-reduce chronic stress, and (if possible) to attenuate environmental influences that negatively affect the patients' health. Furthermore, since comorbid psychopathological symptoms could explain specific gaming motivations (e.g., social motives in introverts or socially anxious gamers), multifaceted therapeutic plans should take into account these specificities to achieve treatment goals and avoid relapses. With regard to the proposed treatment approach, it has been showed that GD patients with higher levels of externalizing symptoms tend to present a better response to interventions with fewer sessions, and that changes take place three months after the beginning of the treatments, while patients with higher levels of internalizing symptoms tend to present slower improvements and require more comprehensive approaches in which the focus on dysfunctional social relationships is central (King & Delfabbro, 2014).

4.1. Limitations

The main limitation of the study is its cross-sectional design, which hinders to analyze the progression of the of GD over a period of time, or to determine the prognosis associated to each of the two classes evidenced in the current study. Second, it is important to note that the clustering procedure used in the study is only one example of a categorization/segmentation procedure, and that other methods may yield different results. Third, although a number of dimensions were analyzed in the study (sociodemographic features, psychopathology and other clinical variables, personality and substances use), no assessment of specific harm and/or functioning was available. Fourth, the low number of women in the sample also affects the generalizability of findings, since no guarantee exists regarding the representative distribution of the female population in this study. It should be considered, however, that the number of women in treatment for problematic gaming or GD is very low. We decided to retain female participants in the statistical analysis since this group constituted all the women seeking treatment in our unit, and their characteristics could be related to a particular profile.

Finally, in relation to the sample size and the statistical power, it is worth noting that there are no rules-of-thumb for cluster analysis, and while some authors have indicated that 2^m can be used (where m = number of clustering variables) (Formann, 1984), others suggested that the minimum sample size should range between 5 and 10 times the number of variables included in the segmentation procedure multiplied by the number of obtained clusters (Qiu & Joe, 2006). This suggests that the sample size should be determined according to the number of input variables in the clustering. This study analyzed data recruited from n = 107 patients, 16 measures were considered for the segmentation and two empirical clusters was the optimal solution, which is compatible with the guidelines provided by Qiu and Joe (2006). On the other hand, studies have also pointed out that the minimum recommended ratio between the number of subjects, the number of variables and the number of empirical clusters are dependent on specific criteria, including goodness-of-fit statistics or sound theoretical and clinical interpretation (Saccenti & Timmerman, 2016). The fair Silhouette value achieved in the study indicated that these n = 107 patients, who met criteria for GD, represents a heterogeneous group, thus calling for a clustering approach. The identification of variables with discriminative capacity on clusters-groups and the adequate clinical interpretation of the results provide additional evidence about the reliability-validity of our statistical procedure.

4.2. Strengths

One of the strengths of the study is the large set of variables assessed including sociodemographic characteristics, clinical course of the condition, psychopathological symptoms and personality traits. Our study is also among the first ones using a segmentation procedure in a clinical sample of treatment-seeking GD, as a very limited number of similar studies have been published, especially in European countries. The use of a data-driven approach (cluster analysis) is also a strength. This person-centered modeling approach identifies empirical classes rather than using groups that are pre-defined according to single variables (such as gender, age, or a risk score). According to Eshghi et al. (2011), advantages of this person-centered method over classical variable-centered techniques include: a) the consideration of subgroups (or individuals) that deviate from means such as outliers; b) the identification of empirical profiles of individuals based on a large set of variables (instead of comparing each variable separately); and c) the possibility to account for potentially inconsistent results across studies or spurious relationships between variables by classifying individuals into naturally occurring profiles.

The present study explored clusters among a sample of GD treatment patients recruited from a treatment unit at the Bellvitge University Hospital, which oversees the outpatient treatment of different forms of behavioral addictions (such as gambling disorder, compulsive buying disorder, compulsive sexual behavior disorder and GD). This unit has the recognition of tertiary care center, which in Spain consist in a level of health care carried out by highly specialized equipment and experts in large hospitals. Patients attended in our unit are referred from primary and secondary care centers, from a catchment area including over 2 million people in the metropolitan area of Barcelona. Therefore, the sample of this work should be considered highly representative of the general population with GD related problems. The long period of recruitment (between 2005 and 2019) probably promoted variations in terms of gaming preferences, types of videogames played, values/beliefs regarding gaming, or help-seeking attitudes. Yet, this level of heterogeneity in the participants should be interpreted as a characteristic contributing to the high external validity and generalizability of our findings (our study relies on both many different types of patients and situations and a large sample size).

5. Conclusion

A large number of studies have analyzed the positive and negative impact of video games on players' cognitive and emotional skills, as well as on their physical and mental health. Most of these researches have been conducted on population-based samples, but little evidence exists regarding problematic gaming and/or GD in clinical samples. Our work focused on the study of the multiple sources explaining the heterogeneity of GD within a sample of treatment-seeking patients, with the aim of reducing the complexity of the empirical clinical profiles associated

with this disorder. The two clusters identified, characterized by different sociodemographic and clinical features, revealed two distinct and clinically relevant GD subtypes. These results provide several directions for future studies in this research field. Firstly, knowing the characteristics of the diverse empirical profiles could contribute to the study of the moderator effect of individual differences and the game types on the onset and progression of the disorder (King, Delfabbro, & Griffiths, 2011; 2019). Secondly, knowledge of the variability within GD treatment-seeking samples could contribute to the development of proper standardized screening and assessment tools, as well as reliable evidence-based tailored interventions focused on the specific patient's needs. The scientific literature on treatments for this clinical condition reveals diverse methodological flaws which prevent robust and valid conclusions about the efficacy of any therapy (Perrochon et al., 2019; Zajac et al., 2020), outlining the need for additional well-designed trials using common standardized metrics to take into account the heterogeneity of GD.

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7. Author Agreement Statement

The manuscript has been read and approved by all authors and there are no other persons who satisfied the criteria for authorship but are not listed.

CRediT authorship contribution statement

Roser Granero: Conceptualization, Formal analysis, Writing - original draft. **Fernando Fernández-Aranda:** Conceptualization. **Jesús Castro-Calvo:** Writing - review & editing. **Joël Billieux:** Writing - review & editing. **Susana Valero-Solís:** Investigation. **Bernat Mora-Maltas:** Investigation. **Sandra Rivas-Pérez:** Investigation. **Eduardo Valenciano-Mendoza:** Investigation. **Amparo del Pino-Gutiérrez:** Investigation. **Mónica Gómez-Peña:** Investigation. **Laura Moragas:** Investigation. **Isabel Baenas:** Investigation. **Teresa Mena-Moreno:** Investigation. **Gemma Casalé-Salayet:** Investigation. **Ester Codina:** Investigation. **Vega González-Bueso:** Writing - review & editing. **Juan José Santamaría:** Writing - review & editing. **Marta Baño:** Investigation. **José M. Menchón:** Writing - review & editing. **Susana Jiménez-Murcia:** Conceptualization, Writing - original draft.

Conflict of Interest Statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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5. Discusión

5.1 Discusión global

Los artículos que forman esta tesis doctoral aportan nueva evidencia empírica sobre factores que contribuyen al perfil clínico y la evolución de diferentes tipos de adicción comportamental. Es importante conceptualizar que bajo esta denominación se agrupan un conjunto heterogéneo de condiciones clínicas caracterizadas por el deseo irrefrenable de realizar ciertas conductas, al margen de las consecuencias negativas que acarrean en múltiples ámbitos de funcionamiento (personal, social, laboral e incluso financier (153–156). Los sujetos que presentan estos problemas sienten un impulso incontrolable de realizar estos comportamientos, y fracasan en su intento de autocontrolarse. Se trata de adicciones que se originan y cursan en ausencia de sustancia, pero que presentan mecanismos neurobiológicos y fenotipos clínicos similares a los que se han identificado en adicciones relacionadas con el consumo de sustancias (68,157–159). Debe tenerse presente, sin embargo, que gran parte de los resultados obtenidos hasta el momento en muestras clínicas se han obtenido de pacientes que presentan TJ, y existe una gran laguna en el estudio etiológico y terapéutico de otras formas de adicciones comportamentales (160–162).

En el primer artículo se evaluó la asociación entre el sexo del paciente, la edad de inicio y la duración del trastorno en el fenotipo clínico, de diferentes tipos de adicción comportamental. Se valoró también la contribución que junto a estas variables tienen la gravedad del trastorno, el estado psicopatológico y los rasgos de personalidad. Los resultados de este estudio refuerzan los hallazgos previos, que subrayan el componente multidimensional de las adicciones comportamentales y la interacción de distintos factores de riesgo biológico o endofenotipos, dependiendo de la adicción comportamental específica, el sexo y la edad. Se refuerza así la idea de las diferencias individuales en el ámbito de las adicciones sin sustancia, que parecen agrupar un conjunto heterogéneo de condiciones clínicas (148,163–165).

Los resultados del primer estudio mostraron que, en general, la edad de inicio temprana, en las adicciones comportamentales, se asocian a perfiles más disfuncionales.

Estos resultados son congruentes con estudios realizados en el área de la clínica y la neurobiología, que también evidencian que edades de inicio más precoces se asocian a duraciones más prolongadas de estos trastornos, lo cual contribuye a un déficit cognitivo en funciones relacionadas con la toma de decisiones y los sistemas de refuerzo-recompensa (34,162,166–170). Pero esta relación parece estar moderada por otras variables, como el sexo de los pacientes. Por ejemplo, los hombres con TJ sí evidencian de forma específica esta relación, mientras que mujeres con TJ muestran una relación menos intensa, y con correlatos más focalizados en variables específicas que miden la gravedad de la conducta adictiva (Jimenez-Murcia et al., 2016). También el sexo es una variable de moderación en la relación que se encuentra entre rasgos de personalidad con edad de inicio y duración de los comportamientos adictivos. En el caso de hombres con TJ, puntuaciones elevadas en búsqueda de novedad se asocian a inicios precoces (111) lo que también sugiere que este rasgo de personalidad podría estar mediando la relación existente entre inicio, duración y nivel de gravedad de las consecuencias del juego patologico. Sin embargo esta relación no fue evidente en el caso de las mujeres con TJ. En el subtipo de CC, el inicio temprano se asoció a altos niveles de dependencia de la recompensa y puntuaciones bajas en autotrascendencia en las mujeres, y con puntuaciones bajas en la evitación del daño y altos niveles de autodirección y cooperación en los hombres. Además, para el grupo CC, una mayor duración del trastorno se asoció con una mayor persistencia, autodirección y autotrascendencia, lo que parece coherente con las observaciones de estudios anteriores (171,172). Los resultados de este estudio también sugieren que en el caso de los hombres, la CC podría ser un mecanismo para incrementar sentimientos de adecuación, eficiencia y competencia. Sin embargo, en las mujeres la CC podría estar motivada por los deseos de obtener mayor aprobación, como una forma de evasión frente a situaciones de estrés, o ser el resultado del fracaso en la puesta en marcha de estrategias de afrontamiento ante estados emocionales negativos (163,173,174).

El segundo artículo planteó como objetivo principal identificar trayectorias de respuesta empírica durante el seguimiento de 6 meses después de la TCC en pacientes

jóvenes y adultos, utilizando como variable para la identificación de las clases latentes la gravedad del TJ. La bondad de los índices de ajuste y la adecuada interpretabilidad clínica de los grupos emergentes fueron interpretados como indicadores de su adecuación psicométrica. Otro objetivo del estudio fue explorar factores asociados a las clases empíricas obtenidas (identificar variables con capacidad

discriminativa de las trayectorias fue también valorada como una evidencia empírica de su fiabilidad y validez). El análisis de clases latentes evolutivas permitió diferenciar 3 grupos de pacientes con diferente evolución del TJ, desde el inicio de la intervención con TCC y el primer semestre de seguimiento. Se observó que los niveles educativos más bajos, niveles socioeconómicos más desfavorables, mayor número de síntomas a nivel psicopatológico y mayor estrés emocional en la línea base, eran variables predictoras de evolución terapéutica más tórpida, lo cual es consistente con numerosos estudios previos que asocian estos factores con resistencia al tratamiento y con mayor riesgo de recaídas y abandonos (145,146,175,176). Puntuaciones altas en evitación del daño y bajas en autodirección también se asociaron a la trayectoria caracterizada por peor respuesta terapéutica. Este patrón de personalidad es característico de pacientes con excesiva preocupación, sentimientos de insatisfacción generalizada, marcadas tendencias al pesimismo y la aprensión, alta impulsividad a la hora de reaccionar ante las demandas inmediatas, ineficacia para elaborar y aplicar estrategias orientadas hacia metas-objetivos, y bajos niveles de motivación. Se trata de pacientes con elevada predisposición a estados de ansiedad y depresión generalizadas (177,178). Otros estudios previos han concluido que este perfil de personalidad es propio de los pacientes que tienden a mantener conductas disfuncionales y muestran alta resistencia a los beneficios de las intervenciones terapéuticas (179,180).

En términos globales, los resultados del segundo estudio subrayan la importancia de que al inicio de las intervenciones se identifique a los pacientes con mayor nivel de preocupaciones excesivas, alta tendencia al pesimismo, alta predisposición a dar respuestas precipitadas/ineficientes para resolver los problemas cotidianos, con dificultades para autogestionar objetivos, con alto grado de insatisfacción y baja motivación. Serían estas características las que podrían estar asociadas a los estados emocionales negativos crónicos (como ansiedad y depresión), que suelen ser difíciles de modificar con las intervenciones habituales y que requieren de intervenciones más específicas. Estos hallazgos son también congruentes con estudios previos, que han señalado que determinados rasgos de personalidad juegan un papel relevante interfiriendo la capacidad de los pacientes para elaborar estrategias adecuadas para afrontar emociones negativas, y que por lo tanto contribuyen a que estos sujetos persistan en la realización de las conductas adictivas como vía de escape para evitar estos estados afectivos (que por otro lado les resultan altamente aversivos) (177,178). De hecho, parece que los rasgos de personalidad, que en este estudio se han presentado

como predictoras de éxito terapéutico limitado son las que, tradicionalmente, también se asocian a preocupaciones excesivas, dificultades en las interacciones sociales, dificultades para la auto-aceptación y alto grado de auto-estigmatización. Todos estos factores de riesgo incrementan la vulnerabilidad a múltiples formas de patología mental (incluyendo el TJ) (141,144,181,182). Los pacientes que presentan este perfil suelen mostrar bajos niveles de auto-eficacia, tienden a infravalorar los potenciales beneficios que les reportan las intervenciones y pueden acabar generando una alta resistencia a los tratamientos (16,179,183).

Es importante destacar que gran parte de los estudios clínicos sobre aplicación de la TCC en TJ se centran en valorar la eficacia a corto plazo (habitualmente al final de la intervención) (136,143) y son escasas las investigaciones que han analizado los beneficios a medio y largo plazo. El presente estudio aporta evidencia empírica sobre la evolución del TJ durante el seguimiento, a los seis meses de finalizar el tratamiento, y además se han obtenido analizando un grupo de edad que se considera especialmente vulnerable (sujetos en edad joven). Los resultados que se han obtenido son congruentes con los que se encuentran en la literatura científica, que sugieren la fuerte contribución de los rasgos de personalidad en el curso del tratamiento (184,185). Otros estudios también han observado que, junto a los rasgos de personalidad, es importante valorar el estado psicopatológico general, ya que la comorbilidad con otras condiciones mentales incrementa la probabilidad de menor eficacia terapéutica en el post-tratamiento y en el seguimiento a corto-medio plazo (182), particularmente niveles elevados de depresión (141).

El tercer estudio que conforma esta tesis doctoral evaluó el papel de la edad cronológica en los niveles de impulsividad de pacientes con TJ y en la gravedad de los sesgos cognitivos, asociados a este trastorno. También se valoraron mecanismos explicativos de la gravedad del TJ, mediante análisis de mediación. Los resultados obtenidos, en cuanto a la asociación entre niveles altos de impulsividad y sesgos cognitivos con el la gravedad de la conducta de juego, son consistentes con estudios clínicos previos (120,186–191). Estos hallazgos concuerdan con la teoría del proceso de las adicciones basada en la sensibilización a los incentivos, según la cual existiría una relación sinergética entre diferentes componentes de impulsividad (incluyendo la falta de control en la toma de decisiones) y la tendencia de los sujetos a aceptar ideas erróneas referidas a la conducta de juego (96,115,123). Así, los sujetos impulsivos son

más vulnerables a incrementar sesgos cognitivos y por tanto están más predispuestos a la realización de conductas de mayor riesgo.

Pero además, en el tercer artículo publicado se obtuvo una tendencia cuadrática entre la edad del paciente y el nivel de sesgos cognitivos relacionados con el juego de apuesta, y una ausencia de relación entre los niveles de impulsividad y la edad cronológica (a excepción de la dimensión de búsqueda de nuevas sensaciones, que se ajustó a una tendencia lineal negativa). Estos resultados son novedosos y, aparentemente, contradictorios con las evidencias previamente publicadas. De hecho, los estudios neurocognitivos muestran que la edad avanzada es un factor clave para que se produzcan declives significativos en los diversos procesos cognitivos (como atención, procesamiento de información, memoria de trabajo y toma de decisiones), y para que aparezcan y se acentúen sesgos cognoscitivos, que afectan al correcto desempeño de las tareas cotidianas (192–194). Los estudios evolutivos en población general muestran que las habilidades cognitivas relacionadas con el razonamiento, la memoria y el rendimiento en el procesamiento disminuyen gradualmente con el tiempo, lo que podría hacer suponer (hipotetizar) la existencia de una tendencia lineal positiva entre la edad cronológica y la gravedad de los sesgos cognitivos relacionados con la conducta de juego (195,196). Lo mismo podría hipotetizarse para la posible asociación prevista entre los niveles de impulsividad y la edad: en base a los estudios evolutivos realizados en población general, sería esperable que la impulsividad disminuyera a medida que las personas envejecen (esto llevó a suponer que se obtendría una disminución en las puntuaciones medias del cuestionario UPPS-P, a medida que los sujetos presentaran edades más avanzadas). Sin embargo, este patrón solo se identificó para uno de los componentes de impulsividad analizados en el estudio: la escala de búsqueda de sensaciones (con puntuaciones medias más bajas en pacientes más mayores). Pero estos estudios deben interpretarse con cierta cautela, ya que gran parte de las investigaciones que presentan tendencias normativas en funciones cerebrales se han realizado con muestras de población general, de manera que informan de trayectorias en grupos que podrían considerarse como de control. El presente estudio, sin embargo, analiza una muestra clínica de pacientes que solicitan tratamiento para un trastorno adictivo (TJ), que se desarrolla a lo largo del ciclo vital y que se caracteriza por altos niveles de impulsividad. Por lo tanto, no es tan sorprendente que muestras clínicas con diagnóstico de TJ, incluso de edad avanzada, presenten altos niveles de impulsividad. Es por tanto importante que los diferentes programas de intervención

incluyan de forma sistemática elementos específicamente orientados a identificar y controlar las conductas impulsivas, al margen del grupo de edad de los pacientes (197).

De los resultados del tercer estudio también es importante atender a lo que evidencia el modelo mediacional: los sesgos cognitivos asociados al juego de azar se relacionan con una mayor gravedad de la conducta adictiva, existiendo efectos indirectos de la edad y del hecho de no tener pareja estable, sobre la gravedad de juego, mediados a través de los niveles de depresión-ansiedad. En este sentido, por un lado, es posible confirmar lo que estudios previos ya han indicado, que una ejecución más pobre en toma de decisiones correlaciona con una conducta más grave. Por otro lado, los resultados también confirman que los sujetos más mayores y los que viven sin pareja son más vulnerables a presentar conductas adictivas más graves si, además, padecen cuadros comórbidos ansioso-depresivos (198,199). Es importante destacar que los pacientes con más edad (especialmente los que alcanzan la jubilación) suelen presentar más dificultades económicas, pérdida de habilidades físicas (por ejemplo de movilidad) y cognitivas, y pérdidas de relaciones sociales significativas, lo cual puede originarles estados emocionales negativos más intensos y como consecuencia mayor riesgo de comportamiento adictivo más grave (200).

El estudio mediacional también mostró que el tipo de juego preferente guarda una relación directa con el nivel de sesgo cognitivo asociado al TJ (mayor nivel de distorsión está asociada a juego no estratégico), lo cual es coherente con otros estudios publicados (102,123,201,202). Y aunque no se halló asociación directa entre actividad de juego elegido para la adicción y nivel de impulsividad (tal como sería previsible atendiendo a otros estudios) (201,203–206), debe tenerse presente que los análisis de mediación incluyeron simultáneamente medidas de impulsividad y el nivel de sesgo cognitivo, y lo que sí se halló fue una correlación positiva entre altos niveles de impulsividad y mayor dificultad en razonamiento cognitivo (esto indicaría que aunque no haya efecto directo, sí habría un efecto mediado) (102). Finalmente, el juego de estrategia también se asoció a pacientes con edad más joven, lo cual es coherente con un nuevo fenotipo descrito en el ámbito del TJ, caracterizado por edad de inicio precoz, mayor sesgo cognitivo, alta sensibilización al refuerzo que ofrece la propia actividad de juego, alta deshibición y alta puntuación en búsqueda de sensaciones (92,222,223). Este perfil es especialmente importante de identificar, ya que sería altamente vulnerable a presentar rápida progresión-escalada a estados graves (209).

El cuarto artículo que forma esta tesis planteó como objetivo principal identificar clústeres empíricos, en pacientes que cumplen criterios clínicos para adicción a los videojuegos. Los resultados principales evidencian que esta condición constituye un trastorno heterogéneo, en el que es posible identificar subgrupos de sujetos con fenotipos distintos, en base a indicadores sociodemográficos y clínicos. En concreto, se identificaron dos clústeres, caracterizados por diferentes niveles de funcionalidad, resultado que es coherente con la literatura científica publicada hasta la fecha actual (210,211) (74,76,212,213). El grupo con mejor nivel de funcionamiento incluyó sujetos más jóvenes, hombres, solteros, laboralmente inactivos, con menor estrés emocional y niveles más adaptativos en relación a los rasgos de personalidad. El grupo con peor funcionalidad se asoció a edades más avanzadas, inicio más tardío y mayor duración de la conducta adictiva, mayor nivel de síntomas psicopatológicos comórbidos y rasgos de personalidad más disfuncionales. Estos resultados son consistentes con numersos estudios realizados en el área de las adicciones ("con" y "sin" sustancias), que muestran que es posible identificar diferentes perfiles de funcionalidad en muestras clínicas de pacientes y que los grupos con mayor gravedad son los que presentan mayor comorbilidad, patrones de personalidad más desadaptativos y más alteraciones neuropsicológicas (59,60,74,214–216). Respecto a los estudios que relacionan los rasgos de personalidad con la AV, los resultados son todavía complejos y se necesitan mayor número de estudios, que aporten evidencias sobre la implicación de las distintas dimensiones de personalidad, las motivaciones que mantienen el uso problemático de los videojuegos, el inicio de los problemas, el curso del trastorno y los correlatos clínicos que se presentan (217,218).

Uno de los resultados más destacados de este cuarto artículo es la observación de que el sexo femenino estaba más representado en el perfil con mayor gravedad. Otros estudios ya habían sugerido que, aunque el uso de videojuegos en general y, más específicamente, la AV es menos frecuente en las mujeres, son ellas las que experimentan correlatos más graves una vez la conducta se ha convertido en adictiva (219,220). Se han planteado varias explicaciones para este hallazgo, como el hecho de que las mujeres podrían frustrarse más que los hombres al jugar a videojuegos, porque les resulta más difícil encontrar elementos que les resulten atractivos dentro de estas plataformas (por ejemplo, personajes con los cuales identificarse, lo cual contribuiría a incrementar sus niveles de frustración) (221–223).

5.2 Limitaciones

Una de las potenciales limitaciones del estudio es el tamaño de los grupos que se han analizado en algunos artículos, que desde un punto de vista meramente estadístico podrían evaluarse como reducidos. El tamaño de los grupos podría afectar la potencia estadística y la capacidad para identificar posibles asociaciones que realmente existen en las poblaciones de origen y también podría comprometer la validez externa, porque disminuye la capacidad de generalización (por ejemplo, los resultados obtenidos al analizar mecanismos explicativos de la adicción al sexo pueden únicamente ser extrapolados a hombres, ya que la muestra no incluyó mujeres). Sin embargo, debe tenerse presente que los análisis se han realizado con muestras clínicas de pacientes, que cumplen criterios clínicos para distintas formas de adicción comportamental, y por lo tanto en este sentido los tamaños de los grupos pueden considerarse adecuados (o incluso amplios). De hecho, algunas de las condiciones clínicas consideradas en la tesis todavía no forman parte de sistemas de clasificación diagnóstica estandarizados (como el DSM o la CIE), lo cual puede contribuir al estigma social de los pacientes y a las dificultades que les supone acudir a centros de tratamiento. Por otro lado, y en relación con el tamaño de los grupos, los análisis realizados incluyen los resultados de pruebas de significación estadística, pero también medidas de efecto estandarizadas (que aportan información sobre el grado de asociación y son más independientes de los tamaños muestrales).

Otra de las limitaciones es que algunos de los trabajos analizan datos que se han recogido de forma transversal, lo cual impide analizar el progreso de diferentes dimensiones analizadas y dificulta la capacidad para establecer conclusiones en términos de causalidad. En relación a este punto, el artículo que explora la existencia de clases latentes evolutivas, en función de la gravedad del TJ tras la TCC, sí analiza datos longitudinales, pero debe tenerse presente que únicamente se analizan los seis meses de seguimiento tras la intervención. Las trayectorias que se han identificado, por lo tanto, podrían no ser representativas del curso del trastorno durante períodos más largos (no existen garantías de que los cursos que se identifican persistan en el tiempo).

Finalmente, los análisis se han realizado con muestras clínicas de pacientes con adicción comportamental, pero no se han incluido grupos de control de sujetos sin adicción (con o sin otras condiciones psicopatológicas comórbidas). En este sentido, es

importante tener presente que los resultados obtenidos en los estudios realizados aportan evidencias empíricas sobre pacientes con un perfiles fenotípicos específicos, pero no son generalizables a otras poblaciones (como por ejemplo población general, otras formas de adicción comportamental u otros trastornos dentro del espectro impulsivo-compulsivo).

5.3 Fortalezas

La tesis doctoral presenta diferentes aspectos potencialmente destacados. En primer lugar, algunos estudios se han realizado con muestras amplias de sujetos (por ejemplo, el trabajo de trayectorias evolutivas con pacientes jóvenes que son tratados con TCC y seguidos durante los seis primeros meses después de la intervención). Este aspecto influye en la potencia estadística, y en la validez externa de la investigación.

Otro aspecto importante es el análisis de variables que exploran múltiples factores, desde aspectos sociodemográficos hasta el estado psicopatológico de los pacientes, sus rasgos de personalidad, así como otros correlatos de la conducta adictiva.

El análisis de datos longitudinales es otra de las fortalezas del estudio de trayectorias evolutivas del curso del TJ, tras la intervención con TCC. De este estudio también destaca el uso de una metodología estadística centrada en el propio sujeto, que difiere de las metodologías clásicas centrada en las variables. Tradicionalmente, el estudio de la eficiencia terapéutica se ha realizado con modelos que se basan en describir las relaciones que existen entre un conjunto de predictores y las variables que miden los resultados de las interenciones, por ejemplo mediante modelos de regresión. Una de las dificultades de este enfoque es que no tiene en cuenta la variabilidad dinámica intra-sujeto, ya que el foco analítico está dirigido a las variables. En contrapartida, los procedimientos centrados en el propio sujeto (como el que se ha empleado para explorar las trayectorias evolutivas) se focaliza en la estructura de las variables intra-sujeto, de manera que el individuo es considerado como un todo y no como la suma de un conjunto de atributos. Esta metodología es habitual en otras disciplinas clínicas como la pediatría, en la que se analizan series longitudinales de datos con el objetivo de obtener trayectorias “normativas” para diferentes aspectos del funcionamiento de los sujetos. Recientemente, otras áreas de conocimiento han ampliado el uso de esta metodología para evaluar cómo evolucionan-progresan diferentes comportamientos, tanto en población general como clínica. Sin embargo, las

clases latentes longitudinales se han utilizado muy poco para el estudio del TJ, y los trabajos publicados hasta la fecha suelen analizar muestras comunitarias (en concreto, la progresión "natural" del juego en sujetos no tratados). En esta línea, el trabajo que se presenta es pionero. El análisis de clústeres del cuarto estudio es también una metodología de clasificación que se incluye en el grupo de procedimientos basados en el sujeto, caracterizado por la exploración de la existencia de agrupaciones empíricas de sujetos cuya variabilidad intra-grupos sea baja y con alta variabilidad entre-grupos.

El tercer estudio también incluye un procedimiento analítico poco habitual en el área de estudio de las adicciones comportamentales: un modelo de mediación implementado mediante ecuaciones estructurales. Una de las ventajas de este modelado es que permite identificar relaciones directas e indirectas, parámetros de moderación y de mediación. Se trata de modelos multivariantes que aportan una descripción (y/o explicación) del conjunto de inter-relaciones entre variables, y que por lo tanto aportan información muy valiosa sobre los procesos que sustentan determinados constructos complejos. Una de las críticas clásicas a los modelos mediacionales es que únicamente pueden aplicarse a datos longitudinales y a muestras grandes con finalidad explicativa, ya que se trata de modelos de "causalidad". Pero los estudios más recientes sugieren que este modelado no únicamente permite "validar" hipótesis con un sustrato teórico robusto, sino que también pueden emplearse con fines exploratorios para valorar en qué grado hipótesis con menor evidencia empírica acumulada podrían ser plausibles. Es decir, se trata de modelos que pueden ser empleados tanto para la validación de las teorías emergentes como para su formulación y desarrollo. Respecto al tamaño de muestra, aunque no existen datos firmes que validen a partir de qué valores resultan más eficientes, los estudios de simulación sugieren que su validez va ligada al grado de cumplimiento de los índices de ajuste: si un modelo ajusta de forma adecuada, se garantiza su aplicabilidad a una muestra concreta. Por otro lado, los resultados obtenidos en estudios con pocos sujetos poseen limitada validez o capacidad de generalización, pero este aspecto no es una cuestión propia de los modelos mediacionales sino de cualquier estudio de investigación empírico.

Respecto a los estudios que miden resultados de las intervenciones, también se debe considerar positivamente la disponibilidad y análisis de datos longitudinales, que han facilitado múltiples variables en diferentes momentos del tiempo medidas mediante cuestionarios estandarizados.

5.4 Implicaciones

Esta tesis doctoral aporta evidencia empírica (obtenida de estudios clínicos) sobre el componente multidimensional de las adicciones comportamentales, y del rol que ejercen variables centrales como el sexo, la edad cronológica, la edad de inicio y la duración del trastorno en el fenotipo de los pacientes que acuden a centros asistenciales en busca de tratamiento.

En conjunto, los resultados que se han obtenido resultan de interés para la elaboración de modelos integrativos que permitan explicar cuáles son los mecanismos subyacentes, que contribuyen al inicio y al curso de estos trastornos. En esta línea, los datos que aporta esta tesis pueden utilizarse también en el ámbito de la definición conceptual. Actualmente el DSM-5 únicamente incluye el TJ dentro de una categoría diagnóstica concreta, mientras que la adicción a los videojuegos se ha ubicado en la sección III de condiciones clínicas emergentes, pendientes de recabar mayor volumen de evidencia científica. La última versión de este manual por primera vez contempla el grupo de "adicciones no relacionadas con sustancias", reconociendo así que el término adicción puede ser aplicado a conductas que cursan sin sustancias como el tabaco, el alcohol o las drogas. Sin embargo, en este grupo únicamente se contempla el trastorno de juego con apuesta, ya que únicamente para esta condición se dispone de estudios suficientes que avalan la similitud neurobiológica y clínica con los trastornos relacionados con el abuso de sustancias. Nos encontramos, por tanto, en una situación compleja, porque las taxonomías de referencia no facilitan definiciones operativas consensuadas para un amplio número de adicciones comportamentales, que además están mostrando prevalencias alarmantemente crecientes durante los últimos años (en paralelo a la transformación digital que está viviendo la sociedad actual). Sin embargo, en 2019, la última edición de la Clasificación Internacional de Enfermedades (CIE-11) incorporó ya la adicción a videojuegos como la segunda adicción comportamental, incluyéndola en el mismo apartado que la adicción al juego de apuesta. De modo que entre 2013, año en el que fue publicado el DSM-5 y 2019 (CIE-11) ya se habían acumularon suficientes evidencias empíricas para realizar este avance significativo en el campo de las adicciones sin sustancia.

Los resultados de esta tesis también son de interés para el desarrollo de instrumentos de evaluación, tanto para el cribado como para el diagnóstico, y que

cubren tanto los síntomas propios de la definición conceptual como de los potenciales factores de riesgo y sus consecuencias.

Finalmente, las evidencias obtenidas pueden servir en el ámbito de la prevención y de la intervención, para elaborar planes de prevención dirigidos a los grupos de mayor vulnerabilidad y para crear programas de intervención específicos que integren mecanismos para dar respuesta a las necesidades concretas de cada paciente.

En relación con lo anterior, es importante finalizar con la siguiente reflexión: esta tesis se enmarca en el modelo biopsicosocial de las adicciones, según el cual las conductas adictivas *aparecen* y *progresan* en función de la interacción de múltiples factores que tienen que ver con el ámbito personal, pero también psicosocial. Prevenir y promocionar la salud (en el ámbito de las adicciones) no debe limitarse al enfoque bio-médico-psiquiátrico (focalizado en el trastorno una vez iniciado y en su tratamiento, siendo el paciente el elemento casi exclusivo), sino que pretende aportar datos que sirvan para la prevención y la detección precoz/temprana. En definitiva: el eje central que ha inspirado este proyecto ha sido aportar hallazgos que contribuyan a que clínicos, pero también responsables de políticas de regulación del juego y de otras actividades relacionadas, pongan en marcha planes de promoción de la salud, para que los ciudadanos dispongan de mayor conocimiento sobre los múltiples factores que interactúan y contribuyen a la génesis y la progresión de las adicciones comportamentales. Se trata de problemas que afectan no únicamente a los pacientes que los padecen, sino que ocasionan un acusado impacto en diversas áreas de funcionamiento (como la familia o el entorno laboral), y por tanto transcienden el ámbito concreto de la salud mental y alcanzan la esfera psicosocial. Según este planteamiento integrador, la adicción comportamental es el resultado de una vulnerabilidad biológica sobre la que contribuyen factores ambientales y condicionantes sociales.

6. Conclusiones

1. Las adicciones comportamentales poseen mecanismos subyacentes y patrones de asociaciones diferenciados según el tipo de adicción. Estos mecanismos deben tenerse en cuenta a la hora de diseñar instrumentos de evaluación y programas de intervención. La edad de inicio es crucial por su fuerte asociación con el el estado clínico y con la gravedad de los problemas por adicción conductual.
2. Es posible identificar trayectorias empíricas de la evolución del TJ en sujetos jóvenes, desde la línea base hasta los seis meses tras la intervención con TCC.
3. El perfil que caracteriza la trayectoria evolutiva con respuesta más pobre a la TCC incluye pacientes con excesiva preocupación, marcadas tendencias al pesimismo y aprensión, falta de control de impulsos para responder a las circunstancias actuales y a las necesidades inmediatas, falta de autodirección hacia metas y objetivos, ineficacia en la resolución de problemas, sentimientos de insatisfacción generalizada, y bajos niveles de motivación.
4. Las relaciones observadas entre la alta impulsividad y la gravedad de los sesgos cognitivos con la gravedad de los síntomas del TJ sugieren la implicación de mecanismos neurológicos implicados en los procesos de sensibilizacion por incentivos (similares a los que participan en adicciones con sustancias).
5. En el grupo de pacientes con AV existen dos perfiles/clústeres diferenciados en variables sociodemográficas y clínicas.
6. El clúster de pacientes con AV con funcionamiento desadaptativo moderado incluye sujetos más jóvenes, con edad de inicio más temprana, menor duración de la conducta adictiva, sexo masculino, estado civil soltero, situación laboral inactiva, mejor estado psicopatológico y rasgos de personalidad más funcionales.
7. El clúster de pacientes con AV con funcionamiento más grave y desadaptativo incluye mayor porcentaje mujeres, sujetos casados, en situación laboral inactiva, edad más avanzada, inicio más tardío del uso de video juegos y mayor duración de los problemas relacionados con la conducta adictiva, mayor número de síntomas psicopatológicos comórbidos y perfil de personalidad más disfuncional.

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Declaración de código ético y buenas prácticas

LA DOCTORANDA

Doña **Susana Valero Solís** declara que la tesis que presenta no contiene plagio, manifiesta conocer y consiente en que la tesis podrá ser sometida a procedimiento para comprobar su originalidad.

El doctorando / La doctoranda

SUSANA VALERO SOLÍS

LAS DIRECTORAS

La Doctora **Susana Jiménez Murcia**

La Doctora **Roser Granero Pérez**

declaran que se han cumplidos los códigos éticos y de buenas prácticas, y que no tiene conocimiento de que se haya producido ningún plagio.

Los Directores / Las Directoras

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