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ORIGINAL ARTICLE

Internet gaming disorder and the alternative five factor personality model: a study in a Spanish community sample

Anton Aluja [1,2 · A,B,C,D,E,F,G], *Oscar García* [2,3 · A,C,D,E,G], *Ferran Balada* [2,4 · C,D,E,F,G], *Neus Aymamí* [2,5 · E,F,G], *Luis F. García* [2,6 · A,B,C,D,E,F,G]

1: University of Lleida, Lleida, Spain
2: Lleida Institute for Biomedical Research, Dr. Pifarré Foundation, Lleida, Spain
3: European University of Madrid, Madrid, Spain
4: Autonomous University of Barcelona, Barcelona, Spain
5: Hospital Universitari Santa Maria de Lleida, Lleida, Spain
6: Autonomous University of Madrid, Madrid, Spain

BACKGROUND
This study was designed to examine the prevalence and relationships between the Internet gaming disorder (IGD) behaviors, suggested by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), and personality traits.

PARTICIPANTS AND PROCEDURE
A sample community of 1,548 subjects, 707 men and 841 women, with a mean age of 40.90 and 38.89 years, respectively, was evaluated.

RESULTS
The results showed that only 7 subjects (0.5%) exceeded the cut-off point of 75 points to be classed as "disordered gamers" proposed by Fuster et al. (2016) in Spain. This study demonstrates the unidimensionality of the IGD-20, so it can be used as an ordinal dimensional measure to study the relationship between IGD symptoms and other related variables such as personality in community samples. A multiple linear regression analysis revealed that up to 8% of the variance of the Internet Gaming Disorder-20 scale (IGD-20), as a dimensional scale, can be explained by low activity, high aggressiveness, introversion, non-planning impulsivity, sensation seeking, neuroticism and impulsiveness (attention impulsivity) using the Alternative Five Factor Model (AFFM) of personality and the Barratt Impulsivity Scale (BIS-11).

CONCLUSIONS
This study shows that the prevalence of IGD in the Spanish population is similar to that of other Western countries. The unidimensionality of the IGD-20 allows its use in correlational studies to examine the relationship between Internet gambling behaviors and personality variables. The implications of these personality profiles are discussed in relation to the psychological and clinical mechanisms involved in Internet gaming disorder.

KEY WORDS
impulsivity; BIS-11; personality; IGD-20; ZKA-PQ/SF

CORRESPONDING AUTHOR – Prof. Anton Aluja, University of Lleida, Pl. de Víctor Siurana 1, E-25003 Lleida, Spain, e-mail: anton.aluja@udl.cat

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BACKGROUND

The DSM-5 (APA, 2013) mentioned that the prevalence of Internet gaming disorder (IGD) was difficult to establish due to the different questionnaires, criteria and diagnostic thresholds used, but there was thought to be a higher prevalence in Asian countries (China and South Korea) and in adolescent males between 12 and 20 years of age. In Asia, it was established that among adolescents between 15 and 19 years of age with a diagnostic threshold of 5 criteria, the prevalence was 8.4% in men and 4.5% in women (APA, 2013). Since then, numerous studies, systematic reviews, and meta-analyses of gaming disorders in general and IGD have been published, reporting their prevalence in different contexts and different samples and methodologies (Chia et al., 2020; Pan et al., 2020; Stevens et al., 2021).

Przybylski et al. (2017) reported a very low prevalence of IGD in the general population of between 0.3% and 1.0%, concluding that Internet-based games may be significantly less addictive than gambling. It is necessary to distinguish between the terms "gambling" (defined by betting and wagering mechanics, predominantly chance-determined outcomes, and monetization features that involve risk and payout to the player) and "gaming" (defined by its interactivity, skill-based play, and contextual indicators of progression and success) (King et al., 2015).

Pan et al. (2020) carried out a meta-analysis which investigated the prevalence rates of generalized Internet addiction (GIA) and Internet gaming disorder (IGD). The result was an average prevalence of 7.02% for GIA, and 2.47% for IGD. Chia et al. (2020) performed a meta-analysis of prevalence rates of Internet addiction and gaming disorders in Southwest Asia using the most important databases, covering 24 studies. The results reported a pooled prevalence of 20.0% for Internet addiction and 10.1% for gaming disorders in general. Fam (2018) carried out a meta-analysis of the prevalence of IGD in adolescents over three decades and found that global prevalence was 4.6%, although male adolescents exceeded this percentage. Stevens et al. (2021) conducted a systematic review and meta-analysis and found that the worldwide prevalence of gaming disorder was 3.05%, but when considering only studies that met the strictest sampling criteria, the prevalence was adjusted to 1.96%.

However, in the DSM-5-TR (APA, 2022), the reported prevalence is higher: "The mean prevalence of 12-month Internet gaming disorder is estimated as 4.7% across multiple countries, with a range of 0.7% to 15.6% across studies"; "An international meta-analysis of 16 studies found a pooled prevalence of Internet gaming disorder among adolescents of 4.6%, with adolescent boys/men generally reporting a higher prevalence rate (6.8%) than adolescent girls/women (1.3%)" (p. 916). The prevalence is similar in Asian and Western countries. This increase in prevalence could be influenced by the COVID pandemic that was declared in January 2020 (Spain). The 11th Revision of the International Classification of Diseases (ICD-11; WHO, 2022) includes digital gaming or video games as a behavior characterized by poor control over the game or intensification of the game despite negative consequences (https://www.psychiatry.org/patients-families/internet-gaming).

PERSONALITY AND INTERNET GAMING DISORDERS

Some personality traits have also been shown to be associated with IGD, such as neuroticism, high impulsivity, and high aggressiveness (Gervasi et al., 2017). The IGD has also shown correlations with psychopathological symptoms in adolescents, such as anxiety, hyperactivity/impulsivity, and suicidal ideation (Bolat et al., 2021) as well as disorders such as borderline personality disorder (Brown et al., 2015).

The relationship between problem gambling, in general, and IGD has usually been studied using the Five Factor personality model (FFM; Costa & McCrae, 1985; De Raad, 2000). A meta-analysis by Müller et al. (2014) checked the relationship between IGD and the Big Five personality model in IGD patients and controls. The findings were that IGD was related to neuroticism, low conscientiousness, and low extraversion. Low conscientiousness and low extraversion were characteristic of IGD. Gervasi et al. (2017), in a systematic review, corroborated that people with IGD symptoms scored in the same Big Five personality traits, which was also in line with another recent meta-analysis (Dudfield et al., 2023; Şalvarlı & Griffiths, 2021). Different studies have also investigated the association between IGD and sensation seeking personality trait (Mazaheri & Hosseinsabet, 2017). The results showed that sensation seeking behaviors tend to be associated with higher gaming hours and greater chances of exhibiting IGD, especially in adolescents (Hamid et al., 2022). However, not all studies obtained the same results. Mehroof and Griffiths (2010) found that sensation seeking was associated with online gaming addiction, but Müller et al. (2016) found that sensation seeking was lower in addicted gamblers than in controls.

AIMS OF THIS STUDY

This study has a triple aim: a) to check the psychometric properties, including the unidimensionality, of the IGD-20 in a large adult community sample, with

parity in sex and an age frequency similar to that of the general population, b) to examine the prevalence of the IGD based on the psychometric criterion represented by the cut-off point of 75 points indicated in the study by Fuster et al. (2016) carried out in gamers, in the same sociocultural context, and c) to study the Alternative Five Factor Model (AFFM) and the Barratt Impulsiveness Scale (BIS-11), associated with low and high scores on the IGD-20.

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

The participants were 1,548 subjects, consisting of 707 men M_{age} = 40.90, *SD* = 17.93) and 841 women (M_{age} = 38.89, *SD* = 18.61) recruited from volunteers from the community of the cities of Lleida and Madrid in Spain in the period between September and November 2019. The mean age of the men was slightly higher (*t*-test = 2.15, $p = .031$). All participants were 18-86 years old.

PROCEDURE

All participants authorized the anonymous use of their data for teaching and research purposes. The research was part of a research project authorized by the university's ethics committee (approval no. CEIC-138).

MEASURES

The Internet Gaming Disorder-20 (IGD-20). The IGD-20 used in this study was validated in Spain by Fuster et al. (2016), in a sample of gamers aged between 12 and 58 years, showing good structural validity and reliability. The cut-off point between "disordered gamers" and "non-disordered gamers" was 75 points (specificity of 99% and a sensitivity of 71%).

Zuckerman-Kuhlman-Aluja Personality Questionnaire Shortened Form (ZKA-PQ/SF). The ZKA-PQ/SF is a shortened version of 80 items (Aluja et al., 2018). The response format is a 4-point Likert-type scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The factor structure retains five personality factors: aggressiveness (AG), activity (AC), extraversion (EX), neuroticism (NE), and sensation seeking (SS) (Aluja et al., 2018, 2020).

The Barratt Impulsiveness Scale (BIS-11). The Barratt Impulsiveness Scale is a 30-item questionnaire comprising three scales: attention (AI), motor (MI) and non-planning (NPI) impulsiveness (Patton et al., 1995). It has a 4-point Likert-type format. The Spanish validation was conducted by Oquendo et al. (2001), corroborating the original psychometric properties.

RESULTS

DESCRIPTIVE, GENDER DIFFERENCES AND INTERNAL CONSISTENCY

Men scored significantly more than women in the six IGD-20 domains. Women scored significantly higher than men on extraversion and neuroticism and men scored significantly higher on sensation seeking. In the impulsivity domains, women scored higher in attention and the men scored higher in non-planning. Additionally, the different sizes of the sample are shown according to Cohen's *d* (Cohen, 1988) (Table 1).

CORRELATIONAL ANALYSIS

Table S1 in Supplementary materials shows the correlations between all the variables with each other. Age correlated negatively with the six domains of the IGD-20, obtaining significant strong correlations with salience, tolerance, and IGD-20 ($p < .001$). Neuroticism, sensation seeking, and aggressiveness correlated significantly with the BIS-11 ($p < .001$). Aggressiveness was the personality domain most closely related to the IGD-20 domains. BIS-11 was also positively related to IGD-20 domains ($p < .001$).

DIMENSIONALITY OF THE INTERNET GAMING DISORDER-20 (IGD-20)

The IGD-20 is a scale with six highly correlated domains. The parallel analysis showed a single factor, and the first factor accumulated 68.7% of the total variance, while the second factor had an eigenvalue of .63. All factorial loadings were high and ranged between .68 and .99 with high communalities. The unidimensionality of the IGD-20 is demonstrated by the different indicators of closeness to unidimensionality assessment such as the general factor (rotated loading matrix in exploratory bi-factor model), the normed measure of sampling adequacy (MSA), item unidimensional congruence (I-UniCo) and explained common variance (ECV) (Table 2).

CONFIRMATORY FACTOR ANALYSIS (CFA) OF IGD-20

A CFA was carried out taking the 6 factors of the IGD-20 as observed variables integrated in the 6 factors to be confirmed using maximum likelihood estimation to test the structural model. The goodness-fit-indices showed an acceptable adjustment similar to those obtained in other studies in the same sociocultural context (Fuster et al., 2016), in Internet gamers. Chi square divided by degrees of freedom was

Table 1

Descriptive, gender comparisons and Cronbach's alpha internal consistency

	Men (n = 707)		Women (n = 841)		All			
	M	*SD*	*M*	*SD*	*t*-test	*p*	*d*	α
Age	40.90	17.93	38.89	18.61	2.15	.031	.07	–
IGD-20								
Salience	4.54	2.49	3.57	1.40	9.62	< .001	.11	.76
Mood modification	5.92	2.84	4.96	2.44	7.12	< .001	.37	.56
Tolerance	4.34	2.24	3.61	1.44	7.74	< .001	.39	.71
Withdrawal	3.96	1.91	3.36	1.31	7.29	< .001	.37	.86
Conflict	8.23	3.23	7.25	2.64	6.55	< .001	.34	.48
Relapse	4.22	1.99	3.60	1.51	6.92	< .001	.36	.68
IGD-20 total	31.20	12.02	26.34	8.41	9.31	< .001	.48	.89
ZKA-PQ/SF								
Aggressiveness	33.12	8.74	33.36	8.91	−0.53	.589	−.14	.88
Activity	41.53	7.22	42.08	7.33	−1.49	.137	−.08	.81
Extraversion	48.10	7.92	49.18	7.80	−2.68	.007	−.14	.86
Neuroticism	32.85	9.12	37.83	9.51	−10.47	< .001	−.53	.90
Sensation seeking	38.47	8.53	36.61	8.99	4.15	< .001	.21	.85
BIS-11								
Attention	14.97	3.97	15.44	3.74	−2.43	.015	−.12	.41
Motor	13.74	5.32	14.14	5.66	−1.41	.158	−.07	.68
Non-planning	18.47	5.34	17.37	5.04	4.16	< .001	.21	.57

Note. ZKA-PQ/SF – Zuckerman-Kuhlman-Aluja Personality Questionnaire shortened form; BIS-11 – Barratt Impulsiveness Scale; IGD-20 – Internet Gaming Disorder-20. Cohen's *d*: 0.10 – very small, 0.20 – small, 0.50 – medium, 0.80 – large, 1.20 – very large.

Table 2

Several unidimensional IGD-20 fit statistics

Variable	Eigenvalues	% Variance	Domains	Loading	H^2	GF	Normed MSA	I-UniCo	ECV
1	4.08	68.07	Tolerance	.89	.98	.84	.87	.98	.89
2	0.63	10.49	Withdrawal	.89	.79	.86	.89	1	.93
3	0.52	8.68	Salience	.87	.76	.82	.89	.99	.84
4	0.30	5.05	Relapse	.86	.74	.85	.91	1	.98
5	0.27	4.48	Conflict	.74	.54	.71	.94	1	.97
6	0.19	3.23	Mood modification	.68	46	.58	.94	.98	1

Note. IGD-20 – Internet Gaming Disorder-20; GF – general factor rotated loading matrix (exploratory bifactor model); H^2 – communalities; normed MSA – measure of sampling adequacy; values of MSA below .50 suggest that the item does not measure the same domain as the remaining items in the pool, so it should be removed; I-UniCo – item unidimensional congruence; a value of UniCo larger than .95 suggests that data can be treated as essentially unidimensional; ECV – explained common variance; a value of ECV larger than .85 suggests that data can be treated as essentially unidimensional.

9.42 (p < .001). The values obtained were as follows: CFI = .93, TLI = .91, RMR = .03 and RMSEA .06 (90% CI: .043-.072). Standardized estimates of all the items regarding their factor were greater than .50 for each, except items 2 and 19. These two items were recoded according to the original authors and the recoding was verified in our data to exclude errors. Factor analysis is considered one of the strongest approaches to establishing the construct validity of a psychometric instrument (Goodwin, 1999).

IGD-20 DISTRIBUTION PERCENTAGES

The mean IGD-20 total score was 28.56 and the standard deviation was 10.49. The minimum score was 20 and the maximum 90. The 25th percentile was reached with 22 points, the 50th with 25 points, and the 75th with 30 points. Since the sample came from the general population, low score frequencies were expected. Following the latent profile analysis (LPA) carried out by Fuster et al. (2016) (personal communication: 1 – 20-34, 2 – 35-49, 3 – 50-59, 4 – 60-74 and 5 – 75-100 rank scores by class) five classes were established: casual gamers (n = 1,277; 82.5%); regular gamers (n = 172; 11.1%); engaged gamers at low risk (n = 54; 3.5%); engaged gamers at high risk (n = 38; 2.5%); disordered gamers (n = 7; 0.5%). Adopting the cut-off point of 75 points to the "disordered gamers" group, as suggested by Fuster et al. (2016), only 7 subjects (four women and three men) fell into this class.

LINEAR REGRESSION ANALYSIS

Table 3 shows a multiple linear regression analysis taking the five domains of ZKA-PQ/SF and BIS-11 as independent variables, and the IGD-20 total score as the dependent variable by men and women separately. The statistically significant predictor scales for both genders were aggressiveness, neuroticism, and extraversion (in negative). Men obtained significant values in activity (negative), sensation seeking, attention, motor and non-planning impulsivity, while women tended to obtain high values in sensation seeking, but it was not significant (p = .075). The accounted variance was 18% and 5% respectively for males and females.

DISCUSSION

Gambling disorders, and in particular Internet gaming disorders (APA, 2013), have received much interest from researchers and there is a large number of publications, systematic reviews and meta-analyses. The present study verifies the good psychometric properties of the IGD-20 in a general healthy adult population, according to most published studies in different samples and cultures. Men scored significantly higher than women in all domains of the IGD-20. The construct validity is verified by the results of the confirmatory factor analysis, obtaining adequate goodness-of-fit-indices, very similar to those obtained in the original validation study by Pontes et al. (2014),

Table 3

Standardized coefficients, t-test and significance of the variables by gender, included in the equation of the multiple regression analysis ZKA-PQ/SF and BIS-11 scales as independent variables, and IGD-20 as the dependent variable

	Men (n = 707) R = .40, R^2 adjusted = .18			Women (n = 841) R = .22, R^2 adjusted = .05		
R^2 adjusted = .08	Standardized coefficients			Standardized coefficients		
	β	t	p	β	t	p
(Constant)		4.69	< .001		8.05	< .001
Aggressiveness	.09	2.13	.033	.11	2.52	.012
Activity	−.16	−4.16	< .001	−.05	−1.26	.207
Extraversion	−.02	−1.96	.049	−.08	−2.10	.036
Neuroticism	.11	2.63	.024	.13	2.72	.032
Sensation seeking	.17	4.36	< .001	.11	2.26	.075
Attention	.09	2.09	.037	.04	0.92	.358
Motor	.09	1.97	.050	.01	0.15	.882
Non-planning	.08	1.98	.048	.00	0.06	.950

Note. ZKA-PQ/SF – Zuckerman-Kuhlman-Aluja Personality Questionnaire shortened form; BIS-11 – Barratt Impulsiveness Scale; IGD-20 – Internet Gaming Disorder-20.

and in the Spanish validation (Fuster et al., 2016). Both studies worked with online gaming forum samples. Other studies using different samples and cultures have found equivalent results (Andrade et al., 2022; Evren et al., 2018; Grajewski & Dragan, 2021; Kim, 2019; Plessis et al., 2021; Shu et al., 2019). Additionally, this study demonstrated the unidimensionality of the IGD-20, so it can be used as an ordinal dimensional measure to study the relationship between IGD symptoms and other related variables such as personality in community samples.

Despite the good results of the CFA, low standardized weights are observed with their respective factor of .24 for item 2 and .02 for item 19. These items are formulated in reverse content and their score must be recorded in the direction of the remaining 18 items. The formulation of these items is negative and is likely to lead to confusion in some subjects. An inspection of the weights obtained by other authors in these items also reveals low weights in almost all studies reviewed in different samples and countries (Andrade et al., 2022; Evren et al., 2018; Grajewski & Dragan, 2021; Kim, 2019; Plessis et al., 2021; Shu et al., 2019), so these items should be reviewed in future studies. The internal alpha consistency of the 20 IGD-20 items was .89, but the mood modification and conflict domains obtained alphas lower than .60. This is probably due to the low correlations of items 2 (mood modification) and 19 (conflict) with the total sum of their respective scales.

As argued in the introductory section, there is no consensus on the prevalence of IGD since researchers have used different instruments and different samples, cultures, and age ranges. The difference in our study is that it analyzed adult men and women from the general population, in a western country, over 18 years of age and with a mean age of 39.8 years. There were no adolescents. As a cut-off point to know the prevalence of subjects with a possible IGD, the value of 75 points reported by Fuster et al. (2016) was used, the result being a prevalence of less than 1%. These data are more similar to those reported by Przybylski et al. (2017), in the general population. These authors suggested that Internet-based games might be significantly less addictive than gambling, in general. However, as mentioned in the method section, this study was conducted before the COVID pandemic and subsequent data collected by the DSM-5-TR increase the prevalence of IGD and question the differences between Asian and Western countries.

Several meta-analyses have reported on the relationship between the IGD and the FFM (Dudfield et al., 2023; Gervasi et al., 2017; Müller et al., 2014; Şalvarlı & Griffiths, 2021). All of them agree that IGD is associated with neuroticism, with some exceptions, with low extraversion, agreeableness, conscientiousness, and even openness to experience (Gervasi et al., 2017). In reference to openness to experience, there are contradictory results. Müller et al. (2014) found positive relationships between openness and IGD. In Zuckerman's model of the five alternative factors of personality (AFFM; Zuckerman et al., 1993; Zuckerman & Aluja, 2015), neuroticism and extraversion are equivalent to their counterpart of FFM. Activity is related to conscientiousness, and openness to sensation seeking (García et al., 2012).

Our global results indicate that aggressiveness, neuroticism and sensation seeking are related to IGD-20. On the other hand, extroversion and activity are negatively correlated. In line with our results, we suggest that people prone to social anxiety (high neuroticism and low extroversion) are at high risk of IGD behaviors. So, it is suggested that a treatment focus on reducing social anxiety could be effective in some people presenting IGD. Openness correlates positively with sensation seeking in other studies (García et al., 2012; Aluja et al., 2003), so it was expected that sensation seeking would present a similar pattern as openness to IGD behaviors contained in the IGD-20 items. However, multiple linear regression analysis showed some differences based on gender. The personality scales with significant standardized values in both groups by gender were aggressiveness, neuroticism, and negative extraversion. Sensation seeking was highly predictive in men and showed a trend in womenThe AFFM has an aggressiveness factor and in our study, it was significantly related to the IGD-20 and its six domains' scores. These data are in line with the findings reported by authors showing aggressiveness to be linked with online additions and games (see review of Gervasi et al., 2017). So, aggressiveness can facilitate the development of addiction to online games (Mehroof & Griffiths, 2010) since this trait is associated with pathological IGD since people engaged in Internet gaming and the group with higher scores on IGD-20 tended to score higher on aggressiveness.

Aggressiveness is related to impulsivity, and both were associated with problematic online gaming. Choi et al. (2014) conducted a study on impulsivity and various addictive behaviors and found a positive relationship between IGD and GD, especially for motor and non-planning impulsivity scales measured by the BIS-11. Our global results also indicated a strong correlation between the aggressiveness of the ZKA-PQ and the impulsivity domains of the BIS-11. Both aggressiveness and impulsiveness were related to the IGD-20, corroborating the findings of other authors. Nevertheless, activity and impulsivity scales were not predictive of IGD in the female group. In previous studies, men tended to score more on the aggressiveness and impulsivity scales and tended to be more addicted to Internet games. The prevalence of IGD is usually higher in men than in women (Darvesh et al., 2020). Additionally, men tended to have higher scores in aggressiveness and impulsivity personality traits (Strüber et al., 2008).

This study has some strengths and limitations. The large community sample was made up of anonymous volunteers from the community. The sample is like the general population in terms of gender parity and age distribution, but it is not completely representative of the Spanish population. Being based on self-reported questionnaires, the possible presence of social desirability or other biased answers cannot be ruled out. Another limitation is that the cross-sectional design does not allow us to establish causality between the variables examined. Future studies with longitudinal designs could provide information on the role of personality and its relationship with Internet gaming over a long period of time. Note that this study was carried out in a general population with a low prevalence of IGD symptoms (prior to the COVID-19 pandemic that began in January 2020 in Spain), but the results of the association between these symptoms and personality are like the studies carried out with Internet gamers using similar instruments (Dudfield et al., 2023; Gervasi et al., 2017; Şalvarlı & Griffiths, 2021). Despite this, these results should be replicated in clinical populations using the Zuckerman-Kuhlman-Aluja questionnaire (ZKA-PQ).

As for practical implications, the results of this study suggest that personality plays a significant role in the mechanisms involved in Internet gaming disorder behaviors. The detection of risk personality patterns for IGD could be useful in the design of prevention and treatment programs for gambling disorders. The IGD can negatively affect school or college performance, and cause job loss or marital failure (Benjet et al., 2023; Chattopadhyay et al., 2020; Grzegorzewska, 2017; Pereira et al., 2021). Ji et al. (2022) carried out a meta-analysis, in which strong correlations were found between IGD and maladaptive cognitions and motivations that were amenable to therapeutic treatment. For instance, as it has been mentioned above, since people with high neuroticism (including aggressiveness) and low extroversion are more vulnerable to social anxiety states that could lead to high risk, frequency, and severity of IGD, a personality assessment could be useful in the clinical context for some IGD cases.

Supplementary materials are available on the journal's website.

Disclosures

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The study was approved by the Bioethics Committee of the University of Lleida, Spain (Approval No. CEIC-138).
The authors declare no conflict of interest.

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