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RESEARCH REPORT

ADDICTION SSA

Gaming disorder and stigma-related judgements of gaming individuals: An online randomized controlled trial

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Abstract

Background and aims: The inclusion of gaming disorder (GD) in the International Classification of Diseases 11th Revision (ICD-11) has generated scholarly debate, including claims about its potential stigmatizing effects on the wider gaming population. The present study aimed to estimate the effect of addiction-based and non-addiction–based conceptualizations of problem gaming on stigma of gamers.

Design: This preregistered experiment involved a 2 (health information: addiction-related or non-addiction-related) × 3 (vignette: problem, regular or casual gamer) randomized, between-subjects design.

Setting: An international sample of participants was recruited via Prolific in June and July 2021.

Participants: Participants were eligible (n = 1228) if they were aged 35 to 50 years, played video games for no more than 6 hours per week and did not endorse DSM-5 or ICD-11 criteria for GD.

Intervention and comparator: Participants were provided with an explanation of problem gaming as related to either an addictive disorder (i.e. 'addiction' explanation) or personal choice and lifestyle factors (i.e. 'non-addiction' explanation).

Measurements: The Attribution Questionnaire (AQ) and Universal Stigma Scale (USS) assessed stigma toward each gamer vignette. Vignettes described a problem gamer (with features of GD); a regular gamer (frequent gaming; some life interference); and a casual gamer (infrequent gaming; no life interference).

Findings: Problem gamer vignettes (mean [M] = 113.3; 95% CI = 111.5–115.4) received higher AQ stigma ratings than regular (M = 94.0; 95% CI = 91.9–95.9) and casual gamers (M = 80.1; 95% CI = 78.2–82.1). Although significant, the effect of health information type on AQ stigma ratings was negligible (addiction group [M = 97.6; 95% CI = 95.9–99.1], non-addiction group [M = 94.1; 95% CI = 92.6–95.8]). However, the addiction information group scored lower on USS blame and responsibility than the non-addiction information group with at least a small effect (99.1% confidence).

Conclusions: Framing of problem gaming as an addictive disorder or non-addictive activity appears to have a negligible effect on stigma of different gamers among middle-age adults with minimal gaming experience. The concept of 'gaming addiction' seems unlikely to be an important influence on public stigma of gaming.

KEYWORDS
addiction, experiment, gaming disorder, ICD-11, stigma, vignette

INTRODUCTION

The inclusion of gaming disorder (GD) in the International Classification of Diseases 11th Revision (ICD-11) has generated significant debate about its wider social implications [1–7]. Some scholars have argued that GD may stigmatize gaming generally, including recreational gaming [8–10]. The GD classification is argued to promote an exaggerated view of the risks of gaming in the context of ongoing uncertainties about the precise criteria or boundaries that differentiate highly engaged gamers from those with problems [8, 11]. In support of this view, Aarseth *et al*. [8] have contended that 'raising concerns around the dangers of video gaming is known to add tension to the parent–child relationship, which exacerbates conflict in the family and can perpetuate violence against children'. In opposition to these views, many researchers and clinicians have expressed support for GD [2, 3, 12, 13]. The ICD-11 refers to GD criteria including loss of control, over prioritization of gaming and continuation despite harm, which are important elements that distinguish it from highly engaged gaming [14]. Given the disunity in academic debates, there is a need for empirical evidence to evaluate claims and 'concerns' [15] about stigma and GD [16].

Stigma occurs when an individual is perceived as undesirable, which can lead to devaluation, status loss and discrimination [17]. Research shows that stigma is not uncommon among individuals with mental disorders such as schizophrenia, mood disorders, anxiety disorders, personality disorders and addictive disorders [18–22]. Negative public stigma has been linked to adverse effects on self-esteem, self-efficacy, social networks and opportunities and exacerbation of symptoms or increased risk of developing comorbid illnesses [20, 23–25]. Discrimination and fear of stigma are common barriers to help-seeking [26, 27].

Models of stigma emphasize the importance of labelling in the creation and propagation of stigma. Corrigan's social–cognitive stigma model proposes that clinical diagnoses generate stereotypes by focussing attention on deficits and impairments, which generate negative perceptions and emotional reactions that motivate acts of prejudice [19, 28]. Attribution models suggest that individuals perceived to have greater control over their behavior are more likely to be blamed for their problems [29]. Survey studies have found support for these assertions and have identified associations between diagnostic labelling and stigmatizing attitudes toward mental illness [28, 30, 31]. However, many of these studies have used cross-sectional surveys, and therefore, the causal relationship between a diagnosis and stigma-related judgements is unclear.

Experimental studies using case vignettes have directly examined stigma toward individuals. However, there are few experimental studies on stigma in relation to behavioral addictions defined in the ICD-11. Hing *et al*. [32] reported that problem gambling tends to attract greater stigma ratings than subclinical problems and recreational gambling. Peter *et al*.'s [33] vignette study evaluated potential differences in public stigma across problem gambling, gaming and eSports betting. They reported that all three activities elicited more public stigma than the control vignette describing an individual experiencing a financial crisis. Problem gamblers were regarded as more dangerous than online gamers. Although this evidence suggests that individuals with a behavioral addiction may be stigmatized, it is not clear whether gamers experience stigma to different degrees depending on their gaming habits and level of problematic use. Furthermore, it is not known whether problem gamers classified or framed as having an addictive disorder versus making a lifestyle choice elicits different stigma-based judgements.

Research on attitudes toward food addiction provides some comparison. In their vignette study, Ruddock *et al*. [34] examined the differential effect of a medical diagnosis, self-diagnosis and no reference to 'food addiction' on stigma ratings. The medical and self-diagnosis had a small effect on increasing stigma ratings relative to the control condition. Latner *et al*.'s [35] study reported that participants provided with a food addiction explanation of a case vignette reported lower stigma and blame toward overeaters than those in the non-addiction condition. This study suggests that, contrary to stigma models, addiction-based explanations of excessive behavior may serve to reduce negative attitudes and attributions of blame toward excessive behaviors.

The present study

The inclusion of GD in the ICD-11 has prompted claims that the diagnosis will generate stigma toward all gaming, including recreational gaming [36]. Few studies of stigma and behavioral addictions exist [32–35], and no study has examined diagnostic categories on gaming and its effect on stigma-related judgements [16]. To address this gap, this study aimed to investigate the effect of GD information on stigma-related ratings for three different case vignettes of gamers. It was hypothesized that there would be a significant ($P < 0.05$) interaction effect of health information (addiction, non-addiction) and vignette type ('casual' non-problematic gamer, frequent or 'regular' gamer, 'problem' gamer with ICD-11 GD features) on stigma ratings, measured by the Attribution Questionnaire (AQ) (Hypothesis 1). There would be a significant ($P < 0.05$) main effect of health information type on stigma ratings where the addiction information conditions would score higher on stigma ratings than the non-addiction information conditions (Hypothesis 2). Finally, there would be a significant ($P < 0.05$) main effect of vignette type on stigma ratings where problem gamer vignettes would be rated higher than regular gamer vignettes, and the regular gamer vignettes would be rated higher than the casual vignettes (Hypothesis 3).

METHODS

Design

This online study used a 2 (health information: addiction; non-addiction) × 3 (gamer vignette: casual; regular; problem) double-blind, between-subjects design. Participants were randomly assigned in equal proportions to health information conditions and subsequent vignette groups using the randomization feature in Qualtrics. Outcome variables (stigma) were assessed by the AQ and the Universal Stigma Scale (USS). The study protocol and analysis plan were preregistered on Open Science Framework (OSF) (https://osf.io/nkfm4).

Participants

Figure 1 shows the flow of participants through the study. Eligible participants were ages 35 to 50 years and played video games for at most 6 hours per week (i.e. to minimize the likelihood of pre-existing strong positive views toward gaming). This sample was chosen to represent important stakeholder positions (e.g. parents of adolescent gamers, teachers, policymakers, clinicians, industry leaders, etc.). Participants' data were excluded ($n = 138$) if they endorsed ICD-11 or DSM-5 GD symptoms or failed an attention check. Repeat survey entries were also excluded ($n = 24$).

A priori G*Power analysis indicated that $n = 1076$ participants were required to detect a small to medium effect size (f = 0.12) in a 2 × 3 interaction ($\alpha = 0.05$, power = 0.95) (Faul *et al.*). A small to medium effect size may be expected as this has been reported in previous studies on diagnostic classifications and stigma [28, 34]. The study was available to ∼19 800 people in June and July 2021. An international sample of 1407 participants, from predominantly Western backgrounds (i.e. North America, United Kingdom and Europe), were recruited via the online crowd-sourcing platform Prolific.

Materials and measures

Gaming health information

Participants were provided with an explanation of problem gaming as related to either an addictive disorder (i.e. 'addiction' explanation) or personal choice and lifestyle factors (i.e. 'non-addiction' explanation). In this way, the two explanations aimed to reflect the main opposing formulations of problem gaming in recent debates [8] with the non-addiction information including refutation of the addiction model (see Data S1). These explanations were adapted from Latner *et al.*'s [35] materials related to food consumption. Both conditions share the same final paragraph referring to consequences of excessive gaming, which is accepted in both addiction and non-clinical formulations of gaming problems [8].

Vignettes

Each participant received one of three vignettes based on Latner *et al.*'s [35] scenarios, depicting: a 'casual' gamer who plays games infrequently, a 'regular' gamer who plays regularly and with minor problems and a 'problem gamer' who games excessively, experiences negative consequence because of their gaming and who meets the criteria for GD (see Data S2). A young adult male was chosen, to match the typical profile of a frequent gamer [37–39] while reducing the likelihood of participants' perceptions of the case study being biased by potential judgements related to parental responsibility for the gamer's behavior.

Primary outcome measure

Attribution Questionnaire

The AQ is a 27-item measure of stigma, including dimensions of blame, anger, pity, willingness to help, fear, dangerousness, avoidance, coercion and segregation [29]. Higher scores indicate greater endorsement of each dimension [29]. Items are measured on 9-point Likert scales. Subscales scores range from 3 to 27 and total scores from 27 to 243. Some minor modifications to four items involved removing references to a 'problem' or 'condition' to prevent leading responses toward the vignettes. These modifications were planned and necessary for clarity and relevance of the survey questions in relation to the vignette, which was confirmed by pilot testing with a small reference group ($n = 7$). The internal consistency of the AQ in the present study was high for both the full scale (Cronbach's $\alpha = 0.86$) and subscales ($\alpha = 0.73$–0.94).

Secondary outcome measure

Universal Stigma Scale

The USS is an 11-item measure with two dimensions; blame/personal responsibility (scored from 5 to 25) and impairment/distrust (scored from 6 to 30) [40]. Items are measured on a 5-point Likert scale where higher scores indicate more endorsement of each construct. Some planned modifications were made to leading terms (e.g. 'problem') to prevent biasing responses. Internal consistency of the blame/personal responsibility subscale was sound (Cronbach's $\alpha = 0.70$) and the impairment/distrust subscale was high ($\alpha = 0.90$).

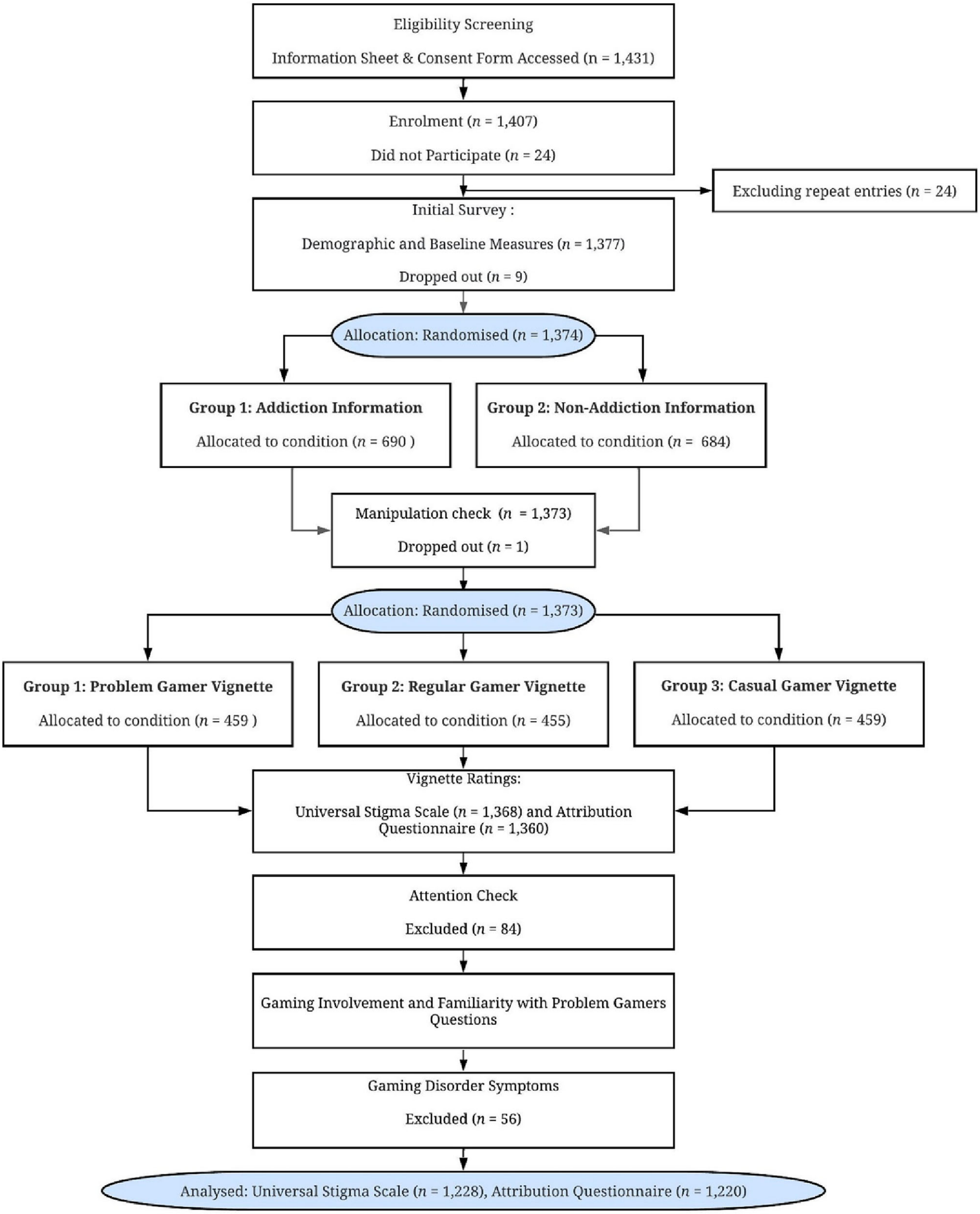

FIGURE 1 Flowchart of the study protocol.

Baseline measure and manipulation check

A three-item measure administered before and after presenting health information assessed perceptions of the addictiveness of video games, problem gamers' control over gaming and the severity of negative consequences of excessive gaming. This was measured on seven-point semantic differential scales from 'not at all addictive' to 'highly addictive', 'no control' to 'complete control' and no 'negative consequences' to 'severe negative consequences'.

Covariates

Familiarity with problem gamers

Familiarity with problem gamers was measured using a modified version of the Level of Contact Report [41]. Twelve situations describing varied contact with a problem gamer are ranked by their degree of intimacy [41]. Participant's score corresponds to the ranking of the most intimate situation selected, where higher scores indicate greater intimacy [41].

Gaming experience

Participants were asked about their experience with gaming. Including frequency of gaming (i.e. daily, weekly, fortnightly, every month, few times per year, almost never or never), number of games played in the last 6 months and the number of household gaming devices.

Exclusion variables

Gaming disorder symptoms

Symptoms of GD were assessed using the DSM-5 criteria checklist [42]. To supplement this measure, a simple ICD-11 screener was created (given the lack of any established measure) by adapting each of the four GD criteria into a 'yes/no' question. Participants who met five or more of the DSM-5 criteria [42] or all of the ICD-11 questions were excluded.

Procedure

The project was approved by the Flinders University's Human Research Ethics Committee (ID: 4349). This online survey was presented in English and hosted on Qualtrics. Participants were provided study information followed by an online consent form and indicated their agreement before continuing. After completing baseline measures, participants were randomly assigned to gaming health information groups (addiction or non-addiction) and then to one of three vignette conditions (casual, regular or problem gamer). They were administered stigma-related outcome measures related to the vignette followed by an attention check, covariate measures and GD screeners. Preregistered hypotheses and analytic plan, data, codes and materials are available: https://osf.io/nkfm4.

Statistical analyses

In line with our preregistered data-analytic plan, 2 (health information; addiction, non-addiction) × 3 (type of vignette; problematic, regular and casual gamer) between-subjects ANOVAs and Tukey *post hoc* analyses were used to test the AQ and USS. A 2 (health information; addiction, non-addiction) × 2 (time; baseline, post) repeated-measures ANOVAs tested the manipulation check. Means, standard deviations, measures of effect size and 95% CIs are used for stigma measures and the manipulation check. Additional ANOVAs and χ^2 analyses checked that groups did not differ on a range of variables. Group mean substitution was used to calculate total scores where one or two items were missing; otherwise data was excluded from analysis if a participant had not completed the required measure. All frequentist analyses were conducted using SPSS [43].

After observing negligible effects, the analysis plan was supplemented by Bayesian analysis for more robust evidence of the absence of an effect [44, 45]. Models were fit using Stan [46] via the R [47] package brms [48, 49]. Data and results processing were conducted using the tidyverse [50] and tidybayes [51] packages. Leave-one-out cross-validation (LOOCV) was used for hypothesis testing and the region of practical equivalence (ROPE) for interpreting effect size estimates for health information and vignette type on the AQ and USS. The LOOCV indicates the model of best fit and compares this to the predictive performance of other models where components have been omitted [52]. An expected log pointwise predictive density (elpd) of two standard errors or more below the model of best fit indicates poorer predictive ability of the model. The present study reports the number of elpd divided by the number of standard errors as the LOOCV. Furthermore, the ROPE defines the range of effect sizes small enough to be considered practically equivalent to no effect (for d [−0.1, 0.1]). Therefore, an estimate of the probability that the effect size is within the ROPE reflects our confidence that the effect size is equivalent to the null hypothesis/zero (−0.1, 0.1). Analogous reasoning can be used to quantify our certainty that the effect is weaker than a small effect [−0.2, 0.2].

RESULTS

Participants

There were 1228 eligible participants included in the main analyses of which 1197 completed the survey (attrition of 4.2% from enrolment). Table 1 presents a summary of participants' characteristics according to group allocation. Groups did not differ on age, gender, relationship status, educational attainment, parenting status, familiarity with problem gamers (including living with a problem gamer), frequency of gaming, number of games played in the last 6 months or number of household gaming devices. On average, participants reported playing video games weekly to fortnightly for ∼ 2 hours. Most participants (94.6%) reside in North America, Australasia, United Kingdom or Europe and (62.5%) report having a child under 18 years of age.

Manipulation check

A three-item manipulation check was used to assess if health information was effective in modifying participants' perceptions. The mixed

TABLE 1 Participant characteristics (*n* = 1228).

	Study condition					
	Addiction information			Non-addiction information		
	Group 1: problem gamer vignette, *n* = 198	Group 2: regular gamer vignette, *n* = 209	Group 3: casual gamer vignette, *n* = 196	Group 4: problem gamer vignette, *n* = 214	Group 5: regular gamer vignette, *n* = 192	Group 6: casual gamer vignette, *n* = 219
Age, M (SD), years	40.65 (4.25)	40.11 (4.32)	40.87 (4.63)	39.86 (4.54)	40.17 (4.23)	40.76 (4.21)
Gender						
Male	115 (58.1%)	139 (66.5%)	113 (57.7%)	130 (60.7%)	115 (59.9%)	121 (55.3%)
Female	80 (40.4%)	69 (33%)	79 (40.3%)	82 (38.3%)	74 (38.5%)	98 (44.7%)
Other/not specified	3 (1.5%)	1 (0.5%)	4 (2%)	2 (0.9%)	3 (1.5%)	0 (0%)
Region of residence						
North America	60 (30.3%)	59 (28.2%)	52 (26.5%)	58 (27.1%)	60 (31.3%)	69 (31.5%)
United Kingdom	78 (39.4%)	90 (43.1%)	92 (46.9%)	102 (47.7%)	81 (42.2%)	94 (42.9%)
Europe	39 (19.7%)	41 (19.6%)	24 (12.2%)	38 (17.8%)	28 (14.6%)	35 (16%)
Australasia	9 (4.5%)	10 (4.8%)	13 (6.6%)	8 (3.7%)	14 (7.3%)	8 (3.7%)
Africa	3 (1.5%)	4 (1.9%)	6 (3.1%)	6 (2.8%)	3 (1.6%)	5 (2.3%)
Asia	2 (1%)	0 (0%)	2 (1%)	0 (0%)	1 (0.5%)	3 (1.4%)
Middle East	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	1 (0.5%)
Relationship status						
Married	112 (56.6%)	113 (54.1%)	103 (52.6%)	119 (55.6%)	111 (57.8%)	135 (61.6%)
Partnered	49 (24.7%)	48 (23%)	39 (19.9%)	41 (19.2%)	38 (19.8%)	38 (17.4%)
Single	27 (13.6%)	40 (19.1%)	40 (20.4%)	40 (18.7%)	37 (19.3%)	32 (14.6%)
Divorced/separated	10 (5.1%)	8 (3.8%)	14 (7.1%)	14 (6.5%)	6 (3.1%)	14 (6.4%)
Children (<18 years)	124 (62.6%)	126 (60.3%)	125 (63.8%)	129 (60.3%)	120 (62.5%)	143 (65.3%)
Highest qualification						
High school	34 (17.2%)	32 (15.3%)	41 (20.9%)	39 (18.2%)	32 (16.7%)	42 (19.2%)
Further education	30 (15.2%)	15 (7.2%)	20 (10.2%)	18 (8.4%)	16 (8.3%)	25 (11.4%)
Higher education	93 (47%)	108 (51.7%)	98 (50%)	116 (54.2%)	104 (54.2%)	108 (49.4%)
Postgraduate	41 (20.7%)	52 (24.9%)	37 (18.9%)	40 (18.7%)	40 (20.8%)	44 (20.1%)
Employment						
Unemployed	22 (11.1%)	24 (11.5%)	30 (15.3%)	35 (16.4%)	24 (12.5%)	25 (11.4%)
Casual	4 (2%)	2 (1%)	8 (4.1%)	2 (0.9%)	7 (3.6%)	5 (2.3%)
Part-time	22 (11.1%)	24 (11.5%)	18 (9.2%)	21 (9.8%)	19 (9.9%)	29 (13.2%)
Full-time	126 (63.6%)	136 (65.1%)	118 (60.2%)	127 (59.3%)	126 (65.6%)	141 (64.4%)
Self-employed	24 (12.1%)	23 (11%)	22 (11.2%)	27 (12.6%)	15 (7.8%)	19 (8.7%)
Retired	0 (0%)	0 (0%)	0 (0%)	2 (0.9%)	1 (0.5%)	0 (0%)
Frequency of gaming						
Daily	42 (21.2%)	33 (15.8%)	38 (19.4%)	49 (22.9%)	36 (18.8%)	47 (21.5%)
Weekly/fortnightly	99 (50.0%)	117 (56.0%)	96 (49.0%)	109 (50.9%)	94 (49.0%)	111 (50.7%)
Every month/few times per year	42 (21.2%)	41 (19.6%)	44 (22.5%)	43 (20.1%)	44 (22.9%)	41 (18.8%)
Almost never/never	15 (7.5%)	14 (6.7%)	17 (8.7%)	11 (5.2%)	13 (6.7%)	14 (6.4%)
Average length of gaming session, in hours: M (SD)	2.18 (3.27)	2.25 (3.66)	2.08 (3.92)	2.30 (4.11)	1.95 (1.70)	2.12 (4.27)
No. of games played in <6 months: M (SD)	1.33 (0.62)	1.28 (0.56)	1.38 (0.75)	1.34 (0.66)	1.29 (0.59)	1.32 (0.62)
No. of devices owned: M (SD)	2.97 (1.96)	3.16 (2.13)	3.25 (2.96)	3.22 (4.16)	3.32 (3.86)	3.03 (2.23)

ANOVA showed that, at post, the addiction group (mean [M] = 5.40, SD = 1.22; 95% CI = 5.28–5.51) perceived videogames as significantly more addictive than the non-addiction group (M = 4.24, SD = 1.64; 95% CI = 4.13–4.35), $F(1,1226) = 195.41$, $P < 0.001$, Cohen's $d = 0.80$. At post, participants in the addiction group (M = 3.25, SD = 1.64; 95% CI = 3.12–3.38) perceived problem gamers as having significantly less control over their gaming than participants in the non-addiction group (M = 4.20, SD = 1.54; 95% CI = 4.08–4.33), $F(1,1223) = 110.21$, $P < 0.001$, Cohen's $d = 0.60$. Participants perceived the severity of consequences of excessive gaming to be significantly greater at post (M = 5.48, SD = 1.30; 95% CI = 5.42–5.56), than at baseline (M = 5.11, SD = 1.37; 95% CI = 5.03–5.19), $F(1,1226) = 147.18$, $P < 0.001$, Cohen's $d = 0.28$. Therefore, the manipulation check confirmed that health information modified perceptions of problem gaming as intended.

Inferential statistics

A between-subjects ANOVA tested the effect of health information (addiction or non-addiction) and vignette type (casual, regular or problem) on the AQ. Figure 2 shows the mean AQ stigma ratings according to health information and vignette type. It should be noted that Figure 2 is truncated for readability, which should be considered for interpretation. There was no statistically significant interaction between health information and vignette type, $F(2,1214) = 0.52$, $P = 0.59$, $\eta_p^2 = 0.001$. Therefore, Hypothesis 1 was not supported.

The ANOVA indicated a significant main effect of health information on AQ ratings. Participants in the addiction group (M = 97.6, SD = 25.9; 95% CI = 95.9–99.1), scored higher on the AQ than the non-addiction group ($M = 94.1$, $SD = 22.8$; 95% CI = 92.6–95.8), $F(1,1214) = 8.40$, $P < 0.01$, with an effect size below the cutoff for small [53], Cohen's $d = 0.14$. Therefore, Hypothesis 2 was supported, albeit with limited statistical support.

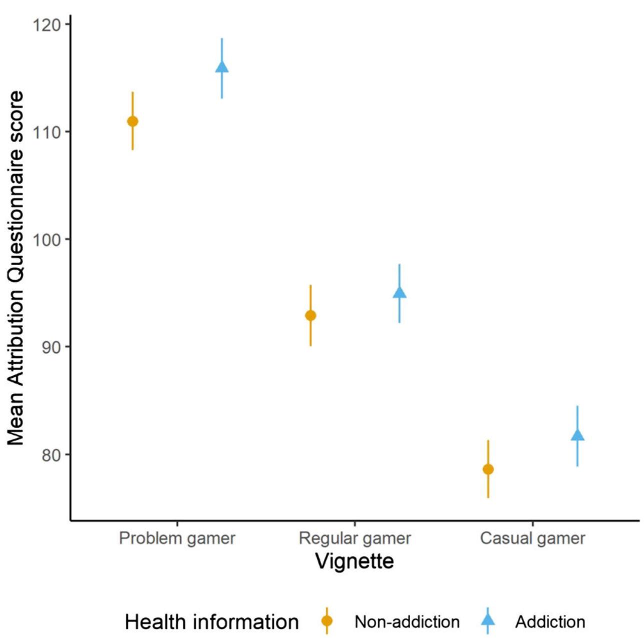

FIGURE 2 Mean Attribution Questionnaire scores according to health information condition with 95% Confidence interval bars. NB: values truncated from 27–243 to 75–120 for readability.

A between-subjects ANOVA revealed a significant main effect of vignette type on AQ ratings, $F(2,1214) = 282.2$, $P < 0.001$, $\eta_p^2 = 0.32$. The problem gamer group (M = 113.3, SD = 24.3; 95% CI = 111.5–115.4) scored significantly higher on the AQ than the regular gamer group (M = 94.0, SD = 22.1; 95% CI = 91.9–95.9), $P < 0.001$, Cohen's $d = 0.83$. The regular gamer group (M = 94.0, SD = 22.1; 95% CI = 91.9–95.9) scored significantly higher on the AQ than the casual gamer group (M = 80.1, SD = 13.9; 78.2–82.1), $P < 0.001$, Cohen's $d = 0.76$. Therefore, Hypothesis 3 was supported.

Table 2 shows the main effects and interaction effects for each subscale of the AQ. All statistically significant effects for the subscales went in the same direction as the full scale apart from the subscale blame, which had the opposite direction of effects for both health information and vignette group.

Bayesian analysis: AQ

The LOOCV and ROPE were used to examine the effect of health information (addiction or non-addiction) and vignette type (casual, regular or problem gamer) on AQ stigma ratings. Figure 3 presents the interaction between health information and vignette type on the AQ and the highest density interval, indicating the most likely distribution of the data, relative to the ROPE.

The LOOCV indicated that the main effects of health information and vignette type were the model of best fit to explain AQ stigma ratings. The interaction effect (plus the main effects) did not meaningfully differ in predicting AQ ratings compared to the model of best fit, LOOCV = −1.33, indicating that data were equivocal regarding the interaction effect. The ROPE values indicated there were a 41.3% to 56.3% chance of no effect and a 76.7% to 89.0% chance that the effect was small at most.

The main effect of vignette did not differ in predicting AQ ratings compared to the model of best fit, LOOCV = −1.10, indicating that the data were equivocal, but provided no evidence that health information was meaningfully related to stigma ratings. The ROPE showed that there was a 77.7% chance that there was an effect of health information, where participants in the addiction group had higher AQ ratings than participants in the non-addiction group. However, there was a 90.7% probability that the effect size was negligible.

Compared to the model of best fit, the main effect of health information alone was a poorer predictor of stigma ratings, LOOCV = −11.82, indicating that the effect of vignette type was meaningful. The ROPE values indicated that there was a 100% probability of at least a small effect size for all comparisons between vignette types. Problem gamers had higher stigma ratings than regular gamers and regular gamers had higher stigma ratings than casual gamers. Therefore, the findings for the main effects on the AQ were consistent with frequentist analyses.

TABLE 2 Attribution Questionnaire subscales: inferential statistics and effect size.

	Interaction			Health information			Vignette		
Attribution Questionnaire Subscale	*F*	*P*	η_p^2	*F*	*P*	η_p^2	*F*	*P*	η_p^2
Blame	3.88	0.02	0.006	29.98	<0.01	0.02	216.83	<0.01	0.26
Anger	0.37	0.69	0.001	2.93	0.09	0.002	414.66	<0.01	0.41
Pity	0.42	0.66	0.001	5.28	0.02	0.004	294.90	<0.01	0.33
Fear	1.98	0.14	0.003	8.34	<0.01	0.007	50.45	<0.01	0.08
Avoidance	1.22	0.30	0.002	7.96	<0.01	0.007	209.28	<0.01	0.26
Coercion	3.94	0.02	0.006	21.49	<0.01	0.02	197.33	<0.01	0.25

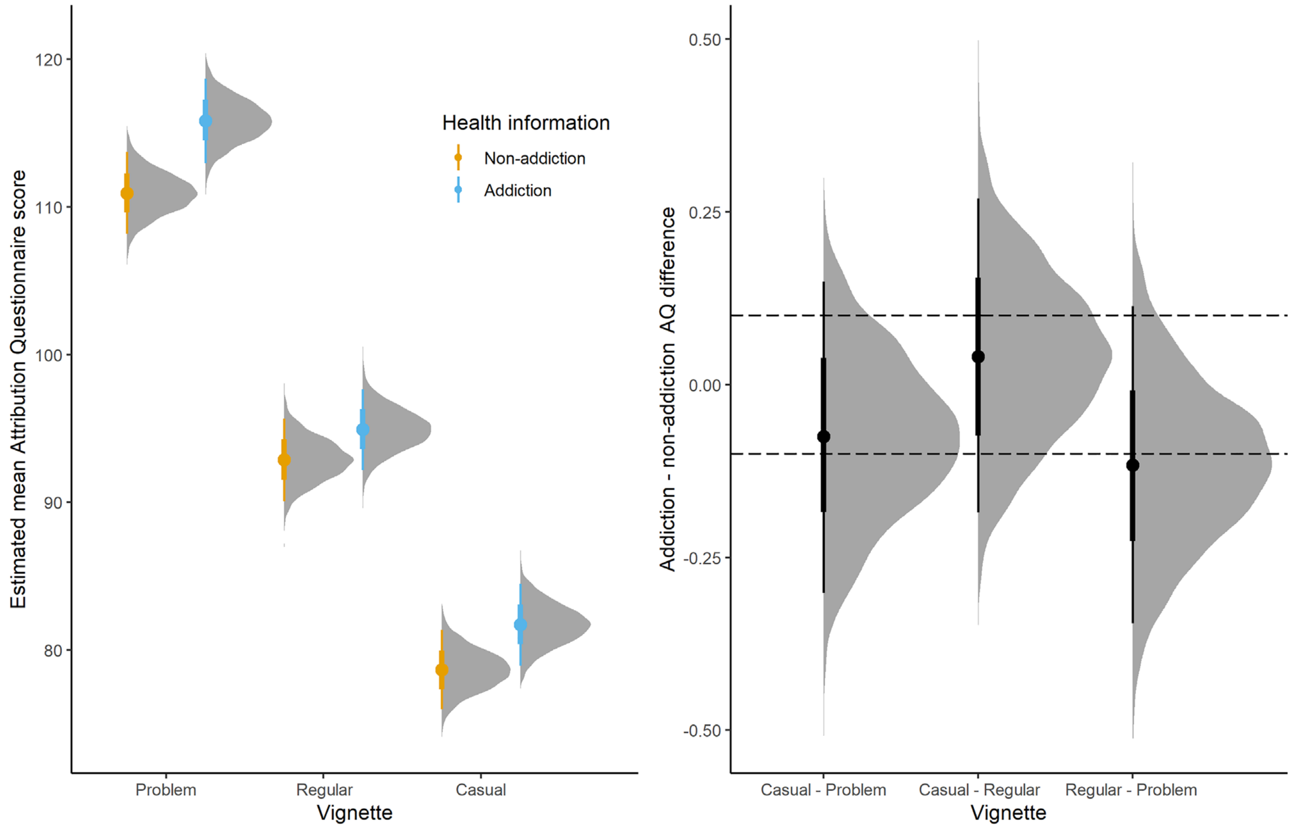

FIGURE 3 The left panel shows model estimates of the mean Attribution Questionnaire (AQ) score separately by health information and vignette. The right panel illustrates evidence for (the lack of) an interaction. Specifically, it shows pairwise differences between levels of vignette in the difference in the effect size (d) of AQ score difference between addiction and non-addiction. The dashed line represents the region of practical equivalence (*d* = [0.1, 0.1]). In both panels, the error bars show Bayesian credibility estimates (thin lines 95% and thick lines 66%), whereas the density plots show the plausibility of different estimated values.

Bayesian analysis: USS

Further analysis was conducted using the LOOCV and ROPE to assess the effects of health information and vignette type on the USS subscales: (i) blame/personal responsibility and (ii) impairment/distrust.

Blame/responsibility

The LOOCV showed that the interaction between health information and vignette type was the model of best fit for blame and responsibility. The ROPE values indicated an 83.3% to 85.2% probability of at least a small effect for interactions including the casual gamer vignette and 90.0% probability that the effect was negligible for the regular and problem gamer interaction. However, the two main effects did not significantly differ from the interaction as a predictor of blame and responsibility, LOOCV = −1.08.

The main effect of vignette type alone was a poorer predictor than the model of best fit, indicating that health information meaningfully contributed to perceptions of blame and responsibility, LOOCV = −2.83. Participants in the non-addiction group (M = 18.8, SD = 2.8) had higher blame and responsibility scores than those in the addiction group (M = 17.8, SD = 3.1) with a 99.1% probability of at least a small effect. The effect of health information alone was a poorer predictor than the interaction, LOOCV = −9.88, indicating that vignette type was also meaningfully contributing to perceptions of blame and responsibility. Participants who received the casual gamer vignette (M = 20.0, SD = 1.7) reported greater blame and responsibility than participants who received the regular gamer vignette (M = 18.4, SD = 2.7), and participants who received the regular gamer vignette had greater perceptions of blame and responsibility than participants who received the problem gamer vignette (M = 16.5, SD = 3.3), with 100% probability of at least a small effect.

Impairment/distrust

The LOOCV indicated that the main effects of vignette type and health information constituted the model of best fit for perceptions of impairment and distrust. The interaction between health information and vignette type did not meaningfully differ from the model of best fit as a predictor of impairment and distrust, LOOCV = −0.10, with ROPE values indicating a 51.7% to 69.5% probability of a small effect at most for interactions involving the problem gamer, and a 91.7% probability of a small effect at most for interactions with the casual and regular gamer.

The effect of vignette type alone was a poorer predictor than the model of best fit, LOOCV = −2.02, indicating that health information meaningfully contributes to impairment and distrust. Participants who received addiction health information (M = 14.2, SD = 5.7) scored higher on impairment and distrust than participants who received non-addiction health information (M = 13.1, SD = 5.4), with a 61% probability of a less than small effect. Health information alone was also a poorer predictor than the model of best fit, LOOCV = −14.59, indicating that vignette type meaningfully contributed to impairment and distrust. Participants who received the problem gamer vignette (M = 18.0, SD = 4.5) had higher impairment and distrust scores than participants in the regular gamer group (M = 13.9, SD = 4.5) and participants in the regular gamer group had higher perceptions of impairment and distrust than participants in the casual gamer group (M = 9.1, SD = 3.6), with 100% probability of at least a small effect.

Table 3 summarizes the Bayes factors examining the effect of health information and vignette type for each dependent variable.

DISCUSSION

The inclusion of GD in the ICD-11 has stimulated debate on its public health implications, including the potential for stigma. The present study was the first to experimentally evaluate the effect of GD information on stigma of different gamers. The manipulation check indicated that health information effectively modified perceptions of problem gaming as intended. The results indicated no evidence of an interaction between health information and vignette type on AQ stigma ratings (i.e. Hypothesis 1 not supported). Furthermore, there was a negligible difference between participants who received the addiction-based explanation of problem gaming from those who received a non-addiction–based explanation on their stigma ratings of three gamer vignettes, despite some statistical support for Hypothesis 2. However, the addiction information attracted lower scores on USS blame and responsibility compared to the non-addiction information.

In support of Hypothesis 3, gamer vignette type was the strongest predictor of AQ and USS impairment and distrust ratings. Participants tended to rate the problem gamer vignette significantly higher on stigma measures than the regular gamer vignette, and the regular gamer higher than the casual gamer vignette. The results indicated, although the health information manipulation affected participants' views on the 'addictiveness' of gaming, it had a negligible impact on participants' perceptions of competency or dangerousness of the gamer depicted in each vignette. Similarly, participants in the addiction information condition reported negligible differences on emotional reactions to the vignettes, including anger, pity and fear, compared to the non-addiction conditions. This suggests that gamers' personal circumstances may be more salient to stigma-related perceptions than observers' general views or understanding of gaming as a mental disorder, which would be consistent with some recent food addiction studies [34, 54].

The addiction information conditions scored lower on USS blame and responsibility subscales than the non-addiction conditions, consistent with Latner *et al.*'s [35] vignette study of overeating. One explanation is that participants in the addiction information group were inclined to view gamers as having less control over their behavior and therefore, less accountable for their actions. The addiction information referred to neurobiological dependency to gaming rewards. Past research has shown that emphasizing the biological and neurological processes can reduce perceptions of blame and garner more positive

TABLE 3 Bayes factors compared to model of best fit.

Stigma assessment	Main effect: Health information	Vignette	Both	Interaction
Attribution Questionnaire	2.63e−98	0.62	2.17e+97[a]	0.005
USS blame/responsibility	5.36e−67	8.39e−08	4.62e+71[a]	0.33
USS impairment/distrust	2.04e−149	3.20e−03	6.18e+149[a]	0.02

Note: Model of best fit is compared to the intercept; interaction is compared to the two main effects; other effects are compared to the model of best fit.
Abbreviation: USS, Universal Stigma Scale.
[a]Model of best fit.

attitudes toward mental illness [55], including potentially reducing the tendency to view the illness as a moral or character flaw [56]. However, neurobiological explanations may also increase stigma by conveying an illness as more inherent and harder to treat [57].

This research informs the current debate on the ICD-11 categories of GD and hazardous gaming [8, 16]. Contrary to some claims, addiction-based explanations of excessive gaming may have only a marginal effect on stigma-related perceptions of gamers. Some researchers contend that the GD classification was a response to 'moral panic' and predict that the diagnosis may generate further anxieties about gaming and other online activities [8, 9, 11]. This study did not evaluate evidence of the claim that ICD-11-related decisions were guided by moral panic. However, the present study suggests that the very concept of 'gaming addiction' seems unlikely to be an important determining factor in public stigma toward different types of gaming. This does not rule out the possibility that moral panics (or similar biases, value judgements or prejudices) toward digital technology exist and affect clinical, research and policy decision-making [58]. However, the concept of problem gaming as an addictive disorder does not appear to be necessary or particularly important as either a precondition or a catalyst for moral panic or similar anxieties. For some, the diagnostic category may be perceived to align with or confirm negative biases related to gaming (e.g. 'gaming is always harmful') that have no basis in the clinical description and guidelines of the disorder.

Future studies of stigma and gaming would be of benefit to behavioral addiction literature. Further stigma studies of GD could use vignettes with a GD diagnosis, for comparison to other diagnoses and/or comorbidities. Studies could examine other non-medical and different cultural models of problem gaming, including those which propose problem gaming as a maladaptive coping mechanism or within an ecological systems approach. Similarly, studies should use vignettes with different sociodemographic characteristics (i.e. profiles other than males in their 20s), including minors living with their parents [32, 33]. Studies should also consider evaluating a broader range of impairments and protective factors in relation to stigma. Problem gaming involving significant financial harms related to overspending (e.g. microtransactions) could be compared to problem gambling [59]. Another important area is self-stigma, specifically how the diagnostic category for GD may affect how different gamers perceive themselves. Among problem gamers, research could determine the extent to which the GD diagnosis affects insight, motivation to change and treatment engagement. Future studies could examine the effect of the GD label presented without an accompanying definition or explanation of the addiction concepts, as well as examining aspects of education including its mode of delivery (e.g. online vs face-to-face, written vs video content, etc.).

The present study has several limitations. Participants were Western middle-age individuals with limited gaming experience and recruited online only, which may not be representative of the wider population. Similarly, the vignettes referred to males in their 20s, which was chosen to capture the main demographic of high-frequency and problem gamers. Study measures may be limited in their capacity to determine real-world impacts of stigma, and may be influenced by social desirability and other self-report biases. Supplementary choice tasks such as decisions about provision of healthcare, funding allocation, employment, renting, and/or offering a scholarship may be useful. English language proficiency was not assessed. Another limitation relates to difficulty in determining which elements of the vignettes were most salient to stigma ratings; for example, whether gaming engagement (i.e. frequency of play) or degree of functional impairment contributed more to stigma. Another issue is the lack of cutoff scores on current stigma measurement tools.

Conclusions

Gaming is a generally normative, legally unrestricted and culturally accepted and valued activity that nevertheless can manifest harms for some vulnerable users. The present study found that stigma judgements of different gamer types did not significantly differ according to addiction–based and non-addiction–based explanations of problem gaming. Public stigma ratings were generally higher for gamers with GD features than for high-frequency and casual gamers. This research provides needed empirical evidence to inform current debates on the public health implications of the GD diagnosis. These data suggest that clinical interventions and public health measures could refer explicitly to individuals with GD as well as gaming products associated with harm and addiction without contributing to public stigma toward gaming.

AUTHOR CONTRIBUTIONS

Christina R. Galanis: Conceptualization (equal); data curation (lead); formal analysis (equal); investigation (lead); methodology (lead); writing—original draft (equal); writing—review and editing (equal). **Nathan Weber:** Formal analysis (equal); software (supporting); writing—review and editing (supporting). **Paul Delfabbro:** Writing—review and editing (supporting). **Joël Billieux:** Methodology (supporting); writing—review and editing (supporting). **Daniel L. King:** Conceptualization (equal); data curation (supporting); formal analysis (supporting); funding acquisition (equal); investigation (supporting); methodology (equal); project administration (supporting); resources (lead); supervision (lead); writing—original draft (equal); writing—review and editing (equal).

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available at: https://osf.io/nkfm4.

DECLARATION OF INTERESTS

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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