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Full title: The role of maladaptive cognitions in gaming disorder: Differences between online and offline gaming types.

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1 **Abstract**

2 Gaming disorder involving online or offline games has been included in the latest International
3 Classification of Diseases (ICD-11). Recent studies on psychological processes related to gaming
4 disorder have identified a number of maladaptive cognitions that may play a role in developing and
5 maintaining problematic gaming behaviors. However, there have been few studies that have
6 examined whether these cognitions may occur differently offline versus online gaming. This study
7 recruited 446 French-speaking adults including 229 online and 217 offline gamers (54.93 % male,
8 Mage = 28.05), who completed a questionnaire providing information about demographic
9 characteristics, gaming habits, cognitions related to video games, gaming disorder and psychological
10 distress. Maladaptive cognitions correlated strongly with gaming disorder, weekly time spent on
11 video games, depression and anxiety symptoms. Mann-Whitney U-tests revealed significant
12 differences between online and offline gaming groups with more addicted gamers in the online
13 group, and more maladaptive cognitions in online than offline gamers. However, regression models
14 comparing offline and online players revealed fewer differences among predictor variables.
15 Maladaptive cognitions predicted the two types of disorder equally, although virtual comfort
16 appeared to be strongly predictive only of online gaming disorder. These findings are discussed in
17 relation to addiction theory and their clinical implications.

18

19 **Key words**

20

21 Online gaming disorder

22 Offline gaming disorder

23 Addiction

24 Maladaptive Cognition

25 Video game

26 ICD-11

27

1 **1. Introduction**

2 Gaming Disorder (GD) is gaining recognition as a significant mental health issue worldwide,
3 particularly among adolescents and young adults. Internet GD is now identified in international
4 classifications of diseases (American Psychiatric Association [APA], 2013; World Health Organization
5 [WHO], 2018), where it is defined as persistent or recurrent gaming behavior (over a 12-months
6 period) that has negative effects across multiple areas of functioning (e.g., social, family, professional
7 and educational). Its symptoms include behavioral and cognitive salience, withdrawal and tolerance
8 symptoms, loss of control, persistence, and functional impairment. The latest International
9 Classification of Diseases (ICD-11; WHO, 2018) distinguishes between online and offline gaming, with
10 two subcategories of GD. To date, few studies have focused on the differences between online and
11 offline gaming. However, one study (Hainey, Connolly, Stansfield & Boyle, 2011) concluded that
12 players' motivations were similar whether they played online or offline and another (Ng & Wiemer-
13 Hastings, 2005) found that massively multiplayer online (MMO) role-gamers played longer and
14 reported more GD symptoms than offline gamers.

15 Maladaptive cognitions and metacognitions about games are thought to intensify or maintain
16 excessive gaming behaviors (Brand, Young, Laier, Wölfling & Potenza, 2016; Caplan, 2003, 2010;
17 Davis, 2001; Haagsma, Caplan, Peters & Pieterse, 2013; Marino & Spada, 2017; Moudiab & Spada,
18 2019). Marino and Spada (2017) differentiated between cognitions (i.e. content of cognitions) and
19 metacognitions (i.e. mental control of cognitions) related to gaming: the present study focused only
20 on the former. Recent studies have assessed maladaptive cognitions in GD, particularly in online
21 gaming (Forrest, King & Delfabbro, 2016; King & Delfabbro, 2014, 2016; Moudiab & Spada, 2019),
22 and their findings indicate that they are strong predictors of GD. The cognitions identified often
23 involve social features which may affect online more than offline forms of gaming.

24 There is a growing body of research on maladaptive cognitions related to GD. However, it is not
25 clear whether current theories apply equally to both online and offline GDs. For example, it is likely

1 that offline gaming has fewer social determinants and that behaviors are less governed by social
2 norms, which may shape certain views about the differences between offline and online gaming.
3 Moreover, as previous studies focused essentially on online gaming, the maladaptive cognitions they
4 identified may only apply to this type of gaming. Clinicians have also reported that most patients
5 with GD were online gamers. Hence, the aim of the present study was to examine the potential
6 differences between maladaptive online and offline gaming. The study was primarily exploratory, but
7 we hypothesized that maladaptive cognitions would mostly concern online gaming, with more
8 maladaptive cognitions and more GD symptoms reported by online than offline gamers. We also
9 expected that maladaptive cognitions would better explain the development and maintenance of
10 online than offline GD.

11 **2. Material and methods**

12 ***2.1. Participants and procedure***

13 All demographic data are presented in Table 1. A total of 446 adults answered the
14 questionnaire: 217 reported that they mainly played games offline, and 229 that they played mainly
15 online. The respondents included 245 males (54.93%). Ages ranged from 18 to 67 years with an
16 average of 28.34 (SD = 6.98) for online gamers and 27.75 (SD = 6.93) for offline gamers. The study
17 was conducted in accordance with the Declaration of Helsinki and ethical guidelines of the University
18 of Tours. Participants were recruited on Facebook and video-game forums. Before completing the
19 questionnaire, designed using Sphinx Online, participants were given detailed information about the
20 study (e.g. aims and background) and their rights (e.g. right to withdraw and confidentiality), and
21 were then asked to give their informed consent. The questionnaire required about 15 minutes to
22 complete and was anonymous.

23 ***2.2. Measures***

24 Participants answered questions about their demographic characteristics and video gaming
25 habits. To create two groups, they were asked whether they played primarily online (using a

1 connection to the Internet) or offline (not using a connection to the Internet). They then completed
2 the following measures:

3 *Video Game Cognition Scale* (Appendix 1). This is a 15-item measure adapted from an existing
4 scale (King & Delfabbro, 2014, 2016) and validated in French (Bodi, Maintenant, Yakimova &
5 Pennequin, 2020). It targets five types of maladaptive cognitions: positive emotions (e.g. feeling
6 proud of gaming achievements), cognitive salience (e.g. planning what to do next in video games),
7 completion (i.e. need to complete gaming objectives as soon as possible), virtual comfort (e.g. feeling
8 safer in virtual worlds), and social recognition (e.g. feeling respected for gaming achievements).
9 Participants were asked how much they agreed with each statement. All items were scored this way:
10 0 for “No agreement”, 1 for “Agree” and 2 for “Strongly agree”. Agreement indicated the presence of
11 the cognition. In the present study, McDonald’s Omegas (Béland, 2018) for each category were .74,
12 .75, .64, .63 and .81 respectively. Omega for the whole scale was $\alpha = .82$.

13 *The Game Addiction Scale (GAS)* (Lemmens, Valkenburg & Peter, 2009). The GAS is a widely used
14 measure of GD symptoms. The seven items are based on the core symptoms of addiction, covering
15 most of the GD criteria in the ICD-11 (WHO, 2018) and the Diagnostic and Statistical Manual of
16 mental disorders (DSM-5; APA, 2013). Participants were asked how frequently they experienced each
17 symptom, on a 5-point Likert scale ranging from 1 “never” to 5 “very often”. Using the CORE-4
18 approach (Brunborg et al., 2013, 2015), four groups of gamers were identified: addicted, problem,
19 highly engaged, and non-addicted/non-problem/non-highly engaged gamers. McDonald’s Omega for
20 the total scale in the present study was $\alpha = .73$.

21 *The Hospital Anxiety Depression Scale (HADS)* (Zigmond & Snaith, 1983). The HADS is a widely
22 used measure of depression and anxiety. The 14-item scale is divided into two 7-item subscales,
23 identifying symptoms of depression and anxiety. Severity of mood disorders is assessed on a 4-point
24 scale, ranging from 0 (least severe) to 3 (most severe). McDonald’s Omega values in the present
25 study were *Depression*: $\alpha = .67$, *Anxiety*: $\alpha = .80$.

1 **3. Results**

2 **3.1. *Demographic data and gaming habits***

3 Mann-Whitney U-tests and chi-squared tests were used to compare the features of offline
4 and online gamers' (Table 1). Significant differences appeared for gender and time spent gaming.
5 Male participants played online more than offline, while the reverse pattern was observed for female
6 participants. Online gamers played more hours per week than offline gamers.

7 **3.2. *Maladaptive cognitions***

8 Kolmogorov-Smirnov's test indicated that our data were not normally distributed. Then, we
9 conducted Spearman correlations in each group. In the online group, maladaptive cognitions were
10 strongly correlated with all variables ($p < .01$) just as gaming addiction scores were ($p < .05$). In the
11 offline group, maladaptive cognitions were strongly correlated with all variables ($p < .05$) except
12 anxiety and depression scores; gaming addiction scores were not correlated with either age or social
13 recognition.

14 The main focus of the study concerned differences between online and offline gaming types. We
15 predicted that maladaptive cognitions would be a significant feature of online than offline GD. Mann-
16 Whitney U-tests and chi-squared tests were used to compare the GAS scores, addiction status and
17 maladaptive cognitions of online and offline gamers (Table 1). These analyses showed that online
18 gamers had higher GAS scores than offline gamers ($p < .001$), and that there were more addicted
19 players among online gamers ($p < .01$). No significant differences were observed for problematic and
20 engaged groups. Online gamers reported more maladaptive cognitions than offline gamers ($p < .001$);
21 all types of cognitions were concerned except virtual comfort. Hierarchical multiple regressions were
22 then conducted to evaluate cognitions as predictors of GAS scores, in offline and online gamers
23 separately, and taking the other variables of influence into account (Table 2). In the first step (Model
24 1), age (only for the online gaming group), weekly time spent on video games and HADS variables
25 were entered. In the second step (Model 2), the five types of maladaptive cognitions (except social

1 recognition for the offline gaming group) were entered. Model 2 significantly predicted both offline
2 and online GD symptoms. All variables together respectively explaining 32% and 48% of the variance.
3 Maladaptive cognitions accounted for 24% of the variance for online GD symptoms based on
4 differences between R square values, compared to 21% for offline GD symptoms. Two maladaptive
5 cognitions, namely cognitive salience and completion, appeared to be strong predictive factors of
6 both types of GD symptoms ($p < .01$). One other cognition, virtual comfort, and one variable, time
7 spent gaming, were significant predictive factors only of online GD symptoms.

8 **4. Discussion**

9 The present study compared offline and online gaming types and assessed the role of
10 maladaptive cognitions in each. The results indicated first, that male participants played mainly
11 online, whereas female participants played mostly offline. Secondly, participants spent more time
12 per week on online games, confirming previous results (Ng & Wiemer-Hastings, 2005). This finding
13 can be explained by a number of factors, including virtual communities (Hsu, Wen & Wu., 2009; King
14 & Delfabbro, 2014; Yee, 2006a, 2006b), competitive environment, discovery of endless virtual worlds
15 (Yee, 2006a, 2006b), and preference for online social interactions (Caplan, 2003, 2010). Thirdly,
16 online players appeared to be more addicted to gaming than offline players. Finally, they reported
17 more maladaptive cognitions in all categories except virtual comfort; they reported a greater need of
18 video games to feel positive emotions (e.g. pride) and to feel respected and accepted by others, a
19 need to complete all their gaming objectives as soon as possible, and thought more about video
20 games, even when not playing (e.g. planning), than offline players. However, online players felt as
21 safe and as in control as offline players in virtual worlds.

22 Although maladaptive cognitions were found more among online than offline gamers, they
23 did not seem to be much more predictive of online GD symptoms, but they had a different role in
24 each type of disorder. Regression analyses showed that cognitive salience and completion were
25 predictive factors of both types of disorder. However, virtual comfort was predictive only of online

1 GD symptoms. Surprisingly, virtual comfort was reported by both online and offline players, but only
2 seemed to be problematic for online players. It is possible that virtual comfort strongly correlated
3 with another variable specific to online gamers, and future research should investigate why it is only
4 problematic for this group.

5 The present study has some limitations. First, it was based on self-report questionnaires and thus
6 there may be some inherent limitations with regard to insight and personal bias. Secondly, the study
7 cannot demonstrate that the predictors measured are causally related to GD, and the results should
8 therefore be viewed cautiously. Thirdly, the study did not assess certain variables that could explain
9 the differences observed between the online and offline gaming groups, such as personality traits,
10 motives for gaming, and gaming features. Future research should focus on these potential variables
11 to extend our understanding of the cognitive functioning of gamers.

12 **5. Conclusions**

13 This research highlights some potential cognitive differences between online and offline players.
14 Current frameworks appear to concern online more than offline gamers, as some maladaptive
15 cognitions are found more and are more predictive of online than offline GD symptoms. GD thus
16 seems to affect mainly online gamers. However, offline gaming should not be ignored, as offline GD
17 is now described in ICD-11 (WHO, 2018), and further studies are needed to examine whether there
18 are differences in the psychological profiles of online and offline players. With regard to the clinical
19 implications of our findings, distinguishing between online and offline gamers would make possible
20 to set up tailored and effective interventions. Therapists should consider how interactions between
21 the client's vulnerabilities and the gaming activity could lead to specific maladaptive cognitions
22 related to gaming and then excessive gaming behaviors with their resulting negative consequences.

23 **Declarations of interest: none.**

24

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1 **Table 1**2 *Comparison of features and scores between offline and online gamers (N = 446)*

	Offline gamers (N = 217)			Online gamers (N =229)			Group differences		
	N	M	SD	N	M	SD	Khi ²	z	p
Demographic and gaming habits									
Male participants	104			141			8.38		< .01
Female participants	113			88			8.38		< .01
Age		27.75	6.93		28.34	6.98		-0.82	.41
Weekly time spent gaming		10.90	12.66		13.96	10.38		-4.72	<.001
Addiction									
GAS score		15.54	4.94		17.44	5.64		-3.60	< .001
Addicted	12			30			7.49		< .01
Problem	55			73			2.32		.13
Highly engaged	23			25			0.01		.91
Other players*	127			101			9.27		< .01
Gaming cognitions									
Total of cognition items		8.54	4.79		10.31	5.23		-3.74	< .001
Cognition: Positive emotions		4.36	2.19		4.83	2.27		-2.19	< .05
Cognition: Cognitive salience		1.27	1.19		1.72	1.24		-3.86	< .001
Cognition: Completion		0.98	1.26		1.30	1.33		-3.06	< .01
Cognition: virtual comfort		1.36	1.57		1.38	1.45		-0.60	.55
Cognition: social recognition		0.58	0.91		1.09	1.16		-5.12	< .001
HADS									
Depression		3.74	3.06		3.33	2.41		-0.85	.40
Anxiety		7.15	3.92		6.22	3.31		-2.19	< .05

3 GAS = Game Addiction Score (Lemmens et al., 2009), HADS = Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983).

4 * Other players are the non-addicted/non-problem/non-highly engaged players

5

6

1 **Table 2**2 *Hierarchical regression analyses predicting GAS scores by offline and online gaming types*

Predictor	Type of gaming			
	Offline gaming		Online gaming	
	R ²	β	R ²	β
Step 1	.11***		.24***	
Age				-.14*
Weekly time spent gaming		.27***		.31***
HADS depression		.07		.17**
HADS anxiety		.15*		.21**
Step 2	.21***		.24***	
Age				-.03
Weekly time spent gaming		.09		.14*
HADS depression		.04		.06
HADS anxiety		.09		.08
Positives emotions		.08		.11
Cognitive salience		.30***		.17**
Completion		.20**		.31***
Virtual comfort		.11		.17**
Social recognition				.03
Total R ²	.32***		.48***	
n	217		229	

3 * p < .05, ** p < .01, *** p < .001. β is a standardized value.

4 GAS = Game Addiction Scale (Lemmens et al., 2009), HADS = Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983).

5
6 All continuous variables that were correlated with GAS scores were included in the regression models (i.e. all variables
7 except age and social recognition for offline gaming).

1 Appendix 1.

2 The 15-item Video Game Cognition Scale (English and French versions) and its factors.

	English item / French item	Factor
1.	When my game character achieves something, I feel like I have achieved that too. <i>Quand mon avatar accomplit quelque chose, j'ai l'impression de l'avoir également accompli.</i>	Positive Emotions
2.	I tend to feel better after playing video games. <i>J'ai tendance à me sentir mieux après avoir joué aux jeux vidéo.</i>	
3.	Playing games has many other benefits in my life. <i>Jouer aux jeux vidéo apporte du positif dans ma vie.</i>	
4.	I am proud of my gaming achievements. <i>Je suis fier / fière de ce que j'ai accompli dans les jeux vidéo.</i>	
5.	If I complete or master an achievement, skill or goal in a video-game, I feel good about myself. <i>Je me sens bien dans ma peau quand je réussis une mission ou atteins un objectif dans un jeu vidéo.</i>	
6.	I find myself thinking about video-games when I am not playing. <i>Je me surprends à penser aux jeux vidéo quand je ne joue pas.</i>	Cognitive Saliency
7.	I spend time planning or thinking about the next thing I need to do in a game. <i>Même quand je ne joue pas, je prévois ou pense aux prochaines choses que j'ai à faire dans le jeu.</i>	
8.	When I have a goal or objective in a video-game, I must complete it as soon as possible. <i>Quand j'ai un objectif dans un jeu vidéo, je dois l'atteindre aussi vite que possible.</i>	Completion
9.	I feel uncomfortable thinking about my unfinished goals or objectives in video-games. <i>Je me sens mal quand je pense aux objectifs que je n'ai pas atteints dans le jeu vidéo.</i>	
10.	I feel unsatisfied until I have done everything I want to in a video-game. <i>Je ne suis pas content(e) tant que je n'ai pas fait tout ce que je voulais faire dans le jeu vidéo.</i>	
11.	I feel more in control when I play video-games. <i>Je contrôle davantage ce qui se passe dans les jeux vidéo que ce qui se passe dans la vraie vie.</i>	Virtual Comfort
12.	I would not be able to cope with stress in my life without video-games. <i>S'il n'y avait pas les jeux vidéo dans ma vie, je gèrerais moins bien mon stress.</i>	
13.	I feel safer and more comfortable playing a video-game than in most other social situations. <i>Je me sens plus en sécurité et plus à l'aise quand je joue aux jeux vidéo que quand je me retrouve face à d'autres personnes, dans le monde réel.</i>	
14.	Other players admire and respect my gaming achievements. <i>Mes réussites dans le jeu vidéo entraînent l'admiration et le respect des autres joueurs.</i>	Social Recognition

15. When I succeed in a video-game, players notice and respect me.
Les autres joueurs me remarquent et me respectent quand je réussis dans un jeu vidéo.
-