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Electronic gaming machines and gambling disorder: a cross-cultural comparison between Brazil and the United States

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Abstract

Aims—The objective of this paper is to perform a cross-cultural comparison of gambling disorder (GD) due to electronic gaming machines (EGM), a form of gambling that may have a high addictive potential. Our goal is to investigate two treatment-seeking samples of adults collected in Brazil and the United States, countries with different socio-cultural backgrounds. This comparison may lead to a better understanding of cultural influences on GD.

Methods—The total studied sample involved 733 treatment-seeking subjects: 353 men and 380 women (average age = 45.80, standard deviation \pm 10.9). The Brazilian sample had 517 individuals and the American sample 216. Subjects were recruited by analogous strategies.

Results—We found that the Brazilian sample was younger, predominantly male, less likely to be Caucasian, more likely to be partnered, had a faster progression from recreational gambling to GD, and were more likely to endorse chasing losses.

Conclusion—This study demonstrated that there are significant differences between treatment-seeking samples of adults presenting GD due to EGM in Brazil and in the United States. These findings suggest that cultural aspects may have a relevant role in GD due to EGM.

Keywords

Gambling; Gambling disorder; Electronic gaming machines; Cross-cultural psychiatry

1. Introduction

In 2013, there were 7,673,134 Electronic Gaming Machines (EGM) in the world with approximately 852,000 in the United States, an increase of 15,000 units compared to the

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CONFLICT OF INTEREST

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previous year (Ziolkowski, 2014). Evidence suggests that EGM (such as slots, keno and different kinds of video-bingo) may have a high addictive potential (Tavares et al, 2003; Dowling et al., 2005; Shao et al., 2013). For example, subjects who play EGM tend to have a shorter lag between the beginning of recreational gambling and onset of problems due to gambling relative to individuals that play other games (Shao et al., 2013). Increased availability of EGMs has also been associated with greater severity of gambling problems (Australian Government, 2010; Livingstone and Adams, 2011). This addictive potential is likely associated with the high frequency and high intensity of reinforcements provided by EGM (Tavares et al, 2003; Williams et al., 2007; Dowling et al., 2005; Nower and Blaszczynski, 2008; Australian Government, 2010). EGM are widely available (Marshall and Baker, 2001; Ladouceur et al., 2005; Delfabbro 2008), even in countries where they are illegal, such as Brazil (Tavares, 2014). EGM generate a significant proportion (about 80%) of revenues in casinos and other betting outlets, which might be explained by this combination of intense addictive potential and large availability (Ghezzi et al., 2000, Shao et al., 2013).

Neurobiological research has provided further clues as to the addictive potential of EGM (Tremblay et al., 2013; Shao et al, 2013). Tremblay and colleagues (2013) suggest that altered D2 receptor activity mediates the excessive use of EGM (Tremblay et al., 2013), and Shao and colleagues (2013) demonstrated that a single episode of EGM play engages well-described reinforcement-learning mechanisms mediated by the mesolimbic dopamine pathway (Shao et al, 2013). Socio-cultural factors may also play a role in shaping gambling behavior, particularly in gambling disorder (GD) psychopathology, prevalence, and acceptance (Raylu, and Tian, 2004; Okuda et al., 2009; Granero et al., 2009; Dhillon et al, 2011). This raises the question of how, and to what extent, culture influences the relationship between GD and EGM (Tavares et al, 2003; Dowling et al., 2005; Azmier, 2005; Shao et al., 2013).

Previous epidemiological research in GD, which has focused largely on Anglo-Saxon countries such as the United States, Canada, and Australia, has found a higher prevalence of EMG use amongst women, and a higher tendency for addiction among gamblers that play EGM (Fattore et al., 2014). Unfortunately, research on this topic in other cultures is more limited. Granero and colleagues (2009) found a higher prevalence of EMG use amongst males (97%) compared to females (80%) (Granero et al. 2009). Additionally, Tavares and colleagues found that among Brazilian gamblers, EGM was more often used by women, who also tended to have a more rapid progression from recreational gambling to GD, and lower prevalence of alcohol-use disorders (Tavares et al, 2003). Despite its strengths, the work developed by Tavares and colleagues used a relatively small sample (n=70) and lacked a cross-cultural analysis. Therefore, their findings were limited to transcultural comparisons, a problem which hinders more reliable and standardized analysis. This limitation results in a gap in understanding how culture influences the use of EGM.

The objective of this paper is to perform a cross-cultural comparison of GD associated with EGM in Brazil and the United States, two countries that have significant differences in socio-cultural background. Our goal is to investigate the socio-demographics, gambling behavior, and psychiatric antecedents of treatment-seeking samples of adults from these two

nations. Our hypothesis is that there are significant differences in GD due to EGM between these countries, and that this comparison can lead to a better understanding of cultural influences of GD due to EGM. These investigations could potentially help to improve preventive and therapeutic approaches based on cross-cultural differences in gambling behavior.

2. Methods

2.1. Participants

The present sample included 733 subjects: 353 men and 380 women (average age = 45.80, standard deviation ± 10.9). The Brazilian sample was comprised of 517 individuals and the American sample 216.

The Brazilian sample consisted of subjects that voluntarily sought treatment and/or participated in clinical trials at the Impulse Control Disorder Outpatient Unit of University of São Paulo Hospital. The recruitment took place in the outpatient clinics during the standard intake interview. Additionally, media advertisements (internet, radio, Gamblers Anonymous) were used to invite subjects to participate in clinical treatment and clinical trials. The American sample included individuals who were treated at an outpatient gambling clinic and/or participated in clinical trials that were conducted at the University of Minnesota and University of Chicago. Media advertisements (newspapers, internet, public places) were also used to recruit participants. Recruitment took place between 1996 and 2014 in Brazil and between 1998 and 2014 in the United States.

The current study is a sub-analysis of a larger cross-cultural study that compares gamblers from Brazil and the United States (see Medeiros et al., 2015). The total sample consisted of 1446 adult gamblers. Out of this number, 1019 (70.5%) subjects considered EGM a preferred form of gambling, and 733 (50.7%) selected EGM exclusively as their main form of gambling.

Inclusion criteria for the current study were: 1) formal GD diagnosis according to the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5); 2) minimum age of 18 years; 3) outpatient status; 4) selection of EGM as the exclusive main form of gambling. Exclusion criteria included: unstable medical illness or participants who needed emergency care, clinically significant abnormalities on physical examination, individuals who had less than 5 years of formal education, patients that presented with psychotic symptoms, and subjects that refused to participate in the study.

2.2 Measures

2.2.1. GD diagnosis—The Structured Clinical Interview for Pathological Gambling was used to diagnose GD. This instrument was originally validated using the criteria of the Fourth Edition of the Diagnostic and Statistical Manual of Mental Disorders [DSM-4] (Grant et al., 2004). Trained psychiatrists made all diagnoses.

As the data obtained before the release of DSM-5 were saved electronically, we retrospectively processed them for a proper adaptation to DSM-5 GD criteria. This

procedure consisted of deleting the criterion “committed illegal acts such as forgery, fraud, theft, or embezzlement to finance gambling regarding illegal acts”, which was present in previous manual, DSM-4. Additionally, we lowered the diagnostic threshold from five to four, consistent with DSM-5. Remaining criteria were unchanged.

2.2.2 Selection of patients presenting with GD specifically due to EGM—We used an open question assessing the subject's preferred gambling activity. Patients were asked to list the main forms of gambling based on frequency, the amount of money spent and the impact of negative consequences. We selected the patients that selected EGM (which includes slot machines, Keno and all different kinds of video-bingo) as their exclusive main form of gambling.

2.2.3 Socio-demographic data—The two samples were evaluated on several socio-demographic variables, including gender, age, race, marital status, and educational level.

2.2.4 Gambling behavior—All participants were assessed for variables related to course of GD, including age of onset of gambling activity, age of onset of GD, lag onset of gambling activity and onset of GD. GD severity was measured by the total number of DSM-5 criteria endorsed, which, according to American Psychiatric Association (APA), is related to different levels of severity (APA, 2013).

2.2.5 Psychiatric antecedents—Participants underwent a psychiatric interview using a semi-structured interview that assesses lifetime psychiatric disorders (the Mini International Neuropsychiatric Interview [M.I.N.I.] [Lecrubier et al., 1997]). This instrument is usually performed by professionals after a brief clinical training. It was previously adapted to Brazilian Portuguese (Amorim, 2000).

2.3 Statistical Analysis

Initially, we conducted a univariate comparison between the Brazilian and the American samples. The analysis included socio-demographic data, gambling behavior variables, and psychiatric antecedents. Chi-square tests were used for categorical variables. ANOVA and Mann-Whitney's U were used, respectively, for continuous variables with normal and non-parametric distribution. Analyses of clinical variables were controlled for demographic differences between the samples, including, gender, age, marital status, and educational level. This methodology was used to reduce the possible confounding effect of demographics.

Next, we conducted a binary logistic regression in which we introduced all of the clinically relevant variables with statistical significance ($p < 0.05$). The significant variables entered into the model at the same time, with country of origin (Brazil or United States) set as the dependent variable. Then, we conducted a backwards procedure by which the least significant variables were withdrawn until all remaining variables in the model were significant at $p < 0.05$.

2.4 Ethics

All data collection was approved by the ethics committee of the Clinical Hospital of Medical School of the University of São Paulo (Brazil), the Institutional Review Board for the University of Chicago (United States), and the Institutional Review Board for University of Minnesota (United States). Written informed consent was obtained from all participants.

3. Results

Demographic comparisons showed significant differences between the two samples (Table 1). Brazilians presenting with GD due to EGM were younger, predominantly male, less likely to be Caucasian, and more likely to be partnered.

Table 2 presents the comparison of gambling behavior variables between the two samples. Overall, Brazilian subjects exhibited a faster progression from recreational gambling to GD and were more likely to endorse chasing losses.

In order to better examine the significantly higher prevalence of chasing losses in the Brazilian sample, we performed a separate sub-analysis of men and women based on this criterion. We found that chasing losses was significantly more likely in both Brazilian men and women when compared to gamblers in the United States. Additionally, chasing losses did not differ when we compared males and females of the same country (Brazilian sample, male versus female comparison: $\chi^2=.519$, $p=.471$; American sample, male versus female comparison: $\chi^2=.635$, $p=.426$). Figure 1 presents the main results of this comparison. Additionally, we tested the association between gender and chasing losses in a logistic regression model. We found that gender had a non-significant association with chasing losses (Wald's $\chi^2 = .585$; sig = .559; Odds-ratio = .022). Thus, the higher rates of chasing losses amongst Brazilians may be more related to socio-cultural factors than gender characteristics.

Brazilian and American patients with GD due to EGM did not demonstrate statistically significant differences regarding lifetime psychiatric antecedents (Figure 2).

All variables (socio-demographic, gambling behavior and psychiatric antecedents) that were statistically significant and clinically relevant were introduced into a binary logistic regression model using a backwards procedure. The variables that significantly differentiated between the two samples were race (Wald's $\chi^2 = 6.778$; sig = .009; Odds-ratio = .146), age (Wald's $\chi^2 = 6.851$; sig = .009; Odds-ratio = 1.040), gender (Wald's $\chi^2 = 7.004$; sig = .008; Odds-ratio = .412), and chasing losses (Wald's $\chi^2 = 7.662$; sig = .006; Odds-ratio = .318). The constant for this model was (Wald's $\chi^2 = .271$; sig = .603; Odds-ratio = .519).

4. Discussion

To our knowledge, this is the largest cross-cultural comparison using patients presenting with GD due to EGM, a highly addictive form of gambling (Tavares et al. 2003; Dowling et al., 2005; Shao et al., 2013). We analyzed socio-demographics, gambling behavior variables and psychiatric antecedents in 733 treatment-seeking subjects from Brazil and the United States.

The demographic composition of our samples differs somewhat from previous epidemiological studies in Brazil and the United States (Tavares et al., 2010; Blanco et al., 2006; Slutske, 2006, Kessler et al., 2008). These differences may be due to two features of the sample: 1) treatment-seeking individuals have significant differences relative to gamblers in the general population (Blanco et al., 2006; Slutske, 2006, Kessler et al., 2008); and 2) epidemiological studies assessing GD have included all forms of gambling, not just EGM, as was the case in this study.

As expected, both samples had lower rates of males than gamblers in the general population: 52.4% in our Brazilian sample versus 77.3% in a previous epidemiological study (Tavares et al., 2010) and 38.0% versus 63.1% in an American sample (Blanco et al., 2006). This finding is consistent with previous research indicating that woman may be particularly susceptible to GD due to EGM (Fattore et al., 2014), which may suggest that this tendency is independent from socio-cultural variables. In Brazil sample, however, the proportion of males with GD in the general population is much higher than the percentage of females – 77.3% versus 22.7% (Tavares et al., 2010). Due to overall greater number of men with GD, there is a slight predominance of males even when isolating GD due to EGM. Interestingly, the educational profile of our American sample was identical to epidemiological studies of GD. Previous research has shown that less education may be a risk factor for developing GD (Farré et al., 2015), which is consistent with the present findings regarding GD specifically due to EGM. Unfortunately, epidemiological data on the educational profile of Brazilian gamblers is not available for comparison.

In terms of race/ethnicity, the Brazilian sample had a lower proportion of individuals identifying as Caucasian. This difference between the two groups may be a natural artifact of the countries, distinct from issues related to GD. For example, in 2010, 47.5% of the Brazilian population identified themselves as Caucasians (Brazilian Government, 2010) while this rate was much higher in the United States – 72% in that same year (United States Government, 2010). Similarly, differences in marital status between the samples may be due to a higher divorce rate in the United States relative to Brazil. For example, in 2009 there were approximately 9.5 divorces per 1000 inhabitants in the United States (Elliott and Tavia, 2011). In Brazil, there were only approximately 1.4 divorces per 1000 inhabitants in the same year (Brazilian Government, 2011). The average age of the Brazilian sample was approximately 46 years, at which point 44.8% of the marriages in the United States had already ended (Aughinbaugh et al., 2013). Therefore, it is unlikely that the demographic differences identified in this analysis are related to GD.

In terms of the clinical presentation of GD, gamblers in Brazil were more likely to chase their losses, a finding which seems to be associated with socio-cultural variables. As Gainsbury and colleagues (2014) highlight, chasing losses is associated with lower socioeconomic status and a greater number of irrational beliefs (Gainsbury et al., 2014). Regarding socioeconomic status, the United States has a much higher GDP per capita - US\$ 53143 - than Brazil – US\$ 15034 (World Bank, 2014). A possible explanation for the associations between lower socioeconomic status and higher rates of chasing is a pervasive misunderstanding of how gambling results and odds are determined (Svetieva and Walker, 2008; Griffiths and Whitty, 2010). Additionally, Weber and Hsee (2000) describe how

South American cultures may have greater overconfidence towards luck, and are generally less risk averse than those in United States (Weber and Hsee, 2000). Chasing losses is an important behavior because it is one of the few externally detectable symptoms in GD (Gainsbury et al., 2014) and it is usually associated with further losses and worse negative consequences (Blaszczynski and Nower, 2002). Due to the relatively rapid progression from recreational use of EGM to the development of GD due to EGM, early interventions are critical. Therefore, identifying gamblers who chase losses might help prevent further escalation to the development of GD, especially in Brazil. Further cognitive studies on why chasing losses is more frequent in Brazil are needed.

Both samples report rapid progressions from recreational gambling to GD, which is probably associated with the high addictive potential of EGM (Shao et al., 2013). The Brazilian sample had a faster evolution than the American sample. However, the variable “lag between onset of gambling activity and onset of GD” did not appear in the final model of the statistical analysis (excluded in the first step of the analysis: Wald's $\chi^2 = 1.566$; sig = .118; Odds-ratio = .059). Additionally, this variable only showed a tendency to significance when controlled for demographics. Nonetheless, the faster progression in developing countries should be investigated more extensively. Several studies in the United States and other countries including Canada, New Zealand, Australia, and Sweden have reported a tendency for faster progression to GD in racial/ethnic minorities, for whom low income appears to be an important contributing factor (Zitzow, 1996; Blaszczynski et al., 1998; Abbott and Volberg, 2000; Volberg et al. 2001; Welte et al., 2001; Westermeyer et al., 2005). The low financial reserve of developing countries, such as Brazil, may also create a tendency faster progression to GD. Future research will also need to assess how distinct legislation regarding EGM may influence the faster progression from recreational gambling to GD. For example, EMG are currently illegal in Brazil, but are legal in the United States, with 852,000 registered EGM reported in 2013 (Ziolkowski, 2014). There are, however, a number of illegal bingo venues still operating in Brazil (Vagos, 2010; UOL, 2011; Tavares, 2014; G1, 2014). Some media reports have indicated that the involvement of police officers in this illegal gambling industry is crucial for the maintenance of the business (Tribuna, 2015). These facts suggest that there is poor supervision of illegal bingo venues, the main place where EGM are found in Brazil. Longitudinal studies in countries changing their legislation on gambling may be particularly interesting, particularly regarding the legality of EGM. With this information, it may be possible to clarify the association between governmental supervision of EGM and faster progression to GD.

In addition to the strengths of this research, the following limitations should be noted. First, this research used treatment-seeking samples, which may weaken generalizability to the wider population of people with gambling problems. Nevertheless, the comparison between treatment-seeking subjects is clinically relevant. Second, the sample may not be perfectly representative of treatment-seeking patients from the respective countries. The Brazilian sample was collected only in State of São Paulo, and the American sample was limited to two States. Third, we excluded patients with less than 5 years of education in order to guarantee a reasonable understanding of the diagnostic instruments. This could be a notable limitation, as subjects with GD are more likely to have little to no educational history (Petry et al., 2005), and this criteria may have excluded a significant subset of gamblers.

Additionally, as our samples were collected over 18 years. During this time it is possible that gambling practices may have change significantly, potentially limiting applicability in the present. Finally, cultural and ethnic differences may also exist within the included samples, suggesting that future research may benefit from more extensive sub-analyses both within and between countries.

This study showed that there are significant differences in socio-demographics and gambling behavior variables between treatment-seeking samples of patients presenting GD due to EGM in Brazil and the United States. These findings reinforce the argument that cultural variables seem to have a significant role in GD psychopathology and negative consequences. Future studies should consider assessing correlations between clinical differences in GD with cultural variables, such as superstitious behavior, collective attitude towards loss of control, and cultural perceptions of impulsiveness. This study limits the generalizability of findings derived from predominantly Anglo-Saxon countries to other cultures, highlighting the need for research on GD in more diverse cultures. The present findings also reinforce the inefficient supervision of illegal bingo venues by the Brazilian Government where the highly addictive EGM still can be easily found. Finally, our results suggest that the addictive potential of EGM may be a cross-cultural phenomenon, as patients with GD due to EGM presented with a fast progression of GD in both samples, particularly in Brazil. EGM could be even more addictive in developing countries due to the poor socio-economic status and specific behaviors such as chasing.

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HIGHLIGHTS

This study approaches gambling disorder (GD), an increasing problem but still not familiar for mental health professionals and with important research gaps.

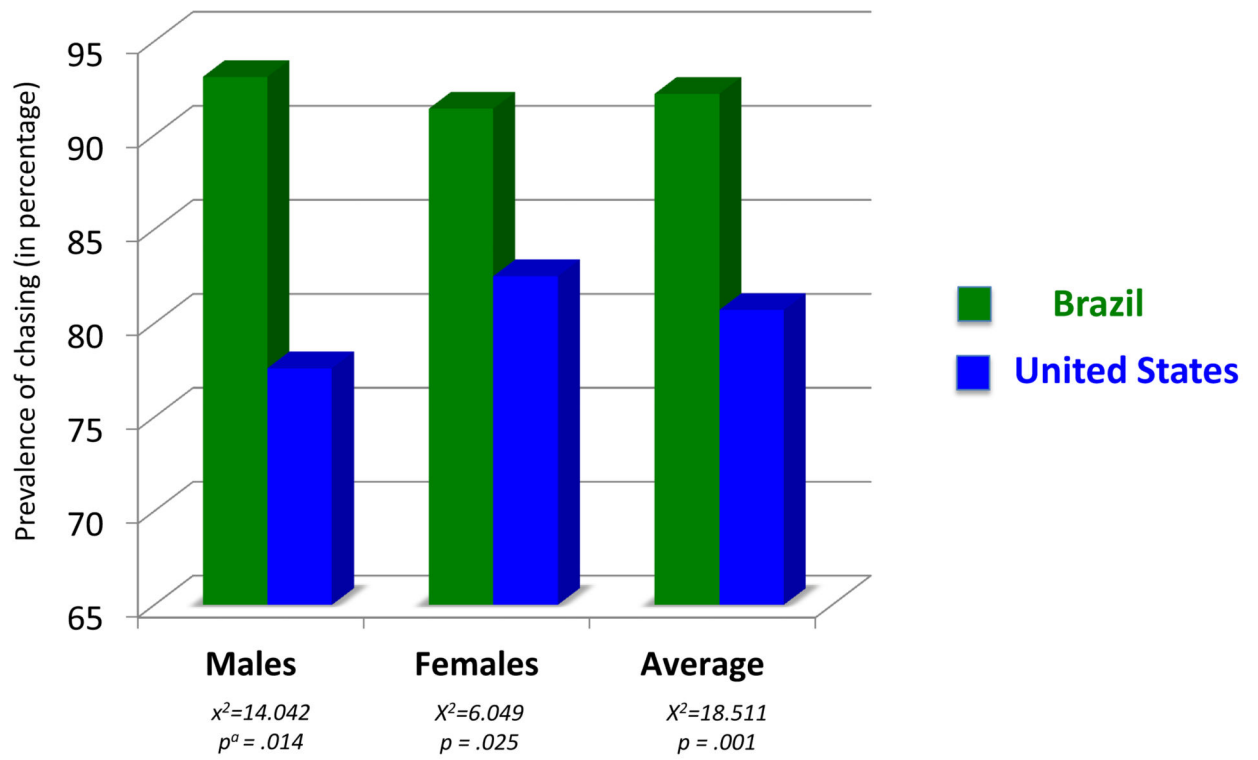
This study approaches a highly addictive form of gambling: electronic gaming machines (EGM).

This study analyses in a standardized and comprehensive way a large sample (733 participants), recruited between 1996 and 2014.

This study is the largest cross-cultural paper on GD due to EGM. We found that there are important differences between Brazil and the United States, two countries with different socio-cultural background as well as different formal legal gambling status. This research suggests the significant role of cultural factor in shaping GD.

This article suggests explanations for some points related to GD that apparently depends on culture such as some demographic variables and differences in gambling behavior.

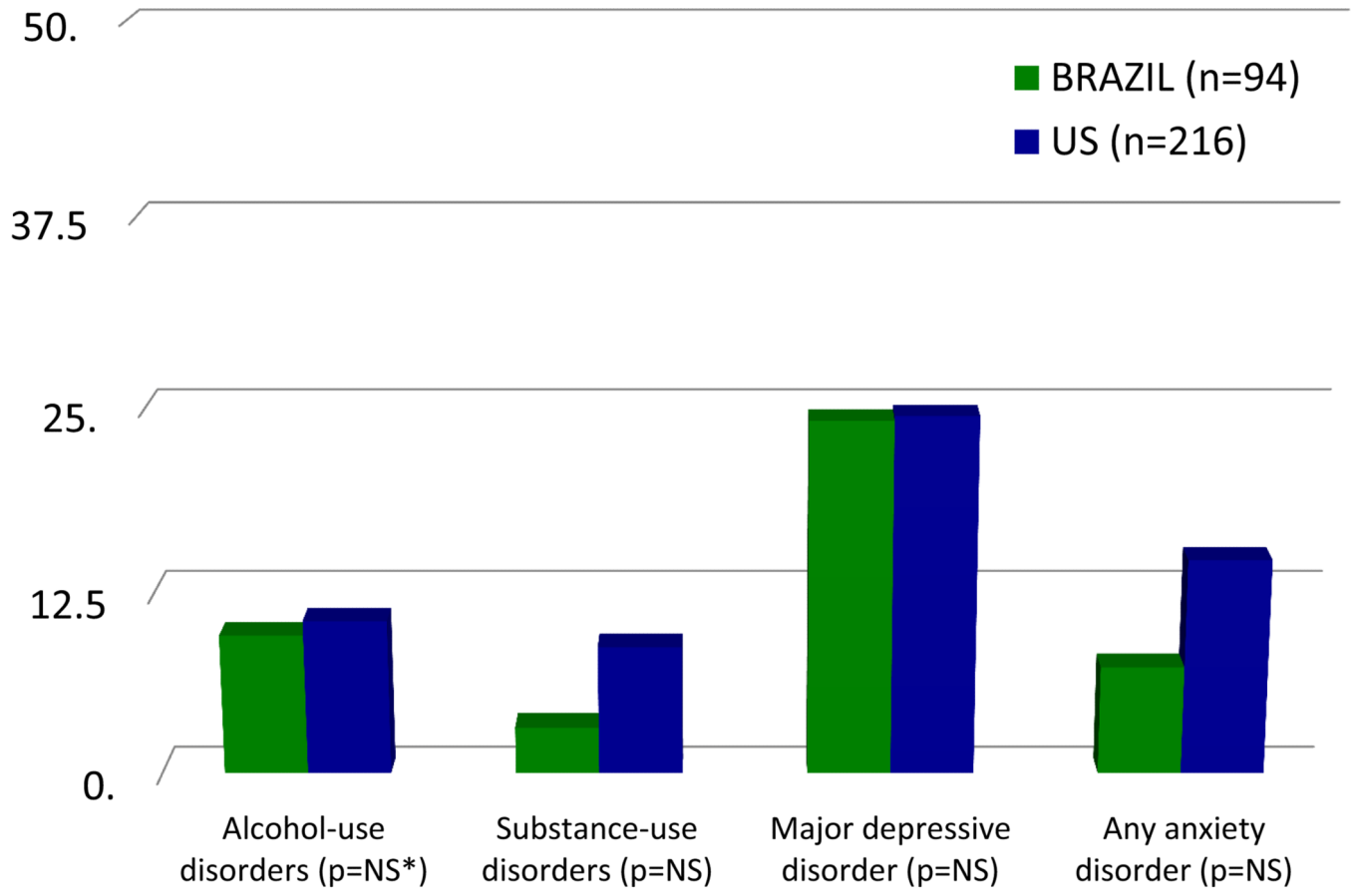
This study reinforces the need for further cross-cultural research on GD. It also weakens the possibility of generalization of finding from Anglo-Saxon cultures to rest of the world.



χ^2 and p values are related to the comparison between countries considering just males (left), just females (center) and both genders (right). These p values were controlled for age, race and marital status.

Figure 1.

Chasing in samples with GD due to EGM in Brazil and in the United States. The charts displays the results considering just males (left), just females (center) and the average of both genders (right).



*NS = non-significant

Figure 2. Lifetime Psychiatric antecedents in subjects with Gambling Disorder due to Electronic Gaming Machines in Brazil and the United States (US).

Table 1

Demographics of subjects presenting with Gambling Disorder due to Electronic Gaming Machines in Brazil and the United States (US).

Demographics	BRAZIL n = 517	US n = 216	Test	
			Coefficient	P
- AGE (years)	44.16 (SD ^a = 10.5)	49.73 (SD = 11)	F = 41.92	< .001
GENDER			$\chi^2 = 12.75$	< .001
- Male	271 (52.4%)	82 (38%)		
- Female	246 (47.6%)	134 (62%)		
RACE			$\chi^2 = 23.59$	< .001
- Caucasian	397 (76.8%)	199 (92.1%)		
- Non-Caucasian	120 (23.2%)	17 (7.9%)		
MARITAL STATUS			$\chi^2 = 13.98$	< .001
- With partner	310 (60%)	119 (55.1%)		
- Without partner	207 (40%)	41 (44.9%)		
EDUCATION			$\chi^2 = .130$.718
- High school or less	278 (53.8%)	113 (52.3%)		
- More than high school	239 (46.2%)	103 (47.7%)		

^aStandard Deviation

Table 2

Gambling behavior variables of subjects with Gambling Disorder (GD) due to Electronic Gaming Machines in Brazil and the United States (US).

Variables	BRAZIL (n = 503) Mean (SD ^a) or n (%)	US (n=181) Mean (SD) or n (%)	Test		
			Coefficient	P	Controlled P ^b
- Age of gambling onset	32.43 (±16.1)	31.50 (±15)	F=.774	.358	NA ^c
- Age of GD onset	39.31 (±10.9)	39.80 (±11.8)	F=.281	.596	NA
- Lag between gambling onset and GD (in years)	6.88 (±8.9)	8.54 (±9.8)	F=4.832	.028	.077
- GD severity ^d	7.44 (±1.2)	7.15 (±1.3)	F=3.493	.062	NA
- Gamble when feel distressed (seeking relief)	372 (74%)	142 (78.5%)	$\chi^2=1.441$.230	NA
- Chasing	464 (92.2%)	146 (80.7%)	$\chi^2=18.511$	<.001	.001
- Illegal acts due to GD ^e	220 (43.7%)	40 (40.8%)	$\chi^2=.269$.604	NA

^a standard deviation

^b controlled for age, gender, race and marital status.

^c do not apply

^d GD severity was measured by the total number of criteria endorsed according to the Fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5).

^e Illegal acts had a n of 503 in the Brazilian Sample and of 98 in the American Sample. The number of respondents in this criteria is lower than the total n due to the evolution of GD criteria in DSM (i.e. DSM-5 removed this behavior from the diagnostic criteria). Therefore, the patients enlisted in 2013 and 2014 did not answer this item.