



Video game addiction and psychological distress among expatriate adolescents in Saudi Arabia



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ABSTRACT

Introduction: Few studies have estimated screen time among Arab adolescents, and no studies, to date, have published data on addiction to video games or Internet games among Arab adolescents. This study aimed to assess the prevalence of addiction to video games and its correlation with mental health in a sample of expatriate high school students from the Al-Qassim region of Saudi Arabia.

Methods: The survey was conducted in 2016 among 276 students enrolled in ninth through twelfth grades in the International Schools in Buraidah, Al-Qassim. Students who returned signed consent forms from their parents filled out a self-administered questionnaire that included validated scales on addiction to video games, general health, and lifestyle.

Results: The proportion between the sexes and the schools were roughly equal. Around 32% were overweight or obese, 75% had screen time ≥ 2 h/day, and 20% slept < 5 h/night. Sixteen per cent (16%) were addicted to video games and 54% had psychological distress. Addiction to video games was strongly associated with psychological distress (OR = 4.1, 95% CI = 1.80, 9.47). Other significant correlates were female gender, higher screen time, and shorter sleep hours.

Conclusions: The proportion of students with psychological distress was high. Future studies should investigate other potential correlates of distress such as personal traits, family relations, and academic performance.

1. Introduction

Video games are a popular source of entertainment among children and adolescents. Video games and the associated implications have become increasingly pervasive in societies around the world (Kuss, 2013). Several studies have examined excessive use of video games, and others have tried to characterize video game addiction as well as to distinguish between the former and the latter (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015; Kardefelt-Winther et al., 2017; Schou Andreassen et al., 2016). Video game addiction falls into the category of “Internet gaming disorder,” which is closely related to impulse control disorder and often compared with gambling addiction. Consensus has not officially been reached regarding its assessment and diagnosis (James & Tunney, 2017), and theoretically-driven research on behavioural addiction is sparse (Kardefelt-Winther et al., 2017). Currently within the DSM-5, Internet gaming disorder is considered to be the “persistent and recurrent use of the Internet to engage in games,

often with other players, leading to clinically significant impairment or distress as indicated by five (or more) criteria in a 12-month period” (American Psychiatric Association, 2013). The diagnostic criteria include a preoccupation with gaming, withdrawal symptoms, tolerance (i.e. spending more time gaming), lack of control, loss of other interests, use despite negative consequences, deception, mood modification, and losing a relationship, job, or similarly important aspects of life (American Psychiatric Association, 2013). Kardefelt-Winther et al. provides an operational definition of behavioural addictions that may provide useful guidance: “A repeated behaviour leading to significant harm or distress. The behaviour is not reduced by the person and persists over a significant period of time. The harm or distress is of a functionally impairing nature.”

Epidemiological studies provide us with estimates of the prevalence and correlates of video game addiction. The prevalence estimates of video game addiction vary widely across studies, but those focused on youth reported to be around 8% in the U.S. (Gentile, 2009) and

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Australia (Porter, Starcevic, Berle, & Fenech, 2010), 10% in China (Wang et al., 2014), 4% in Korea (Park, Jeon, Son, Kim, & Hong, 2017), and 3% in Germany (Rehbein, Kliem, Baier, Mößle, & Petry, 2015).

Cross-sectional studies that have compared people with Internet gaming disorders to those without the disorder reported that those with the disorders played games for longer periods, skipped school more often, had lower grades in school, reported more sleep problems and more often endorsed feeling 'addicted to gaming' than their counterparts (Greitemeyer & Mügge, 2014; Hale & Guan, 2015; Higuchi, Motohashi, Liu, & Maeda, 2005; Mak et al., 2014; Mei, Yau, Chai, Guo, & Potenza, 2016). The higher screen time that comes along with this video game addiction disrupts normal sleep pattern, resulting in a pattern with less sleep overall, longer time to fall asleep, and more interruptions during sleep (Hale & Guan, 2015; Higuchi et al., 2005; Hysing et al., 2015).

Video game addiction may have both short and long-term effects on adolescents, which span psychological, emotional, and neurological ramifications (Higuchi et al., 2005; Meng, Deng, Wang, Guo, & Li, 2015; Spada & Caselli, 2017). Several studies have shown that anxiety and depression are common among those who are addicted to video games (Schou Andreassen et al., 2016; Wei, Chen, Huang, & Bai, 2012; Wenzel, Bakken, Johansson, Göttestam, & Øren, 2009). Other research suggests that there are cognitive and neurological correlates of Internet gaming disorder (King & Delfabbro, 2014; Marino & Spada, 2017; Meng et al., 2015; Weinstein & Lejoyeux, 2015). There are strong cognitive reinforcements such as social acceptance, self-esteem, and goal achievement that perpetuate video game use (King & Delfabbro, 2014; Rasmussen et al., 2015). Brain imaging studies report that there are significant changes in the areas of the brain that regulate impulse control and decision making among individuals with Internet gaming disorder (Meng et al., 2015). Addicted video gamers who have poor self-control or poor social skills are more likely to exhibit aggressive behaviour (Anderson et al., 2010; Liau et al., 2015). This aggressive behaviour is shaped by the various psychological responses, such as anger, cruelty, or hostility, which video games, especially the violent types, typically invoke (Greitemeyer & Mügge, 2014). Furthermore, studies have shown that once an adolescent has become 'addicted,' the symptoms usually persist over time (Strittmatter et al., 2016). One longitudinal study showed that 84% of the adolescents who were addicted to video games at the baseline remained addicted to them two years later (Gentile et al., 2011). Longitudinal follow-up data suggests that these comorbid conditions are not a mere correlate, but a direct consequence of this addiction (Gentile et al., 2011).

The availability and use of electronic gadgets among the youth in Arab countries in the Gulf region are likely as common as elsewhere in developed countries (80% have a laptop or desktop; 67% of the remaining 20% who do not possess one have access to one) (Jacobson, Bailin, Milanaik, & Adesman, 2016). Published data related to video games is limited to studies that have focused on excessive screen time. Two Emirati studies and one Bahraini study reported the proportion of their study participants that had greater than 2 h/day of screen time was 37% (age 5–15 years), 85% (age 11–16 years), and 65% (age 15–18 years) respectively (Henry, Lightowler, & Al-Hourani, 2004; Musaiager, Bader, Al-Roomi, & D'Souza, 2011; Yousef, Eapen, Zoubeidi, & Mabrouk, 2014). The corresponding prevalence was even higher in Saudi Arabia (The Arab Teens Lifestyle Study, age: 14–19 years, male: 84%, female: 91%) (Al-Hazzaa et al., 2014). It is reasonable to assume that screen time and video game addiction could be correlated, but it is well-established that addiction and/or Internet gaming disorder is distinctly different from excessive use and should include the individual context and distress caused to the addict.

Little is known about screen time or video game addiction among the expatriate children in Saudi Arabia. They are the sons and daughters of expatriate professionals in Saudi Arabia, who represent a significant portion of current jobholders in the education, engineering, health, and business sectors in Saudi Arabia (Shah, 2009). Many of

these children go to schools that follow an English curriculum and do not speak Arabic; furthermore, it is likely that they engage in risky behaviours (e.g. smoking) and have limited physical activity (Al-Hazzaa et al., 2014; Asfour, Stanley, Weitzman, & Sherman, 2015). We hypothesize that social isolation, coupled with inclement weather, may force them to stay indoors more than they would otherwise, and they may resort to spending more time with the television, computer, cell phone, Internet, etc.

In order to address this gap in knowledge, we surveyed two expatriate schools in the Al-Qassim region of Saudi Arabia. We assessed their screen time and addiction to video games, along with other lifestyle practices, with validated questionnaires (Al-Hazzaa, Musaiager, & Group, 2011; Gentile, 2009). We further evaluated their psychological distress with the General Health Questionnaire (GHQ-28), a widely used screening tool (Sterling, 2011). We hypothesized that the prevalence of addiction to video games would be high in this population. In addition, based on the literature, we hypothesized that addiction to video games and higher screen time would be associated with higher psychological distress.

2. Method and measures

2.1. Sample

This cross-sectional study included 276 students who were enrolled in the Indian or Pakistani international secondary schools in the city of Buraydah in Al-Qassim province in Saudi Arabia. The inclusion criteria included (a) Non-Saudi, and (b) currently enrolled in either of the schools. The study protocol was approved by the ethics committee at Sulaiman Al-Rajhi Colleges (SRC) as well as by the respective school administrators.

2.2. Data collection

The researchers described the study's purpose and procedures to the students and provided them with the informed consent form to be signed by the parents. Out of 324 eligible students from these two schools, a total of 48 students did not return the signed consent form. Those who returned the consent ($n = 276$; response rate = 85%) were given the paper survey, which was self-administered.

2.3. Assessment

The survey included scales for video game addiction and a general health assessment. It also included a lifestyle questionnaire used previously in the Arab Teen Lifestyle Study (ATLS), which includes questions on diet, physical activity, screen time, and sleep (47-item) (Al-Hazzaa et al., 2011). Questions related to video game addiction did not have missing data, general health assessment had < 1% missing, and covariate data had < 4% missing.

2.4. Dietary habits

The diet section included 10 questions using a 7-point response scale ranging from none to seven times weekly. Each question stem addressed how often a particular food was eaten per week. The questions included homemade breakfast, fruits, vegetables, milk, fast food (e.g. hamburger, shawarma), french-fries, cookies, chocolate, sugary drinks, and energy drinks. The items were categorized as either healthy food choices or unhealthy food choices. The healthy food items included breakfast, fruits, vegetables, and milk; and the other items comprised the unhealthy food items. Summary scores were calculated for each of the categories: a) Healthy: 0 to 28, and b) Unhealthy: 0 to 42.

2.5. Physical activity calculation

Physical activity questions included the following activities: running, biking, swimming, moderate-intensity sports (e.g. volleyball, table tennis), vigorous-intensity sports (e.g. basketball, handball), self-defence, weight lifting, and household chores. For each activity, the frequency per week and time spent per bout were recorded. Metabolic equivalence (MET) values were assigned to each type of activity (Ainsworth et al., 2011). The MET minutes per week were calculated by multiplying the frequency by time by MET equivalent. Participants were divided into physically active or inactive based on total physical activity cut-off scores of 1680 MET min/week (60 min per day \times 7 - days per week \times 4 METs), corresponding to 1 h of daily moderate-intensity physical activity (Al-Hazzaa et al., 2011).

2.6. Screen time

The screen time was calculated as the summary of responses from two questions. The first question assessed daily time spent watching television or videos, while the second question assessed daily time spent using the computer or Internet (Al-Hazzaa et al., 2014). The two questions had a 6-point response scale ranging from < 30 min to > 5 h, which resulted in a range of less than 1 h to 12 h/day. Total screen time was categorized into less than 1 h, 2 to 3 h, 4 to 5 h, and 6 or more hours.

2.7. Video game addiction

The survey included a validated scale on video game addiction (11 items) (D. Gentile, 2009; D. A. Gentile et al., 2011). This scale is based on a theory for pathological gaming, which includes indication that gaming harms the individual's social, occupational, familial, academic, and/or psychological functioning. Those classified as an addict exceed a fixed number of criteria (similar to criteria from DSM-5). The validated scale includes 10 items with a response scale and scoring as follows: a 'no' response was scored as a 0, a 'yes' response was scored as a 1, and a 'sometimes' was scored as a 0.5. The sum of the responses was calculated and the threshold for addiction was 6 (Gentile, 2009). Cronbach's alpha for the 11 items in this sample was 0.72.

2.8. Psychological distress

The General Health Questionnaire (GHQ-28) responses were scored as 0, 1, 2, and 3; items 1 and 17 through 21 were reverse coded to reflect the positive stem of the question. The sum of the responses was calculated and the threshold for psychological distress was 24 (Sterling, 2011). Cronbach's alpha for the 28 items in this sample was 0.80.

2.9. Physical indices

Participants reported weight in kilograms and height in centimetres. Body mass index (BMI) was calculated in kg/m^2 and categorized as normal, overweight, or obese according to the established cut-off values by age and gender for individuals between the ages of 2 and 18 (Cole, Bellizzi, Flegal, & Dietz, 2000).

2.10. Analysis

The variables were checked for accuracy before the analysis was undertaken. First, descriptive statistics for the whole sample were generated as follows: frequency for categorical variables and mean and standard deviation for continuous variables. The percentage of students who endorsed each item for video game addiction was analysed and the prevalence of video game addiction was calculated from the summary score. Afterwards, demographic and lifestyle factors were compared between those with and without video game addiction. Chi-square test

Table 1

Demographic characteristics of 276 Secondary School Students in Al-Qassim, Saudi Arabia.

Variable	Count	Percent or mean \pm standard deviation
Age (years)	276	15.3 \pm 1.25
Gender		
Male	140	50.7
Female	136	49.3
School		
Pakistan	135	48.9
Indian	141	51.1
Grade		
Nine and ten	131	47.5
Eleven	83	30.1
Twelve	62	22.5
Weight status		
Normal	189	68.5
Overweight	63	22.8
Obese	24	8.7
Physical activity		
Inactive (\leq 1680 MET-min/week)	152	55.1
Active ($>$ 1680 MET-min/week)	124	44.9
Healthy food score	276	15.5 \pm 7.12
Unhealthy food score	276	14.7 \pm 8.10
Screen time (h/day)		
Less than one	71	25.7
Two to three	75	27.2
Four to five	64	23.2
Six or more	66	23.9
Sleep time (h/night)		
Less than five	55	19.9
Six or seven	85	30.8
Eight or more	136	49.3
Video game addiction		
No	232	84.1
Yes	44	15.9

was used to compare the categorical variables and *t*-tests for continuous variables. Indices of central tendency were analysed for the summary score and the subscale scores for the General Health Questionnaire. The sample was stratified by males and females, and univariate associations between general distress and selected covariates were graphed.

Logistic regression was employed to assess the correlates of general distress. The unadjusted models included the following covariates: age, gender, body mass index, physical activity, screen time, sleep time, and video game addiction. All variables were considered for the inclusion in the adjusted model. A backward selection procedure was conducted, in which non-significant variables were deleted one by one until only variables significant at $p < 0.05$ were included. Model adequacy was checked with a Hosmer-Lemeshow test. Odds ratios and the associated 95% confidence intervals for variables in the final model were reported. All tests were two-sided with an alpha level of 0.05 and the analyses were carried out with SPSS version 22.

3. Results

The mean and the standard deviation for age and BMI were 15.3 \pm 1.3 (years) and 22.0 \pm 4.9 (kg/m^2), respectively [Table 1]. The proportion between boys and girls as well as between the Pakistani and the Indian school were roughly equal. The majority of the students (47%) were from grade nine or ten. Around 30% of the students were overweight or obese and 45% were physically active. Close to 75% of the students reported screen time of at least 2 h a day, and 20% reported sleeping less than 5 h/night.

Of the sample, 15.8% were addicted to video games. They were slightly older, more likely to be boys, more likely to be overweight but less likely to be obese, had higher screen time, and fewer sleep hours than those who were not addicted to video games; these differences

Table 2
Descriptive statistics for the subscales of the General Health Questionnaire (GHQ) among 276 Secondary School Students in Al-Qassim, Saudi Arabia.

GHQ subscale	Male Mean (sd)	Female Mean (sd)	p-Value
Somatic	6.0 (3.52)	6.7 (3.48)	0.098
Anxiety/insomnia	5.2 (4.17)	6.2 (4.49)	0.05
Social dysfunction	8.9 (3.49)	9.8 (3.30)	0.047
Severe depression	6.4 (4.93)	7.1 (4.87)	0.19

were not statistically significant. The physical activity level and the school affiliation were very similar between those who were and those who were not addicted to video games.

The majority of the students (54%) had high psychological distress (GHQ score ≥ 24). The frequency of high distress was greater among the girls than the boys (62% vs. 46%, p = 0.008). Additionally, the mean score for the girls was higher than the boys for all four subscales of GHQ, somatic, anxiety, social dysfunction, and severe depression; the difference for anxiety and social dysfunction were statistically significant [Table 2]. The difference of mean distress score between the boys and girls was higher among the older students (reference: younger), among the overweight or obese (reference: normal weight), among those who slept less than 5 h/night (reference: eight or more), and among those who were physically active (reference: physically inactive) [Fig. 1].

Addiction to video games was a strong and significant correlate of psychological distress; those who were addicted to it were 4.7 times (95% CI: 1.80, 9.47) more likely to be in distress than who were not in the multivariate model [Table 3]. Increased screen time was associated with distress in a monotonic fashion; those who reported a daily screen time of 2–3 h, 4–5 h, or ≥ 6 h had respectively 1.8, 2.5, and 3.6 times higher distress than those who reported a daily screen time an hour or less. The other significant covariates of distress in the model were gender and nightly sleep hours. Girls were twice as likely to be distressed as boys (95% CI: 1.13, 3.37). Those who slept less than 5 h a night were 3 times (95% CI: 1.26, 5.70) more likely to be distressed than those who slept 8 h or more. The remaining variables in the model

Table 3
Multivariate logistic regression for the correlates of distress (assessed using the General Health Questionnaire) among 276 Secondary School Students in Al-Qassim, Saudi Arabia.

Variable	N	OR	95% CI	p-Value
Age	276	1.03	0.82, 1.28	0.82
Gender				
Male	140	1.0		
Female	136	1.95	1.13, 3.37	0.02
Body mass index	276	1.00	0.92, 1.02	0.25
Physical activity				
Inactive (≤ 1680 MET-min/week)	152	1.0		
Active (> 1680 MET-min/week)	124	0.90	0.52, 1.55	0.70
Healthy food score	276	0.96	0.92, 0.99	0.04
Unhealthy food score	276	1.02	0.98, 1.05	0.29
Screen time (h/day)				
Less than one	71	1.0		
Two to three	75	1.88	0.90, 3.92	0.09
Four to five	64	2.55	1.17, 5.57	0.02
Six or more	66	3.52	1.56, 7.93	0.002
Sleep time (h/night)				
Less than five	55	2.68	1.26, 5.70	0.01
Six or seven	85	1.23	0.60, 2.22	0.50
Eight or more	136	1.0		
Video game addict				
No	232	1.0		
Yes	44	4.1	1.80, 9.47	0.001

such as participants' age, BMI, physical activity and fast food consumption frequency were not significantly associated with distress.

4. Discussion

4.1. Interpretation

This is the first study in the Middle East, to our knowledge, on video-game addiction among adolescents and the relationship between video game addiction and psychological distress. The results showed that a significant portion of them (around 16%) were addicted to video games and that the correlation between video game addiction and psychological distress was very strong and significant. Being female,

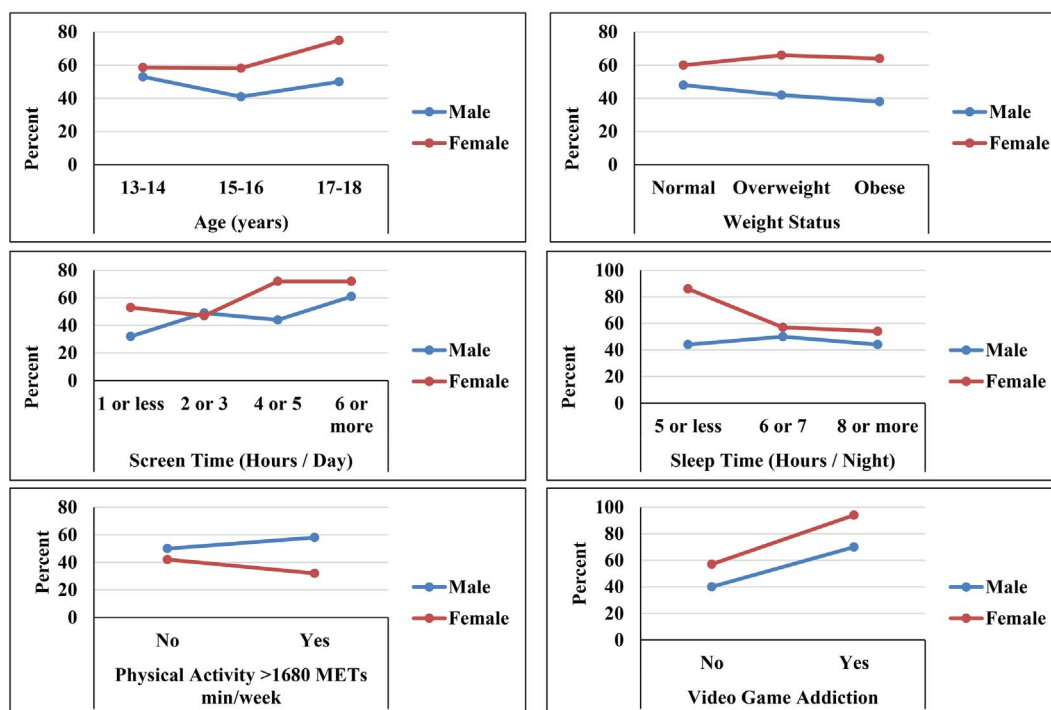


Fig. 1. Association between selected factors and the General Health Score Stratified by gender among 276 Secondary School Students in Al-Qassim, Saudi Arabia.

fewer hours of sleep, and higher screen time were more likely to be associated with psychological distress; on the other hand, eating healthily was less likely to be associated with psychological distress.

The prevalence estimate in this study (16%) was higher than those from other studies (8–12%) around the world (Gentile, 2009; Grüsser, Thalemann, & Griffiths, 2007; Porter et al., 2010). Potential explanations for the difference in the prevalence include the following: (a) the use of different assessment tools, (b) a rise in prevalence over time, (c) age composition of the sample, or (d) the participants' characteristics (i.e. expatriate). Because of the lack of consensus on the diagnosis of behavioural addictions in general and video game addiction specifically, there have been a variety of assessment tools used in previous studies (Grüsser et al., 2007; Johansson & Götestam, 2004; Porter et al., 2010; Tejero Salguero & Morán, 2002). Our approach was the most conservative calculation from a validated scale; hence, we conclude that our sample has a high prevalence compared to other adolescent studies (Gentile, 2009).

Most studies report, like the current one, a high prevalence of psychological distress among adolescents (Hanprathet, Manwong, Khumsri, Yingyeun, & Phanasathit, 2015; Lopes et al., 2016; Rikkers, Lawrence, Hafekost, & Zubrick, 2016; Willmott, Boardman, Henshaw, & Jones, 2004), which could be inherent to adolescence as a life stage and all the changes that occur within this stage (West, 2017). The prevalence goes up with age and is consistently higher among girls than boys (Hanprathet et al., 2015; Lopes et al., 2016; Rikkers et al., 2016). However, some behaviours exacerbate adolescent distress; those with Internet addiction are more likely to suffer from psychological distress than those without it (Kawabe, Horiuchi, Ochi, Oka, & Ueno, 2016), and the addiction seems to affect all dimensions of psychological distress. For example, in a Thai study of high school students, an addiction to Facebook was associated with an increased level of somatic symptoms, anxiety/insomnia, social dysfunction, and severe depression (subscales of GHQ-28) (Hanprathet et al., 2015). Video game addiction affects adolescents in a myriad of other ways. Higher screen time is associated with decreased psychosocial quality of life (Goldfield et al., 2015). Those who are addicted generally have lower self-esteem, poorer self-control, lower well-being, and a poorer social network than those who are not addicted (Mei et al., 2016; Rasmussen et al., 2015; Wu et al., 2016).

It is plausible that certain adolescents are predisposed to video game addiction either via genetics and/or personality factors (Leeman & Potenza, 2013). Once the individual becomes exposed to video game use, the time spent gaming increases and various neurological changes take place (Meng et al., 2015). These structural and functional changes within in the brain may contribute to sustained addiction over time (D. A. Gentile et al., 2011).

This study shows that higher screen time has an independent association with psychological distress, even when other covariates are present in the statistical model. One factor that could be a potential mediator is sleep (Higuchi et al., 2005; Ojio, Nishida, Shimodera, Togo, & Sasaki, 2016). Evidence suggests that the optimal sleep duration for boys in grade 10–12 is 8.5 h and for girls is 7.5 (Ojio et al., 2016). Screen time, including video game use, has been associated with disruption in the pattern, duration, and latency of sleep (Higuchi et al., 2005; Ojio et al., 2016). These disruptions at a critical stage of development, such as adolescence, and sustained over time could potentially lead to more distress.

4.2. Limitations

The results of this study should be interpreted with several limitations in mind. This study dealt with a relatively small sample ($n = 276$) although it targeted two expatriate schools and the overall participation from the eligible students was high (85%). A larger sample is necessary for the accurate estimation of the association of the outcome with the other covariates in the model. The study results pertain to addiction

prevalence among adolescents from central Saudi Arabia, and may not represent the adolescents from larger coastal cities. A third limitation was that the participants' height and weight data were self-reported. A certain degree of measurement error is attributable to the self-reporting although research indicates self-reported height and weight data to be reasonably accurate.

4.3. Conclusions and future directions

We conclude, based on the study findings, that adolescents who live in Saudi Arabia may have an increased risk for video game addiction, which is strongly associated with greater distress. The negative impact from video game addiction on the life of the adolescent is pervasive and severe. We recommend that public health authorities and researchers place video game use and addiction as one of the health priorities in the community. Future research should aim to acquire a comprehensive understanding of video game addiction among adolescents in Saudi Arabia for the development of programs to manage this problem and its consequences. First, the scope of the problem needs to be determined with a large and nationally-representative sample that includes both Saudi and expatriate adolescents. Second, video game addiction needs to be further qualified by the types of games that are being played (violent vs. non-violent), the amount of time spent on them, and the duration of the addiction. Third, it has yet to be determined whether video game addiction is a solitary behavioural problem or whether it co-exists or leads to other types of addiction, such as substance use. Fourth, the effect of video game addiction on psychological distress needs to be estimated after taking into account additional risk factors for distress such family environment, interpersonal relationship, and academic performance.

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