



Sex and national differences in internet addiction in Egypt and Saudi Arabia

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ABSTRACT

Background: Understanding individual differences in psychology, and how they relate to specific addictions, may allow society to better identify those at most risk and even enact policies to ameliorate them. Internet addiction is a growing health concern, a research focus of which is to understand individual differences and the psychology of those most susceptible to developing it. Western countries are strongly overrepresented in this regard.

Method: Here, sex and national differences in internet addiction are measured, using Young's 'Internet Addiction Test,' in two non-Western countries, Egypt and Saudi Arabia. >800 students aged 18 and 35 years ($M = 20.65$, $SD = 1.48$) completed a multidimensional internet addiction instrument. The instrument measures traits such as Withdrawal and Social Problems, Time Management and Performance and Reality Substitute.

Results: Analyses revealed that males scored higher than females and Saudis higher than Egyptians on nearly all scales, including the total score. Factor analysis of the 20-item instrument revealed three factors, all exhibiting sex and culture differences.

Conclusions: These findings add to the body of evidence that males are higher than females in problematic internet use, as they are in addictive behaviors in general. Our findings may also imply that restrictions on male-female interaction, which are more pronounced in Saudi Arabia, may elevate the prevalence of internet addiction. The internet is also easier and cheaper to access in Saudi Arabia than in Egypt.

1. Introduction

In this study, we will compare levels of internet addiction among students in Egypt and Saudi Arabia, in order to discern what key differences between societies may impact the prevalence of internet addiction. In doing so, we will also fill a research gap, as there is very little research on internet addiction in the Middle East. Over the past twenty years, the internet has become a vital component of people's daily lives as a tool for information gathering, social interaction and communication (Kuss et al., 2014). Greater affordability and advances in digital devices (such as smartphones and wearable technologies) that

provide easier access to the internet are some of the key drivers in the rapid growth of internet users, particularly in developing countries where access was previously limited. Approximately 45 % of the global population is online, with the number of internet users growing nearly tenfold between 2006 and 2016 (Internet Live Stats, 2016). However, the increasing popularity and usage of the internet has been shown to lead to the emergence of clinical symptoms of internet addiction. Internet addiction is characterized as an impulse control disorder and is defined as the loss of control over internet use that results in an adverse impact on major life domains, such as physical health and interpersonal relationships (Young, 1998). Whilst the internet is a useful tool, it has

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also brought about a significant global health problem. Thus, an in-depth study of the etiology and epidemiology of internet addiction is necessary.

1.1. Significance of internet addiction

Over 20 years ago, in 1996, when the concept of internet addiction first arose, much of the early evidence was solely based on exploratory case studies of individuals demonstrating negative symptoms, seemingly due to the internet, often using unrepresentative samples and less than optimal diagnostic tools. Following this, Young (1996) and Griffiths (2000) were two of the early pioneers in this field of research and began to study this phenomenon empirically. The earliest empirical research study was conducted by Young (1996) who developed an eight-item questionnaire that identified individuals as dependent on the internet as well as reporting significant impairment in many areas of their lives, including health, occupational, social, and financial. As the research grew into a rapidly evolving field, psychologists highlighted the major symptoms of internet addiction as uncontrolled impulsive use, more than intended usage, intolerance of withdrawal, and impairment in decision-making ability (Ko et al., 2008). More recent research has been concerned with smartphone addiction (e.g. Aljomaa et al., 2016).

Researchers have demonstrated that internet addiction should not be taken lightly, as it has been associated with a myriad of consequences for the individual and those around them. Neuroscientific evidence has suggested that uncontrollable misuse of the internet can result in a change of structure in the developing brain (Yuan et al., 2011). Moreover, internet addiction poses a threat to academic performance (Tsit-sika et al., 2014) and subsequently is associated with destructive lifestyles, social isolation, and aggressive behaviors (Ko et al., 2008; Valkenburg et al., 2006). Therefore, it appears necessary to establish and explore a diagnosis that may prove beneficial for young people who experience similar and related problems (King et al., 2012) which this present study aims to do in its exploration of internet addiction in university students.

1.2. Prevalence of internet addiction

As the number of studies within this field grew, focus shifted to understanding individual differences in internet addiction and making sense of the psychology of those most susceptible to developing it. A major finding in the research was that compared to other sectors of society, adolescents are especially vulnerable to using the internet in an impulsive manner because of easier access and of their higher emotional instability (Kuss et al., 2014; Monacis et al., 2017). For example, Dufour et al. (2016) found that 18 % of a sample of over 3500 adolescents in Canada was classified as excessive internet users. In addition, Durkee et al. (2012) conducted a survey on a sample of approximately 12,000 adolescents from eleven European countries where their findings demonstrated a 4.4 % prevalence of internet addiction. This effect is not limited to adolescents but is also found in individuals up to the age of 25 years; numerous of studies have highlighted the danger that excessive internet use may pose to students as a group. For instance, Scherer (1997) studied 531 students at the University of Texas and found a 13 % prevalence rate for internet addiction. This population is deemed to be vulnerable and at risk given the accessibility of the internet and the flexibility of their schedules (Anderson, 1998). The prevalence of internet addiction has also been reported using an Italian sample. They found that 20 % of Italians are prone signs of pronounced internet addiction, including withdrawal symptoms (Monacis et al., 2018).

1.3. Sex difference in prevalence

In addition, sex has been highlighted as an important predictor of internet addiction. There is robust evidence that males are more likely to develop symptoms of internet addiction than females (Lam et al., 2009).

Pontes and Griffiths (2015) found that in over half the studies they found published between 2014 and 2015 there was a higher prevalence of internet addiction in males than females. This finding is shown to be consistent regardless of cultural factors. For example, Sharma et al. (2014) concluded that male students in India were more addicted to the internet than female students.

Choi et al. (2008) reached similar conclusions in their research in South Korea, and the results of a nationally representative sample study in China demonstrated that the percentage of males with internet addiction (14.8 %) was significantly higher than females (7.0 %) (Li et al., 2014) thus confirming the uniformity of sex differences in internet addiction across countries with males more likely to become addicted. It is probable that this is, to a significant degree, a reflection of the fact that males are more addiction-prone than are females more generally, though female addicts tend to have become hooked more quickly than male addicts (e.g. Kalaydjian & Merikangas, 2009). A plausible explanation for elevated addiction-proneness among males would be that age-controlled, they score lower on Conscientiousness, which is, to a great extent, impulse control (Soto et al., 2011). However, there is also evidence that females score higher than males on social media addiction specifically (e.g. Casale et al., 2018; Kircaburun et al., 2019), an issue to which we will return later. These studies have been conducted in Western countries, and there are yet very few studies about this issue in non-Western countries.

1.4. National differences in prevalence

However, general prevalence rates of internet addiction vary greatly between countries. According to Young's Internet Addiction Test (IAT), 10.7 % of adolescents in South Korea had an internet addiction (Park et al., 2008). In Italy, Poli, and Agrimi (2012) found that approximately 5 % of high school students displayed signs of problematic internet use, which was defined as scoring >50 on the IAT. Furthermore, Gamal et al. (2015) reported that 40 % of university students were classified as internet addicts based on the cut-off point of the Jordanian version of the internet addiction scale.

We conducted between June 2022 and August 2022 a literature search using EBSCO, MEDLINE, PsychINFO, CINAHL, EMBASE, PubMed, Cochrane Library, Taylor & Francis databases, Almandhumah (Arabic database) and Shamaa (another Arabic database) by entering the following search terms: (Internet addiction OR Internet abuse OR Internet problematic use OR Internet addiction scale) AND (gender differences * OR sex differences OR cultural differences) AND (prevalence of internet addiction). Our inclusion criteria were that the studies in Arabic or English, the full study available and in a peer reviewed journals and the studies were published between 2000 and 2022. Our exclusion criteria were if the subjects were aged <10 or >35 years and using another questionnaire. Some studies were deleted for not meeting the inclusion criteria. The following table clarifies the comparison between the studies.

It is clear from Table 1 that some studies found that there were no differences between males and females in Internet addiction. Some studies found differences, but they were in favor of males, while others were in favor of females. These differences can possibly be explained by the variable of different countries with different customs, traditions, and social and economic conditions. Moreover, the availability of the internet and the availability of smart devices will vary between these countries.

1.5. Prevalence in non-Western countries

Table 1 shows the results of many cross-cultural studies in the area. These studies demonstrate that internet addiction is prevalent across both Eastern and Western countries, suggesting it is becoming a global disorder. However, compared to non-Western countries, estimates of prevalence are higher in Eastern countries. Cheng and Li (2014)

Table 1
A review of studies in the area.

Study	Sample	Country	Criteria of IAT (Young, 1998a)	Results
Dufour et al., 2016	N = 3938 adolescents from grade 9–11	Canada	Two cut off points; 50/100 70/100	70+ cut off scores = 1.3 % with IA 50+ cutoff = 18 % seen to be excessive users -Boys spent significantly more time on the internet than did girls.
Maigel & Braism, 2016	N = 200 University students from Baghdad University	Iraq	Arabic Version of Young (1998a) 70/100	- The level of Internet addiction was medium by the university students. - No differences between males and females.
Gamal et al., 2015	N = 587 university students	Jordan	Scoring 50/100 = excessive internet users	-40 % excessive users
Abdullah, 2015	N = 351 adolescents, males and females	Syrian	Arabic Version of Young (1998a) 70/100	There are differences between males and females in favor of males. Males have higher degree of Internet Addiction
Tsimtsiou et al., 2015	N = 588 medical students (mean age 21y)	Greece	31/100 = excessive internet users	5.4 % prevalence rate of excessive uses
Przybylski et al., 2013	N = 4311 adolescents in Turkey (46 % male, age range 15–19 years)	Turkey	- Scoring 60/100 on the IAT = excessive internet users	- 5 % excessive users - Predictors of internet addiction: internet access at home, male gender, family income
Poli & Agrimi, 2012	N = 2533 high school students (44.3 % males, mean age = 16.4 years, SD = 1.51, range 14–21)	Italy	- Scoring 50–79/100 = moderately addicted - Scoring 80 = seriously addicted	- 5.01 % moderately and 0.79 % seriously addicted to the Internet - Higher prevalence in males
Barke et al., 2012	Total N = 1882 (online sample [n = 1041, mean age = 24.2 years, 46.7 % male] and offline student sample [n = 841, mean age = 23.5, 46.8 % male] and student sample [n = 108, mean age = 21.5,	Germany	- Scoring 70/100 on IAT = significant problems, scoring 40–69 = frequent problems	- 2 % addicted to the Internet

Table 1 (continued)

Study	Sample	Country	Criteria of IAT (Young, 1998a)	Results
Cannon et al., 2012	25.7 % male) N = 1034 students (age range = 18–27 years) in Turkey	Turkey	- Scoring >80 on IAT indicated internet addiction	- 9.7 % of the study sample addicted to the Internet - internet addiction correlated with dissociative experiences - internet addiction higher in males
Yates et al., 2012	N = 1470 college students (62.9 % female, mean age = 19.13)	USA	- Problematic internet Use (PIU) = scoring 50/100	6 % addicted - Higher levels of PIU in males and Asian students - PIU associated with low self-concept, low social support, high psychopathology, child maltreatment experiences (latter partially mediated by alexithymia)
Cao et al., 2011	N = 17,599 students (51.2 % male, mean age = 16.1, SD = 2.8 years, range = 10–24)	China (8 Cities)	- Potential problematic internet use (PIU): scores >50/100 on YIAT	- Problematic internet use prevalence 8.1 % - PIU associated with male gender, high school status, urban, Eastern and Western areas, high family economy, internet for entertainment use, loneliness motivation, and internet use frequency
Kormas et al., 2011	N = 866 randomly selected adolescents mean age = 14.7 years)	Greece	Scoring >50/100 indicates addiction	1.5 % with problematic internet use
Wang et al., 2011	N = 14,296 high school students (48.7 % males)	Guangdong Province, China	- Potential problematic Internet use: scoring >50/100 on YIAT	- 12.2 % problematic Internet users - Risk factors for PIU: study- related stress, social friends, poor relations with teachers and students, conflicts in family relations, time spent online
Liberatore et al., 2011	N = 71 adolescent outpatients (age range = 13–17 years)	Puerto Rico	scores ≥80/100 indicates addiction	11.6 % addicted
Morrison & Gore, 2010	N = 1319 UK online social network users (63 % female, mean age =	UK	- Scoring 49 considered normal, 50–79 problematic, 80–100	- 1.2 % internet addiction prevalence - internet addiction higher in males and

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Table 1 (continued)

Study	Sample	Country	Criteria of IAT (Young, 1998a)	Results
	21.24, SE = 0.11, age range = 16–51)		significantly problematic internet use	younger people, engagement in gaming, chat, and online sexual gratification
Choi et al., 2009	N = 2336 high school students (57.5 % male, mean age = 16.7, SD = 1.0 years)	South Korea	- Scoring 70 on IAT addicted, 40–69 possibly addicted	- Prevalence of internet addiction and possible Internet addiction: 2.5 % and 53.7 % for boys, and 1.9 % and 38.9 % for girls - Internet addicts more likely to be male, drink more alcohol, have poor health condition, experience EDS 10.7 % addicted
Park et al., 2008	N = 903 middle and high school students (60.5 % middle school seniors, 39.5 % high school students (12.4 % freshman, 27.1 % juniors)) randomly selected	South Korea	Modified Young's Internet Addiction Test (IAT) (1998), scoring ≥ 70 indicates addiction	
Whang et al., 2003	N = 13,588 Internet users (7878 males, mean age = 26.74, age range = 20–40 years)	Korea	- internet addiction classification when scoring $>60/80$ on IAT, scoring 50–60	- 3.5 % internet addicts, 18.4 % possible internet addicts

provided empirical support for this conclusion in their meta-analysis, where they found 164 internet addiction prevalence rates published across 80 studies from 31 nations across seven world regions. The results indicated a global prevalence of internet addiction of 6 %, with the highest rates found in the Middle East (10.9 %) and lowest rates found in Europe (2.6 %). Tran et al. (2017) suggested that Eastern peoples' addiction to the internet is a result of conflicts between their collectivist cultures and individual identity formation. Online activities can provide an escapism method and an opportunity to avoid their real world problems (Davis, 2001).

Further research has highlighted other risk factors that are more prevalent in the East such as poor social support that may result in people seeking close contact with others online (Tsai et al., 2009). Internet addiction is particularly high in parts of the Arab world. This, indeed, is consistent with other evidence of addictive behavior in this region. It has been found that 45 % of men in Yemen were smokers in 2008, despite the harmful effects being widely known, and, in general in the Middle East, around 40 % of men smoke (Weglicki et al., 2008), compared to 19 % of men in the UK in 2015 (Office for National Statistics, 2017). Mindful of the comorbidity of addictions (see Kalaydjian & Merikangas, 2009), it would seem reasonable to expect that, at least in areas with substantial internet availability, internet addiction would be higher in Middle Eastern countries than in Europe and this is evidently so, albeit based on relatively limited data for the Middle East.

Previous research has also demonstrated differences in internet addiction prevalence for age, sex and region. Nevertheless, although a significant amount of research has been conducted in Far Eastern countries, such as China, Korea and Hong Kong, one important region where data has been limited is the Middle East (Chen & Nath, 2016). It is therefore difficult to compare internet addiction prevalence and characteristics across different cultures. Cultural differences can affect how internet addiction is diagnosed or treated in different countries, and given its debilitating effects it is key to identify any cultural differences in order to generate appropriate treatment methods.

1.6. Comparing students in Saudi Arabia and Egypt: objectives

The purpose of the present study is to contribute to this knowledge in by assessing the prevalence of internet addiction in university students in both Egypt and Saudi Arabia and to compare to the two with a view to discerning which factors might lead to any difference in prevalence. The students were at Egypt's Menoufia University and at King Saud University in Riyadh in Saudi Arabia. As of 2016, 64 % of the population in Saudi Arabia and 33 % in Egypt were internet users (Internet Live Stats, 2016). Given the high levels of broadband availability in both countries, there is no doubt that internet addiction is becoming increasingly problematic among young Arabs. Yet, as already noted, research on internet addiction in this part of the world is scarce, and the few studies that have been conducted have focused samples of only middle school or secondary school students (Al-Hantoushi & Al-Abdullateef, 2014; Bafakih et al., 2016).

1.7. Hypotheses

Our hypotheses are that: (i) Saudi Arabian students are higher in internet addiction than Egyptian students and that: (ii) Males are higher in internet addiction than females. The second hypothesis is reasonable based on the findings already summarized that males have been found to have higher levels of internet addiction in many countries and that they appear, cross-culturally, to be more addiction-prone than females.

As for the first hypothesis, there are, it should be noted, substantial cultural differences between Saudi Arabia and Egypt. Firstly, perhaps because Saudi Arabia is a wealthier country, Saudi students have a greater opportunity to access the internet and so become addicted to it. At Saudi universities, internet access is free for educational and also entertainment purposes. In Egypt, a large number of university students do not have smart phones. At Egyptian universities, by contrast, free use of the internet is far more limited. There is greater time flexibility in schedules within Saudi universities (credit hours), which allows students a large interval between lectures, something which may make them use the internet to a greater extent. Secondly, there is, in many ways, a greater need to use the internet in Saudi Arabia. Compared to Saudi Arabia, Egypt can be understood as a society that is rather influenced by Western mores, one in which, at least in the cities, non-related males and females can intermingle and form relationships, although far from as freely as in the West (El Feki, 2013). By contrast, Saudi Arabia is a Wahhabi society, with Wahhabism being a particularly strict interpretation of Islam. It is illegal for unrelated people of the opposite sex to socialize in Saudi Arabia (Commins, 2015). There is a degree to which the internet allows these laws and customs to be obviated – causing it, indeed, to be associated with particularly enjoyable and satisfying experiences - so we would expect the internet to be employed to a greater extent, leading to a higher prevalence of internet addiction among Saudi students.

2. Method

2.1. Research design

We applied a cross-sectional design, comparing both males and

females, and Egyptian and Saudi Arabian students on ratings of Young's Internet Addiction Test.

2.2. Participants

Overall, there were 817 participants from Saudi and Egyptian universities. From Saudi Arabia 374 students from different disciplines and levels of study participated, 181 male and 194 female. They were aged 18 to 35 years with an average age of 21.20 and a standard deviation of 1.91 years. The Egyptian sample was similar in composition, and consisted of 443 students, 210 male and 233 female. They were aged 18 to 33 years with an average of 20.09 and a standard deviation of 1.05. The age of the female samples ranged from 19 to 35 years old with a mean of 20.17 (SD = 1.082), and the age range of male samples was between 18 and 32 years with a mean of 20.02 (SD = 1.013). Students were randomly recruited from several Saudi and Egyptian universities. The IAT questionnaire was implemented in Google Forms, and was administered to students within their regular course participation. Participation was voluntary, while they were strongly encouraged to fill out the scale. Specifically, we obtained a list of all teachers in these universities, and contacted randomly selected teachers until a large enough number of students had responded. After explaining the objectives of the study, the students provided a written consent, and were told that they could withdraw at any time.

2.3. Instrument

Young's *Internet Addiction Test* (Young, 1996) is a 20-item instrument designed to identify problematic behaviors associated with internet use. Each item is rated on a five-point Likert scale, starting from rarely/never = 1, to always = 5, meaning that the total score ranges from 20 to 100. According to Young and Nabuco de Abreu (2017, p. 133) a score in the range 0–30 is normal, and 31–49 characterizes mild, 50–79 moderate, and 80–100 severe addictive behaviors. This instrument was translated into Standard Arabic by a university professor specializing in curricula and methods of teaching English and was then back-translated into English by another specialist, then it was reviewed by a professor specialized in psychology, in order to verify the conformity of the two English versions. The final Arabic version was examined and approved by five psychology professors. There was no need to transfer the translation into the local Egyptian Arabic, since the target study sample was university students, who are fluent in Standard Arabic. The scale has been used in several Arab countries and has been shown to have acceptable levels of validity and reliability. In the present study, Cronbach's alpha coefficient was 0.76 for the scale as a whole and ranged from 0.71 to 0.83 for the sub-dimensions.

2.3.1. Instrument development and validation

Factor analyses have come to quite different results regarding the possible factor structure underlying the 20 items. Some studies have found a single factor to fit the data well (Hawi, 2013; Khazaal et al., 2008), one found two factors (Faraci et al., 2013), and one three (Chang & Man Law, 2008). Some have reported as many as six factors (Ferraro et al., 2007; Widyanto & McMurrin, 2004), but their item structures were quite different, which might be related to small samples of 236 and 86, respectively. Using a larger sample, we must remain open to the emerging factor structure in our Arabic-speaking sample. Faraci et al. (2007) and Chang and Man Law (2008) named their factors differently, but the item structure largely overlaps. Specifically, 7 out of the 9 items that form Chang and Man Law's 10 *Withdrawal, and Social Problems* overlap with Faraci et al.'s *Emotional and Cognitive Preoccupation with the Internet*, and 4 out of the 7 items that form Faraci et al.'s *Loss of Control and Interference with Daily Life* overlap with Chang and Man Law's *Time Management and Performance*. The overlap had likely been larger if items had not been excluded to improve the model fit, namely items 8 and 17 in Faraci et al. and 7 and 11 in Chang and Man Law. Due to these

inconsistencies, and because we are here concerned with group differences rather than factor structure per se, we will retain all items in our analysis.

2.4. Procedure

Egyptian students were tested in 2021 whilst Saudi students were tested during the second semester in 2021/2022. As participants were anonymous and the study was not considered to contain sensitive questions, it did not require ethical approval from an institutional review board. However, we obtained approval from each of the colleges in which the study was conducted.

3. Results

The results are broadly in line with our hypotheses: male display higher levels of internet addiction, as do Saudis over Egyptians. First, we consider the total sum of all items, which was the metric devised in the original edition of the scale. As seen in Table 2, all groups exhibit mildly addictive internet behaviors, except the Egyptian females, who are in the normal range below 30. It is also evident that there are large differences between the groups, with Saudis and males having higher IAT scores, just as we hypothesized. Both these were medium size effects, with a Cohen's *d* of 0.47 for Sex and 0.46 for Country.

Table 2 shows the means and SDs as well as the results of two-way (2 Sex × 2 Country) ANOVAs for each of the subscales. All exhibited statistically significant effects of both Country and Sex, as we hypothesized, except for Country upon *Reality Substitute*, with higher scores for Saudis and males, as illustrated in Fig. 1. Effect sizes (Cohen's *d*) were 0.45, 0.33, and 0.45 for sex and 0.46, 0.55, and 0.02 for Country. None of the Sex × Country interactions were statistically significant.

Gaging the cultural appropriateness of the scales, we assessed invariance by comparing inter-scale correlations for the two cultural groups taken separately in Table 3, and also separately for each sex.

Note. Male sex is the upper right diagonal and female sex is the lower left diagonal.

It is clear from Table 3 that the correlations are quite similar across countries, except for Time Management and Performance and Reality Substitute for the females. The correlations between Reality Substitute and the other subscales were lower by about 0.15–0.20 for Egyptian females, whereas they were essentially the same across countries for the males.

3.1. Exploratory factor analysis

Next, we consider which subscales of the IAT that are reasonable. A number of exploratory factor analyses were performed for both samples together and separately, as well as for two random split-half subsets. They generally identified three but sometimes four factors with Eigenvalues above 1.0, but in all cases was the fourth and smallest factor hard to interpret, and the items with the highest loadings differed between the subsamples in an arbitrary fashion. The largest three factors could generally be given the same interpretation, even though the specific items differed somewhat across subsamples. Given also that previous studies found two and three, but not four factors to yield satisfactory models, we forced the final analysis to a maximum of three factors, yielding principal component extraction Eigenvalues of 7.37, 1.36, and 1.08. Table 3 lists the factor loadings of this model after varimax normalized rotation, which accounted for nearly half of the variance. The first factor is very similar to those previously identified, sharing 8 out of 9 items with the 11 items that formed *Emotional and Cognitive Preoccupation with the Internet* (Faraci et al., 2013) and 6 items with the 9 items that formed *Withdrawal and Social Problems* (Chang & Man Law, 2008). This is also true of the second factor, sharing 6 out of 7 items with the 7 items that formed *Loss of Control and Interference with Daily Life* (Faraci et al., 2013) and sharing 6 out of 7 items with the 6 items that

Table 2
Factor structure of Young's 20-item Internet Addiction Test scale.

Item number	Item text	Factor		
		Withdrawal	Time management	Reality substitute
15	How often do you feel preoccupied with the Internet when off-line, or fantasize about being on-line?	0.72	0.22	0.13
20	How often do you feel depressed, moody or nervous when you are off-line, which goes away once you are back on-line?	0.70	0.19	0.24
19	How often do you choose to spend more time on-line over going out with others?	0.65	0.10	0.30
13	How often do you snap, yell, or act annoyed if someone bothers you while you are on-line?	0.65	0.22	0.13
18	How often do you try to hide how long you've been on-line?	0.61	0.30	0.09
12	How often do you fear that life without the Internet would be boring, empty, and joyless?	0.60	0.26	0.09
14	How often do you lose sleep due to late-night log-ins?	0.57	0.49	-0.06
11	How often do you find yourself anticipating when you will go on-line again?	0.49	0.32	0.40
9	How often do you become defensive or secretive when anyone asks you what you do on-line?	0.50	0.22	0.16
2	How often do you neglect household chores to spend more time on-line?	0.21	0.76	0.10
6	How often do your grades or school work suffers because of the amount of time you spend on-line?	0.23	0.73	0.18
1	How often do you find that you stay on-line longer than you intended?	0.14	0.66	-0.01
8	How often does your job performance or productivity suffer because of the Internet?	0.20	0.65	0.30
17	How often do you try to cut down the amount of time you spend on-line and fail?	0.32	0.56	0.13
5	How often do others in your life complain to you about the amount of time you spend on-line?	0.25	0.49	0.40
16	How often do you find yourself saying "just a few more minutes" when on-line?	0.42	0.46	0.22
7	How often do you check your email before something else that you need to do?	0.02	0.17	0.71

Table 2 (continued)

Item number	Item text	Factor		
		Withdrawal	Time management	Reality substitute
4	How often do you form new relationships with fellow on-line users?	0.19	0.06	0.63
10	How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?	0.45	0.01	0.47
3	How often do you prefer the excitement of the Internet to intimacy with your partner?	0.40	0.24	0.45
	Eigenvalue	4.23	3.51	2.08
	Percentage of total variance	21.21	17.54	10.39
	Cumulative variance	21.21	38.75	49.14

formed *Time Management and Performance* (Chang & Man Law, 2008). We label the third factor *Reality Substitute*, like Chang and Man Law, noting that this interpretation is more apt for our data than theirs, and that they share only 1 out of 4 items. Thus, adhering to previous labels, we call our factors *Withdrawal and Social Problems*, *Time Management and Performance*, and *Reality Substitute*. To not capitalize on arbitrary distribution of error variance in the factor analysis, we computed the corresponding subscales as the means of the items marked in bold in Table 4.

4. Discussion

This study investigated sex and culture differences in two equivalent samples in two Arabic speaking countries. It showed relatively high rates of addiction as well as both sex and cultural differences. There are many reasons to expect culture differences in the use of the internet. The first, as we have noted, is availability. There are significant regional differences in the availability of the internet and of particular internet functions. Some countries began to use the internet earlier. Some have the infrastructure to better support it and others not. Further the cost of buying the technology differs greatly from one country to another. Saudi Arabia has greater internet access, especially among students, than Egypt, partly explaining the accuracy of our second hypothesis. Moreover, many university students in Egypt do not have smartphones. They use mobile phones without internet. The cost of internet use compared to income in Egypt is higher than it is in Saudi Arabia.

The second issue is social control. Most Arab speaking countries are more restrictive than Western countries on intersex social interaction. There are often strict conventions and rules with respect to whether and how young, unmarried and unrelated people can interact face-to-face. The internet can provide a very attractive and easy way to communicate with people of different groups and sexes, perhaps "in secret." It may provide the only way to communicate in certain instances, which means it may be more addictive. In that social control in Saudi Arabia is so much more pronounced than in Egypt it, again, makes sense that internet addiction in Saudi Arabia would be higher, as we have found. This is potentially important in terms of the implications it may have for public policy. In terms of the social implications of our findings, they can be understood to imply an unhealthy use of the internet will develop where, firstly, the internet is widely available, and, secondly, where it is difficult to socialize in the same satisfactory way via other means. Thus, in a sense, the combination of widespread internet access when together with a highly regulated and restricted social culture becomes a recipe for the development of internet addiction. This finding is highly germane even to Western countries, especially as they become increasingly multicultural and play host to a growing population that coming from

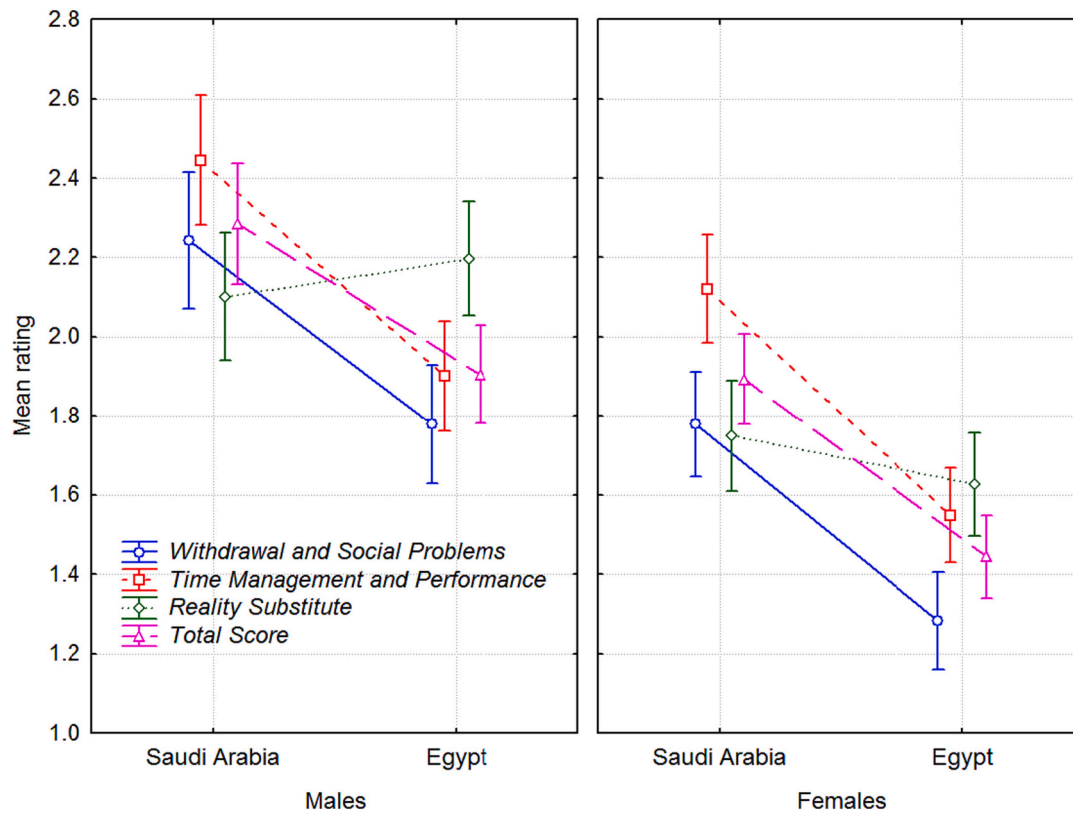


Fig. 1. Mean ratings for the four scales, as a function of Sex and Country. Error bars depict 0.95 % confidence intervals.

Table 3

Means (M), standard deviations (SD), and ANOVA results for the four different metrics from the IAT, separately for Country and Sex. Total score is computed as the sum of ratings on all items, and the other three scales as the mean across the selected items. Parametric effect sizes are partial η^2 .

Subscale	Saudi Arabia				Egypt				Country		Sex			Country x Sex interaction		
	Male		Female		Male		Female		F	p	η^2	F	p	η^2	F	p
	M	SD	M	SD	M	SD	M	SD								
Total Score	45.7	20.8	37.9	16.2	38.1	18.4	28.9	16.1	43.65	*	0.054	48.21	*	0.057	0.300	0.585
Withdrawal and Social Problems	2.24	1.17	1.78	0.93	1.77	1.10	1.28	0.95	43.40	*	0.053	43.28	*	0.053	0.05	0.819
Time Management and Performance	2.44	1.11	2.12	0.96	1.90	1.02	1.55	0.92	63.14	*	0.077	23.2	*	0.028	0.038	0.840
Reality Substitute	2.10	1.09	1.75	0.98	2.20	1.05	1.62	1.00	0.039	0.84	<0.0001	40.2	*	0.049	2.290	0.130
N	181		193		210		233									

* $p < .000005$.

Table 4

Correlations between IAT scales separately for each country and sex.

		Saudi Arabia				Egypt			
		1	2	3	4	1	2	3	4
1	Total Score	1	0.92	0.85	0.72	1	0.91	0.85	0.71
2	Withdrawal and Social Problems	0.95	1	0.64	0.57	0.93	1	0.62	0.52
3	Time Management and Performance	0.91	0.76	1	0.45	0.85	0.67	1	0.46
4	Reality Substitute	0.86	0.75	0.71	1	0.72	0.57	0.46	1

Note. Inter-scale correlations for each country and sex are provided to assess the consistency and invariance of the scales. Lower left diagonal represents males and upper right diagonal represents females.

Arabic and African countries, including Arabs from Asia and Africa. The fact that the wide availability of the internet appears to heighten addiction is a relevant finding to Western researchers due to the cheapness and ubiquity of the internet in the West. It is, potentially, another data point in favor of restricting internet use, especially among the very young who may easily become addicted.

Future research could follow this up by looking at internet addiction in relatively isolated and sparsely populated areas of Western countries where, especially in the winter, face-to-face socializing can be potentially problematic. We might expect to find elevated levels of internet addiction in such regions, such as northern Finland or northern Norway. Interestingly, we might also expect to find it among political or other

lifestyle or sexual minorities for whom openly meeting might raise certain dangers. These would be fascinating areas for future research.

This study has also shown, as have many others, that males tend to be more internet addicted than females. As we have already noted, this appears to be something of a universal and it is paralleled by the way in which males are more-prone to addiction in general than are females, so our study simply adds to this body of research. This finding is highly germane even to Western countries, especially as they become increasingly multicultural and play host to a growing population that coming from Arabic and African countries, including Arabs from Asia and Africa. The fact that the wide availability of the internet appears to heighten addiction is a relevant finding to Western researchers due to the cheapness and ubiquity of the internet in the West. It is, potentially, another data point in favor of restricting internet use, especially among the very young who may easily become addicted.

As Western workplaces, therefore, become more centered around the internet – allowing people to work from home online and expecting people to be online, via their smart phones, when they are coming to and from work and even well into the evening when they are theoretically in their free time – this might be predicted to be especially detrimental to the health of males, as they are more likely to become addicted. However, there may be a cultural element to our finding of higher male, compared to female, internet addiction in Saudi Arabia. As we have already observed, Saudi Arabia is a strictly religious society. The behavior of females tends to be more strongly monitored and restricted the more religious a society is, as females are often considered to embody the family's religious honor and purity; religious codes tending to restrict females to a greater extent than males (Sela et al., 2015). This would extend to greater monitoring of females' use of the internet, reducing time spent on it and rendering time spent on it less pleasurable and so less addictive. To a lesser extent, this may also be true in Egypt. Future research should empirically test these hypotheses.

As we noted above, however, one noteworthy finding in this regard is that though internet addiction is higher among males, social media addiction is higher among females. Again, in terms of the international significance of our findings, this adds to the argument that this difference, found in Western and Arab countries despite the cultural differences between the two, is likely to relate to innate sex differences. This superficial contradiction actually makes a great deal of sense. Males are, on average, lower in impulse control than females meaning that they are more prone to addiction in general. However, females are, on average, more pro-social than males: they are higher in Agreeableness and in Extraversion traits (see Nettle, 2007). Thus, we would expect females to be much more attracted to social media, resulting in them becoming more addicted to it despite having higher average impulse control than males. It might be argued, therefore, that the entire concept of 'internet addiction' is misleading and that we need to distinguish between addiction to different elements of the internet, such as social media or news, and different means of using the internet, such as smart phones as being especially addictive, which they are, in particular, to females (Albursan et al., 2019). It is true that these distinctions should be made, but it is widely understood what is meant by 'internet addiction,' it is a widely employed term in the literature, and is not uncommon to find intra-group differences in general addiction to a substance and in addiction to a specific sub-category of that substance. Nevertheless, future studies of internet addiction should be mindful of these subtle sex differences.

In terms of psychometric qualities, the results suggest that three factors is the most one can extract, if they are to be interpretable and reasonably consistent across different subsamples. In considering limitations, our samples were closely matched on age and occupation, but there might be other differences such as income which may in part account for the differences observed. The selection of participants constituted a convenience sample rather than a representative random sample. The study is based on self-report, which has a number of limitations including dissimulation and self-deception. Previous studies

have almost exclusively also used self-report scales of internet and social media (e.g., Monacis et al., 2018). It is possible that peer-evaluation or some other combination of methods might attain a more nuanced result. Nevertheless, our findings are overall congruous with those which have been found elsewhere. Also, a cross-sectional design like the present study does not necessarily indicate causality: that the internet causes negative behaviors. It is just as likely that such people are simply prone to addiction and that internet use is, due to its prevalence and nature, easy to become addicted to.

Declaration of competing interest

All authors declare that they have no conflict of interest.

Data availability

Data will be made available on request.

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