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# Oppositional defiant disorder, internet gaming disorder, and suicidal ideation among Saudi adolescents: a moderated mediation model of gender and self-control

Mogeda El Sayed El Keshky<sup>1,2\*</sup>

## Abstract

**Background** Many psychological changes occur during adolescence, as well as, for some, behavioral disorders. Two such deviant behaviors are internet gaming disorder and oppositional defiant disorder. Prior research has documented the relationships between oppositional defiant disorder and internet gaming addiction with suicidal ideation among adolescents, but none has studied the potential mediating role of self-control nor the moderation role of gender.

**Objective** This study investigated the relationships between oppositional defiant disorder, internet gaming disorder, and suicidal ideation, and applied a moderated mediation model including the roles of gender and self-control.

**Method** 273 adolescents (mean age = 15.47, 57% females) participated in the study. Respondents completed the Suicidal Ideation Scale; the Internet Gaming Disorder Scale, Short Form; the Oppositional Defiant Scale; and the Self-Control Scale; as well as a set of socio-demographic questions. A moderated mediation model was applied using the PROCESS software package.

**Results** Oppositional defiant disorder and internet addiction were positively related with suicidal ideation ( $\beta = 0.89$ ,  $p < 0.001$  and  $\beta = 0.31$ ,  $p < 0.001$ , respectively). Self-control was found to mediate these relationships ( $\beta_{\text{ind}} = 0.10$ ,  $CI = 0.03$  to  $0.18$  for the oppositional defiant disorder–suicidal ideation relationship) and ( $\beta_{\text{ind}} = 0.19$ ,  $CI = 0.12$  to  $0.26$  for internet gaming disorder–suicidal ideation relationship). Further, it was found that these relationships were stronger in females compared to males.

**Conclusions** Efforts to reduce suicidal ideation among adolescents with defiant behaviors and gaming disorder should be directed at enhancing their self-control and should be gender mindful.

**Keywords** Oppositional defiant disorder, Internet gaming disorder, Self-control, Suicidal ideation, Adolescents, Saudi Arabia

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## Background

Every 40 s someone dies by suicide somewhere in the world, and there are countless unknown suicide attempts [1]. Suicide is a major public health problem worldwide [2] as evidenced by 703,000 such deaths each year [3]. And for every death by suicide, it is believed that around 135 persons are directly or indirectly affected and may require health care services [4].

Studies have demonstrated that suicidal ideation precedes suicide plan, attempt, and behavior [5, 6]. Among all predictors of suicide, suicidal ideation is thought to be the biggest predictor of a subsequent suicidal event [7]. Klonsky et al. asserted that intervention should focus on prevention of ideation, rather than on the transition to much more serious suicidal behaviors [8]. Prior research has examined behavioral and psychological factors leading to suicidal ideation among Saudi adolescents [9, 10]. Nonetheless, little research has investigated multiple behavioral and psychological factors simultaneously, which might unveil mediating pathways and moderating mechanisms of such relationships during adolescence.

Adolescence is a period during which one may be more susceptible to suicide. A survey by Avenevoli and colleagues reported that 16% of students between the grades of nine and twelve had thought seriously of committing suicide, and 8% had attempted suicide in the previous 12 months [11]. Studies focusing on adolescence and young adulthood have shown that suicide was related to oppositional defiant disorder and internet gaming disorder or internet addiction, among other factors [12–14]. A study from Saudi Arabia concluded that around 19% of the surveyed adolescents were symptomatic of internet gaming disorder and that it was related to symptoms of depression and anxiety [10]. Another study found in a sample of Saudi school students that oppositional defiant disorder was apparent and was related to other psychiatric problems [15]. A study conducted among Saudi fathers and mothers regarding their children aged between 4 and 17 revealed that around 20% reported that their children had emotional and behavioral problems [16]. It is, therefore, important to investigate psychological protective mechanisms for children and adolescents, particularly because little research has addressed protective factors in this population in Saudi Arabia.

It has been argued that self-control is a protective factor for suicidal ideation [17], but to date no study has investigated the mediation role of self-control in the relationships between oppositional defiant disorder, internet gaming disorders, and suicidal ideation. Further, gender differences have been reported in the incidence of suicidal ideation [18], but no prior study has examined an interaction with gender among Saudi adolescents. Therefore, the purpose of this study was to investigate the relationships among oppositional defiant disorder, internet

gaming disorder, and suicidal ideation, and to test a moderated mediation model of gender and self-control among Saudi adolescents.

### Oppositional defiant disorder and suicidal ideation

Oppositional defiant disorder (ODD) is typically a childhood disorder whose characteristics include persistent defiant and antagonistic behavior, irritability, anger, and argumentativeness [19, 20]. A meta-analysis that examined ODD among samples around the world reported that around 3.3% of children and adolescents had symptoms of the disorder [21]. A systematic review by Boylan et al. reported much higher estimates, a prevalence of ODD in between 28% and 65% of children [22]. When ODD is not treated in early childhood, it may be a predictor of behavioral and psychological issues during adolescence [23, 24]. Oppositional defiant disorder has been associated with social impairment, problematic interaction with others even online, and conflict with authority figures. Researchers have reported that the irritability nature of ODD was related to suicidal ideation among detained teen offenders [25]. Prior research has also found that among children with ADHD, ODD was related to suicidal ideation [26]. Thus, overall, individuals with ODD encounter various challenges in their lives [27] which may lead to suicidal ideation. Thus, the first hypothesis for our study is as follows:

**H1** Oppositional defiant disorder is positively related to suicidal ideation.

### Internet gaming disorder and suicidal ideation

Internet gaming disorder (IGD) can be described as pathologically excessive involvement in computer games on the internet. Previous studies have found that the more general notion of internet addiction was related to suicidal ideation [28–30]. Other studies have demonstrated that people with higher IGD symptomology have higher chances of thinking about suicide than their counterparts [31]. Junus et al. [32] found that adolescents exhibiting IGD had higher lifetime suicide attempts as compared to their counterparts. Cheng et al. [31] carried out a meta-analysis of 15 studies and concluded that those who were addicted to internet gaming had higher chances of experiencing suicidal ideation. A systematic literature review of 12 studies by Erevik et al. [33] also found a positive relationship between problem gaming and suicidal ideation and/or attempts. Thus, our second study hypothesis:

**H2** Internet gaming disorder is positively related to suicidal ideation.

### The mediation role of self-control

Self-control can be defined as “the ability to change or override one’s inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them” [34, p. 274]. Tangney et al. [34] developed the Self-Control Scale after reviewing previous studies. This measure encompasses many spheres of self-control, including impulse control, emotional control, control over thoughts, habit breaking, and performance regulation. Using this measure in a study [34], these researchers found that higher scores correlated with academic success, higher self-esteem, better relationships and interpersonal skills, and other positive emotional responses. Other researchers have found similar correlations between self-control and psychological well-being and better life outcomes [35–38]. Prior studies have also reported that people with increased self-control experience lower levels of depression [36], and, conversely, adolescents with low self-control reported increased depression [37].

Other research has revealed that high self-control was related to reduced levels of internet gaming disorder [39]. Pour et al. found in a sample of male students a negative association between self-control and oppositional defiant disorders [40]. Adolescents with better self-control, as a quality that helps one choose to engage in desired behaviors and refrain from undesired behaviors [38] may be better able to choose not to overindulge in gaming behaviors and are less likely to exhibit oppositional defiant behaviors, which may reduce their chances of experiencing suicidal thoughts. Indeed, Martin and colleagues [17] found that self-control was negatively related to suicidal ideation.

Mediation effects of self-control have also been documented. Low self-control was found to mediate the relationship between inattention and internet gaming disorder [41]. In a study conducted during the COVID-19 lockdown when individuals’ activity levels were decreased, it was reported that self-control mediated the relationship between self-efficacy and physical activity among college students [42]. Guo et al. [38] found that self-control mediated the relationship between social isolation and internet gaming disorder. In a study conducted among deaf children, it was found that self-control mediated the relationship between psychological function and oppositional defiant disorder [43]. Based on this evidence, we hypothesized that self-control would mediate the association between internet gaming disorder and oppositional defiant disorder and suicidal ideation.

**H3** Self-control mediates the association between oppositional defiant disorder and suicidal ideation.

**H4** Self-control mediates the association between internet gaming disorder and suicidal ideation.

### The moderation role of gender

Empirical evidence indicates gender differences in the occurrence of suicidal ideation. Blum et al. [44] and Peltzer and Pengpid [45] found that females were more likely to have higher rates of suicidal ideation. A meta-analytic study [46] that involved 67 longitudinal studies concluded that female adolescents had higher numbers of suicide attempts, while males exhibited higher chances of suicide deaths. This is known as the gender paradox in suicidal rates [47]. Previous research also showed gender differences with regard to self-control: females had higher self-control than males, as well as less delinquent behavior [48, 49]. On the other hand, males adolescents were found to have higher oppositional defiant behaviors and excessive gaming behaviors [50–52]. The mechanisms underlying these gender differences may be found in differences in emotional and behavioral problems [53]. Suicidality in male adolescents may be explained by the externalizing behaviors prevalent in males, including deviant behaviors and conduct disorders [54], while female adolescents are more vulnerable to internalizing behaviors [55]. Given these gender differences, one might expect the relationships between ODD, IGD, and suicidal ideation to be different in females and in males.

Thus, two additional hypotheses for our research and a model (Fig. 1) of the variables and hypotheses guiding our work:

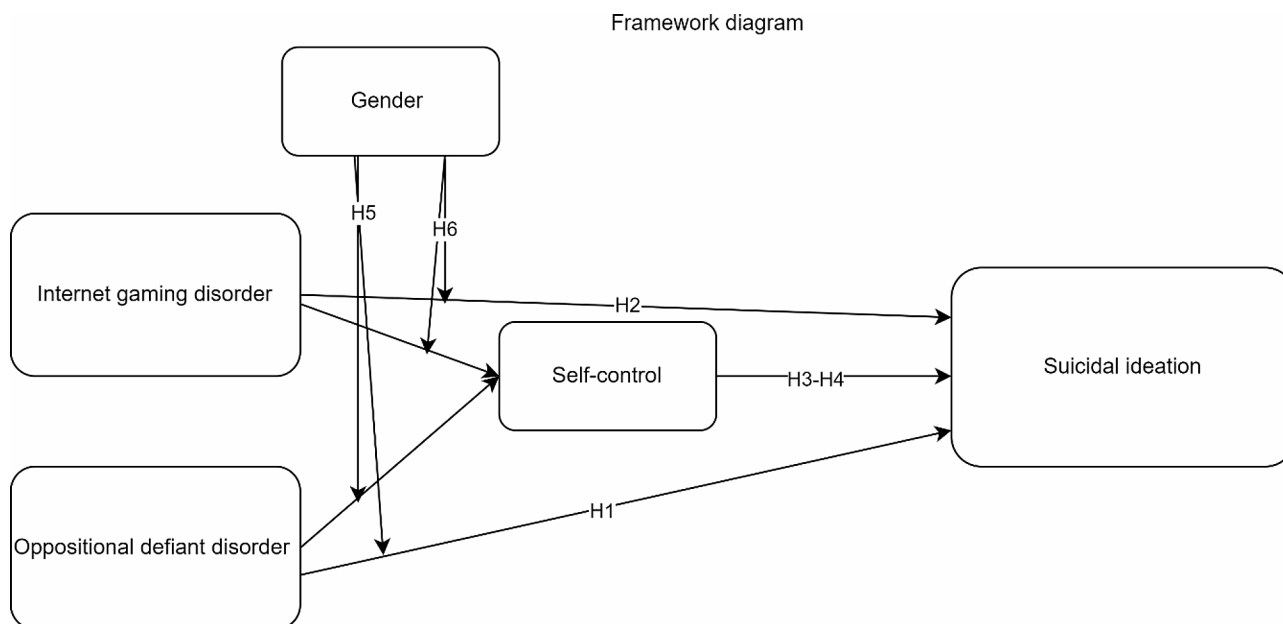
**H5** Gender moderates the mediation of self-control between oppositional defiant disorder and suicidal ideation.

**H6** Gender moderates the mediation of self-control between internet gaming disorder and suicidal ideation.

## Methods

### Participants

This study adopted a cross-sectional design and convenience sampling in order to reach as many and diverse participants as possible. Permission to conduct this study was obtained from King AbdulAziz University. A link to the questionnaire was sent to respondents via email and social media. The email addresses of potential respondents were obtained through universities and they were asked to share the questionnaire with their peers and friends aged 12 to 19 via any type of social media. At the beginning of the questionnaire, there was a specific request of those under the age of 18 to show the questionnaire to their parents and obtain their permission to participate. The questionnaire also asked, “Did you ask



**Fig. 1** Framework diagram of the relationships

permission from your parents?” and those under 18 who answered “no” were removed from the study.

550 participants returned the survey. A total of 277 respondents were removed from the study, 153 because of substantial missing data and 124 because they were under 18 and did not obtain parental permission. All 273 remaining participants were Saudis. The mean age was 15.47 ( $SD=2.65$ , range=12–19). Around 57% were female, 39.2% were middle school students, 35.6% were high school students, and 25.3% were college students. Regarding their parent’s education, 15% had mothers with less than high school education, 18.9% of the mothers had high school education, 50.3% had a university degree, and 15.8% possessed a postgraduate degree. Around 13.2% had fathers with less than high school education, 19.5% had high school education, 49.1% had a university degree, and 18.2% had fathers with a postgraduate degree.

### Instruments

The measures used in this study were the Suicidal Ideation Scale [56], the Internet Gaming Disorder Scale, Short Form [57], the Oppositional Defiant Scale [27], and the Self-Control Scale [34]. The questionnaire also included demographic questions about the participants.

### The suicidal ideation scale

The Suicidal Ideation Scale [56] is a brief measure with 10 items scored on a five-point Likert scale ranging between 1 (never or none of the time) and 5 (always or a great many times). Possible total scores range between 10 and 50, where higher scores indicate a greater level of suicidal

ideation. This scale has demonstrated good psychometric properties [58]. In this study, the internal consistency reliability was good (Cronbach’s  $\alpha=0.94$ ).

### The internet gaming disorder scale, short form

The Internet Gaming Disorder Scale, Short Form [57] is a brief instrument that assesses addiction to internet gaming. The scale consists of nine items scored on five-point Likert scale between 1 (never) and 5 (very often). Possible total scores range between 9 and 45, where higher scores indicate greater severity of IGD. This scale was translated to Arabic and validated in Saudi Arabia by the authors and yielded good validity and reliability in this population [59]. In this study, the internal consistency reliability was good (Cronbach’s  $\alpha=0.87$ ).

### The oppositional defiant scale

The Oppositional Defiant Scale [27] is a brief measure consisting of eight questions that ask respondents how frequently they experienced specific symptoms. Examples are: “how often do you lose your temper?” and “how often do you defy or refuse to comply with rules and requests from people in authority?” [27]. The scale is scored on a five-point Likert scale ranging between 1 (never) and 5 (very often). Possible total scores range between 8 and 40, where higher scores indicate higher intensity of oppositional defiant behavior. The internal consistency reliability was good in this study (Cronbach’s  $\alpha=0.80$ ).

### The self-control scale

Self-control was measured using the brief version of the Self-Control Scale [34]. The scale consists of 13 items that measure the degree of one's self-control. It is scored on a five-point Likert scale ranging between 1 (not at all) and 5 (very much). Some of the items are negatively worded and are reversely scored. Possible total scores range between 13 and 65, where higher scores indicate greater self-control. The internal consistency reliability in this study was fairly good (Cronbach's alpha=0.72).

### Data analysis

All data analyses were carried out using RStudio statistical software [60]. The first phase consisted of descriptive statistics and Pearson correlations analyses. The second phase consisted of internal consistency reliabilities for the scales using the "psych" software package [61]. The third phase consisted of the mediation model and the moderated mediated model using the "PROCESS" macro software package developed by Hayes [62]. For the mediation analysis, the model 4 of the PROCESS macro was preferred, and for the moderated mediation analysis, the model 8 was preferred. 95% confidence intervals with 10,000 bootstrap samples were set during analysis. 95% confidence intervals that do not contain 0 are significant and indicate significant conditional indirect effects. In PROCESS [62], variables that are part of the product terms are centered in order to set conditional effects for different levels of the moderator variable.

### Translation process and pilot study

The measures were translated from English to Arabic following WHO recommendations [63]. Two independent translators forward translated the scale. Next, an expert panel back-translated the scale from the new Arabic version to English. These experts were university professors who had experience in scale translations. The versions were compared and the translation was refined. The process iterated until consensus was achieved. The final Arabic version was sent to 75 students in a pilot study to check the understandability and conciseness of the items. The results indicated that the scale was suitable to be used in the main study. The validity of the scale was further assessed by a panel of five experts who rated the scale and agreed on all the items ( $k=0.85$ ).

## Results

### Descriptive statistics

The descriptive statistics and Pearson correlation coefficients are displayed in Table 1. The mean scores were 15.92 (SD=8.75, range 10–50) for suicidal ideation, 15.92 (SD=4.50, range 8–40) for ODD, 16.97 (SD=7.06, range 9–45) for IGD, and 41.72 (SD=7.27, range 13–65) for self-control. As expected, suicidal ideation was positively correlated with ODD ( $r=0.48, p<0.001$ ), positively correlated with IGD ( $r=0.25, p<0.001$ ), and negatively correlated with self-control ( $r = -0.40, p<0.001$ ). Further, self-control was negatively correlated with both ODD ( $r = -0.53, p<0.001$ ) and IGD ( $r=0.55, p<0.001$ ).

Based on the suggested threshold score of 36 for IGD [57], 7.5% of the respondents had clinical levels of gaming disorder. For suicidal ideation, the suggested cut-off score of 36 [56] was used and thereby 11.9% had serious suicidal ideation. For ODD, responses of "often" and "very often" indicated presence of the symptom, and responses "never" and "sometimes" indicated absence of the symptom. A suggested cut-off of four symptoms [27] was used and 14% of respondents had clinical levels of oppositional defiant disorder.

### Mediation model

The summary of the mediation model is displayed in Table 2. We used model 4 of the PROCESS macro to test the mediation role of self-control in the relationship between ODD and suicidal ideation, and between IGD and suicidal ideation, with age as a covariate. The findings indicated that both ODD and IGD were positively associated with suicidal ideation ( $\beta=0.89, p<0.001$  and  $\beta=0.31, p<0.001$ , respectively) in the absence of the mediator variable. When the mediator was included in the model, only ODD was associated with suicidal ideation ( $\beta=0.37, p<0.001$ ). Also in this model, ODD and IGD negatively predicted self-control ( $\beta = -0.50, p<0.001$  and  $\beta = -0.52, p<0.001$ , respectively).

Nonetheless, in the mediation model using bootstrapping methods, the indirect relationships through self-control were significant for both ODD ( $\beta_{\text{ind}} = 0.10, \text{CI}=0.03$  to  $0.18$ ) and IGD ( $\beta_{\text{ind}} = 0.19, \text{CI}=0.12$  to  $0.26$ ). These confidence intervals do not contain 0, indicating that the indirect relationships between both ODD and IGD and suicidal ideation through self-control were

**Table 1** Descriptive statistics, Pearson correlation, and gender differences

Variable	Mean	SD	1	2	3	4	female		male		p
							mean	SD	mean	SD	
1. Suicidal ideation	15.92	8.75	1				18.58	10.04	12.39	4.78	<0.001
2. Oppositional deviant behavior	15.92	4.50	0.48***	1			16.40	4.89	15.45	3.86	0.056
3. Internet gaming disorder	16.97	7.06	0.25***	0.43***	1		18.08	8.47	20.35	6.76	<0.01
4. Self-control	41.72	7.27	-0.40***	-0.53***	-0.55***	1	41.94	7.75	41.40	6.59	0.504

Notes: \*\*\*  $p<0.001$ ; SD=standard deviation; column heading numbers refer to the variables with matching row heading numbers

**Table 2** Mediation role of self-control between ODD, IGD, and suicidal ideation

Outcome variable	Independent variable	$\beta$	SE	t	p	LLCI	ULCI
Suicidal ideation	Intercept	11.32	3.34	3.23	$p < 0.001$	5.03	20.4
	ODD	0.89	0.10	8.66	$p < 0.001$	0.43	0.98
	IGD	0.31	0.06	4.71	$p < 0.001$	0.15	0.44
	Age	-0.21	0.18	-1.17	$p = 0.234$	-0.23	0.12
Suicidal ideation	Intercept	12.67	4.36	2.90	$p < 0.001$	4.09	21.26
	ODD	0.37	0.10	6.78	$p < 0.001$	0.21	0.65
	IGD	0.06	0.06	0.09	$p = 0.360$	-0.07	0.21
	Self-control	-0.20	0.07	-3.51	$p < 0.001$	-0.38	-0.10
Self-control	Intercept	43.70	2.43	17.93	$p < 0.001$	38.91	48.50
	ODD	-0.50	0.07	-11.30	$p < 0.001$	-0.76	-0.43
	IGD	-0.52	0.04	-10.88	$p < 0.001$	-0.61	-0.42
	Age	0.24	0.12	5.50	$p = 0.434$	0.06	0.30

Notes The  $\beta$  values are standardized coefficients; LLCI=lower limit of confidence interval; ULCI=upper limit of confidence interval

**Table 3** Bootstrapping indirect effect and 95% confidence interval (CI) for the mediation model

Indirect path	Standardized estimated effect	BootSE	95% CI
ODD => self-control => suicidal ideation	0.10	0.03	[0.03, 0.18]
IGD => self-control => suicidal ideation	0.19	0.03	[0.12, 0.26]

Notes: BootSE=bootstrapping standard error; CI=confidence intervals. Confidence intervals that do not contain 0 are significant

**Table 4** Moderated mediation model of gender and self-control

Outcome variable	Independent variable	$\beta$	BootSE	BootLLCI	BootULCI
Self-control	Intercept	32.14	2.01	28.30	36.20
	ODD	-1.43	0.19	-1.83	-1.04
	IGD	-0.62	0.16	-0.92	-0.32
	Gender	-0.75	0.62	-2.01	0.44
	ODD x gender	0.45	0.14	0.17	0.74
	IGD x gender	0.07	0.11	-0.14	0.28
	Age	0.65	0.10	0.43	0.86
Suicidal ideation	Intercept	35.76	4.50	27.06	44.72
	ODD	1.04	0.32	0.42	1.65
	IGD	1.08	0.20	0.65	1.46
	Gender	-5.81	0.76	-7.34	-4.33
	ODD x gender	-0.30	0.18	-0.66	0.06
	IGD x gender	-0.70	0.11	-0.92	-0.46
	Age	-0.03	0.16	-0.36	0.26

Notes the coefficients are unstandardized; SE=standard errors; LLCI=low limit of confidence interval; ULCI=upper limit of confidence interval

significant. Thus, Hypothesis 1 and Hypothesis 2 were supported. The results are displayed in Table 3.

#### The moderated mediation model

We used model 8 of the PROCESS macro to test the moderated mediation model. The results are summarized in Table 4. In this model, ODD negatively predicted self-control ( $\beta = -1.43$ , CI = -1.83 to -1.04) and the interaction with gender was significant ( $\beta = 0.45$ , CI = 0.17 to 0.74). IGD negatively predicted self-control ( $\beta = -0.62$ , CI = -0.92 to -0.32), but the interaction with gender was not significant. ODD positively predicted suicidal ideation

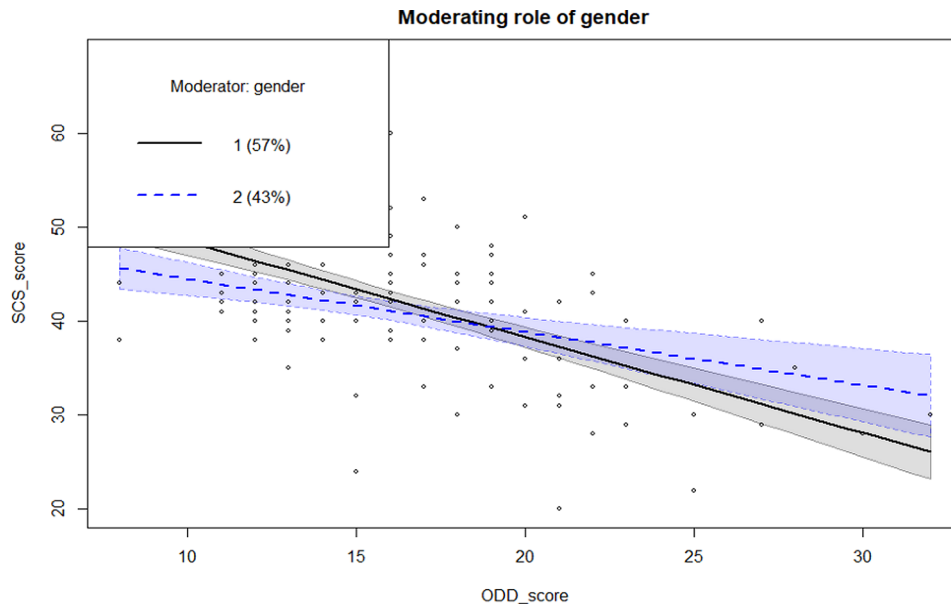
( $\beta = 1.04$ , CI = 0.42 to 1.45), but the interaction was not significant. IGD also positively predicted suicidal ideation ( $\beta = 1.08$ , CI = 0.65 to 1.46) and the interaction with gender was significant ( $\beta = -0.70$ , CI = -0.92 to -0.46). The interaction with gender was significant for the relationship between ODD and self-control and for the relationship between IGD and suicidal ideation. Therefore, Hypotheses 3 and 4 were supported.

Table 5 summarizes the conditional indirect relationships for males and females separately. The indirect relationship between ODD and suicidal ideation through self-control was stronger in females than males

**Table 5** Conditional indirect relationship of ODD, IGD, and suicidal ideation for males and females

	Classification	Indirect effects	BootSE	95% CI
ODD => self-control => suicidal ideation	Females	0.25	0.08	[0.10,0.44]
	Males	0.13	0.05	[0.05,0.24]
	Index of moderated mediation	-0.12	0.06	[-0.26, -0.02]
IGD => self-control => suicidal ideation	Females	0.22	0.04	[0.14,0.32]
	Males	0.19	0.04	[0.11,0.29]
	Index of moderated mediation	-0.03	0.04	[-0.12,-0.01]

Notes BootSE=bootstrapping standard error; CI=confidence intervals. Confidence intervals that do not contain 0 are significant



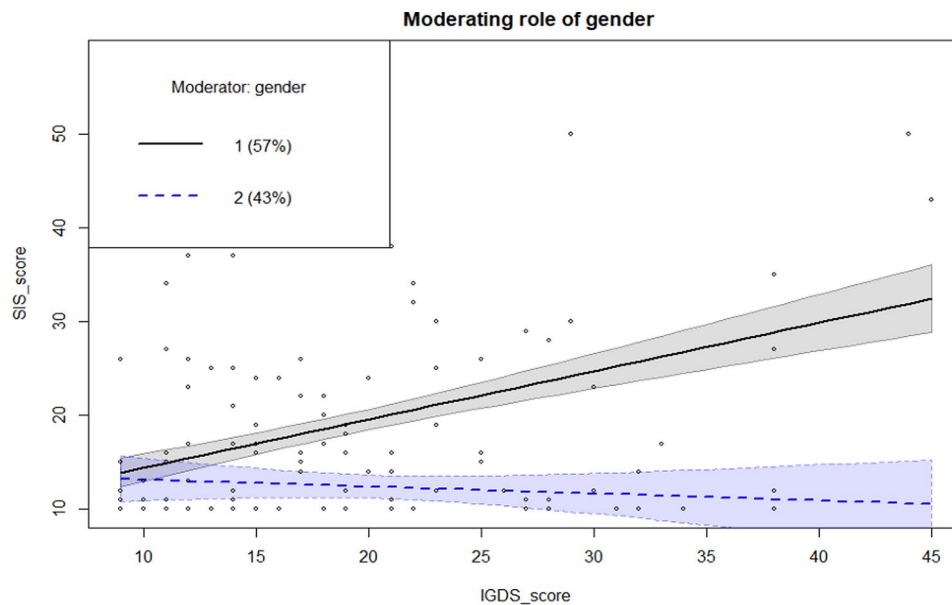
**Fig. 2** Relationship between ODD and self-control in females and males. Notes ODD\_score=oppositional defiant disorder; SCS\_score=self-control; 1 = females; 2 = males

( $\beta_{ind} = 0.25$ ,  $CI=0.10$  to  $0.44$  in females versus  $\beta_{ind} = 0.13$ ,  $CI=0.05$  to  $0.24$  in males), and the index of moderated mediation was significant as well. The indirect relationship between IGD and suicidal ideation through self-control was slightly stronger in females than in males ( $\beta_{ind} = 0.22$ ,  $CI=0.14$  to  $0.32$  in females versus  $\beta_{ind} = 0.19$ ,  $CI=0.11$  to  $0.29$ ), and the index of moderated mediation was significant. Therefore, Hypotheses 5 and 6 were also supported. These conditional relationships in females and males are plotted in Figs. 2 and 3.

## Discussion

This study applied a moderated mediation model according to Hayes [62] and investigated a moderated mediation of gender and self-control in the relationships between ODD and suicidal ideation and between IGD and suicidal ideation among Saudi adolescents. The findings showed that ODD and IGD were positively associated with suicidal ideation. Further, self-control mediated these relationships. In addition, these relationships were stronger in females compared to males.

ODD predicting suicidal ideation in Saudi adolescents corroborates results of prior research [25, 26]. Among adolescents who were diagnosed with ODD, a high prevalence of suicidal ideation was reported by Hardan and Sahl [64]. That study was conducted among a clinical sample of children and adolescents and compared suicidality across different developmental disorders. Their findings may not be fully comparable to those of this study given that the sample and study design differ. In another study among hospitalized adolescents, ODD was associated with episodes of suicidal ideation [65]. This association may be due to the comorbidity between ODD and other types of psychopathology. While that study relied on an interesting design, it did not show the possible mechanisms through which the negative impacts of ODD could be mitigated. Longitudinal prospective studies have related ODD to ADHD, anxiety, and depression [66, 67]. It has been argued that depressive students may use self-harming behaviors and suicidal ideation in an attempt to internalize their negative emotions and decrease their anxiety [68]. Those studies provided interesting findings showing the comorbidity of ODD with anxiety,



**Fig. 3** Relationship between IGDS and suicidal ideation in females and males. Notes IGDS\_score = internet gaming disorder; SIS\_score = suicidal ideation; 1 = females; 2 = males

depression, and substance use in relation to suicidality, but failed to show psychological pathways leading to reduced impacts, and did not show gender differences.

Our study also found a positive association between IGDS and suicidal ideation. This is also in line with previous research [31–33]. Jeong et al. [69] also found that online gaming overuse was associated with suicidal ideation. That study used secondary data with a large sample, but did not address the mediating pathways of this relationship. Peng et al. [70] found that Chinese adolescents with IGDS were more likely to experience suicidal ideation. They used a large sample and included in their study psychological measures as covariates, but did not address them as possible mediating mechanisms. It is possible that adolescents who become addicted to internet gaming tend to be prone to depersonalization, affecting their overall social functioning, which results in their failure to satisfy a sense of belonging, leading to episodes of suicidal ideation [71].

Our study revealed that self-control played a mediating role in the association between ODD/IGDS and suicidal ideation. These results echo previous research findings that self-control plays a protective role against many negative outcomes [72–74], including specifically suicidal ideation and depression [17, 75]. In the presence of self-control in the model, IGDS was no longer a predictor of suicidal ideation, showing that self-control can protect online gamers from developing suicidal ideation. It has been argued that self-control facilitates healthy adjustment, good interpersonal relationships, and social integration [34], which reduces the likelihood of developing suicidal ideation. While these studies revealed

the benefits of self-control, no prior study examined the mediating mechanisms of self-control in the relationship between IGDS/ODD and suicidal ideation.

This study's results also showed that the mediation role of self-control in the relationships among ODD, IGDS, and suicidal ideation was stronger in females than in males. Prior research has reported gender differences with respect to suicidal ideation more generally, where females had higher chances of developing suicidal ideation [18]. The explanation could be that females and males deal with and manage emotions very differently [76, 77]. Others have claimed that females are more prone to negative affect because they are more likely to focus on internal emotions and thoughts [78]. Similarly, it may be possible that these gender differences are due to differences in interpersonal socialization, where girls feel increased pressure to create and maintain social relationships [79, 80], which may increase their vulnerability to life stressors. Furthermore, Chapple, Vaske, and Hope [81] found gender differences in a study investigating the causes of variations in self-control. Comparing male and female adolescents, Matos and colleagues [82] found that externalizing behaviors, such as ODD, were more predictive of internalizing problems in female adolescents than in male adolescents. This shows that externalizing behaviors may have more impact in female adolescents when it comes to internalizing problems, such as suicidal ideation. This is especially true in eastern cultures, where girls are more pressured to display exemplary behaviors than boys. So, it is possible that even sub-clinical levels of externalizing behaviors such as IGDS and ODD in female adolescents might be perceived as deviant because they



violate the gender stereotypes in these cultures [83]. Similarly, the eastern cultures tend to attenuate and tolerate the male externalizing behaviors, while exaggerating the female externalizing behaviors [84], which emphasizes the stronger relationship between externalizing behaviors and suicidal ideation in Saudi female adolescents.

Furthermore, while research has shown that males have higher chances of IGD symptomology [85], it is possible that females experience more negative effects from IGD, especially in Saudi Arabia where female-male interactions are very restricted [86]. These restrictions may result in females engaging in disordered gaming behaviors, especially in those females with lower levels of self-control. In fact, studies from Saudi Arabia indicate varying prevalences of IGD in males and females. A study conducted among male Saudi students found that around 21.85% of the surveyed respondents had IGD [87], whereas in a study of female Saudi adolescents [10], it was reported that around 19% of the female respondents qualified for IGD; associations with anxiety and depression symptoms were also reported in both studies. Generally, females with IGD were found to be more prone to negative mood and affective disorders compared to males with IGD [88], which might lead to suicidal thoughts.

This study has limitations that have to be acknowledged. This study used a cross-sectional design, which prevents to draw temporal and causal inferences in the relationships. Longitudinal designs are recommended for future research. Further, this study used a convenience sample, which hampers the generalizability of the findings to other populations. Random sampling methods are recommended for future research. This study relied on subjective measures that can be subjected to social desirability, future research should include objective measures too. Finally, this study was conducted online, thus we cannot know the situations respondents were involved in while completing the questionnaire.

## Conclusions

The aim of this study was to examine the relationships between both oppositional defiant disorder and internet gaming disorder and suicidal ideation, and the mediating role of self-control, as well as the moderation role of gender. This study found that there was a relationship between oppositional defiant disorder and internet gaming disorder and suicidal ideation. Further, self-control played a mediating role in these relationships. There were gender differences, where the relationships were stronger in female adolescents.

## Implications

The findings of this study suggest that self-control can mitigate the negative impact of oppositional defiant disorder and internet gaming disorder on suicidal ideation

among adolescents. Efforts to counteract suicidal ideation in adolescents with behavioral problems and/or a gaming disorder ought to emphasize developing and enhancing self-control in this population. This is important for school psychologists, parents, and educators in planning effective training and interventions. Further, this study found that there was gender differences in the relationships studied, suggesting that interventional efforts to reduce suicidal ideation among adolescents should take into account gender differences as females were found to be more highly affected.

## Acknowledgements

The Deanship of Scientific Research (DSR) at King Abdulaziz University (KAU), Jeddah, Saudi Arabia has funded this Project under grant no. (GPIP: 1783-246-2024). The author, therefore, acknowledge with thanks to DSR for their technical and financial support.

## Author contributions

A. wrote the main manuscript text and A. prepared figures. All authors reviewed the manuscript.

## Funding

The Deanship of Scientific Research (DSR), at King Abdulaziz University (KAU), Jeddah, Saudi Arabia has funded this Project under grant no. (GPIP: 1783-246-2024).

## Data availability

The data that support the findings of this study are available from the author upon reasonable request.

## Declarations

### Ethics approval and consent to participate

Ethics Board approval was obtained from the Deanship of Scientific Research (DSR), at King Abdulaziz University, Jeddah (GPIP: 1783-246-2024). All participants were informed about the aim of the study and their right to withdraw from the study at any time and informed consent was obtained from all participants. For participant under the age of 18, informed consent to participate was obtained from their parents. Parents and participants were informed that participation was voluntary and that confidentiality of the data obtained persists even after the study results are disseminated. All procedures followed were carried out in accordance with the Helsinki Declaration of 1975, as revised in 2000.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

Received: 29 July 2024 / Accepted: 8 November 2024

Published online: 21 November 2024

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