

# **Good Technology Requires a Good Environment: The Role of Parenting Practices in Adolescent Internet Addiction**

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Studies over the past decade have shown that Internet Addiction (IA), can impact adolescents' health across physical, mental, and social domains. While extensive research has explored adolescents' vulnerability to IA, the role of parental influence through communication and discipline requires further examination. This study investigates the influence of parenting practices on IA among adolescents in the Arab Gulf Cooperation Council (GCC) countries. Participants included 236 parents of adolescents aged 12 to 15 from GCC countries. Data were collected via a digital survey, which included the Alabama Parenting Questionnaire-Short Form (APQ-SF) to measure three facets of parenting practices: positive parenting, inconsistent discipline, and poor supervision. The survey also collected participants' demographics, their children's internet addiction levels, and the frequency of arguments about the children's technology usage. The findings indicated that inconsistent discipline significantly predicts higher IA levels in adolescents, while positive parenting predicts lower IA levels. Poor supervision did not correlate with IA. Notably, the frequency of serious arguments over Internet overuse fully mediated the relationship between positive parenting and IA among adolescents. Furthermore, the effect of inconsistent discipline on IA among adolescents was partially mediated by the frequency of serious arguments over Internet overuse. The findings highlight the family environment's significant role in adolescents' IA and underscore the need for family-centered approaches to address this issue. Addressing underrepresented populations in psychological research is crucial for developing responsive Information Technology (IT) interventions. Digital parenting tools should enhance family environments by promoting positive parenting practices, establishing consistent disciplinary strategies, and incorporating joint goal-setting. Additionally, joint real-time monitoring can facilitate mutual understanding of progress, improving adherence to these strategies and fostering a supportive environment for adolescents.

**CCS CONCEPTS** • Human-centered computing~Human computer interaction (HCI)~HCI design and evaluation methods~Field studies•Human-centered computing~Human computer interaction (HCI)

**Keywords:** Internet Addiction, Adolescents, Parenting Practices, Family Dynamics, Arabs

## 1 INTRODUCTION

As the number of social online platforms has rapidly grown, the number of users has increased exponentially around the world, reaching 1,392 % between 2000 and 2023 according to the World Statistics data [1]. Keenan and Shiri [2], stated that social networking sites have sparked a sociotechnical revolution by fostering a new kind of sociability, facilitated by virtually constant connectivity. This shift has led to behavioral issues categorized by excessive internet use which in turn has caused a profound deterioration of one's psychological and physical health such as depression, anxiety [3], isolation, low academic performance, reduced productivity, and other health issues [4, 5]. The emergence of behavioral issues has prompted the use of terms such as Problematic Internet Use (PIU) and IA, which are defined as the inability to refrain or limit the time spent on the Internet [4, 5]. Although PIU and IA are commonly used, they are not recognized by the experts in the field of psychology nor officially added to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [6].

While online platforms have facilitated continued connectivity across various sectors and communities, they have also led to increased dependency and excessive usage of social technologies, especially among the younger generation. This has become a significant behavioral problem among children and adolescents, with prevalence rated surpassing 5% in some populations [7]. This is due to their critical developmental stage, characterized by major physiological changes. These changes heighten sensitivity to sociocultural processing, and increase susceptibility to environmental changes, which are crucial for adolescents to begin forming their identity and social relations [8,9]. Therefore, the need for social relations is heightened during this period, amplifying the need for social support, especially from the immediate environment; the microsystem of the family [8, 10]. Within the familial system, children's identity is mainly formed by several internal and external factors, including genetically influenced traits shared with their biological family, parents' behavioral patterns, and parenting practices [11].

When parent-adolescent relationships are inadequate and adolescents' need for social support is unmet within the family, they may seek compensation online, leading to excessive internet use [12, 13]. The compensatory satisfaction theory posits that adolescents' PIU is negatively associated with offline satisfaction [14]. Research suggests that meeting online psychological needs can compensate for the lack of offline satisfaction, making online platforms a preferred choice for adolescents seeking psychological fulfillment [14]. Other key factors within the family system also contribute to adolescents' PIU, particularly parental modeling; parents' own internet habits can model behavior for their children [15]. A study by Chemand et al. [7] observed that adolescents showed a higher tendency towards internet dependency if their parents exhibited similar behaviors. Notably, out of eight symptoms of IA identified in parents, seven were found to be correlated with corresponding symptoms in their children [7]. Additionally, inconsistent discipline or avoidance of conflicts may further promote excessive internet use [16], while appropriate monitoring and regulation can mitigate the risk. Lee and Chae [17] demonstrated that setting clear guidelines and monitoring internet use without being overly restrictive helps reduce problematic online activities among children. The emotional quality of parent-adolescent relationships is another impactful factor that significantly affects adolescents' internet usage [18, 19]. A study by Appel et al. [20], found that adolescents with supportive and open communication with their parents are less likely to develop IA. Therefore, to mitigate the risk of adolescents' IA, Bleakley et al. [16] advocate for balanced parenting practices, that grant freedom while still monitoring their behavior to mitigate the risk of adolescents' IA.

Understanding the influence of the family environment on adolescents' behavior provides valuable insights into designing effective IT solutions, such as digital parenting tools [10]. By acknowledging the importance of positive parenting practices and discipline, we can create IT interventions that support families in fostering healthier

technology habits among adolescents. For instance, family-based interventions have significantly improved dietary habits and physical activity levels among children [21]. Similarly, family-based programs have proven effective in reducing childhood obesity and enhancing overall dietary habits by involving parents in the intervention process [22]. These findings underscore the need for interdisciplinary approaches in designing IT interventions, drawing on successful strategies from health and behavioral sciences to create comprehensive solutions that benefit both adolescents and their families [21, 22].

There is an extensive body of research on IA among adolescents focusing on variables within the familial environment. Key variables include the quality of parents' relationship with their adolescent, measured by the Parent-Adolescents Relationship Scale (PARS) [5], parenting styles assessed using the Parenting Styles Scale (PSS) [13], and parenting practices commonly measured by the Alabama Parenting Questionnaire (APQ) [23]. Another significant variable is parent-adolescent conflict. Studies, such as Qi et al. [5], and Branje [24], have found that persistent conflicts are positively correlated with adolescents' IA, as they can create a sense of rejection and negatively affect their relationships.

This paper investigates the frequency of conflicts or arguments as a mediator variable between parenting practices and adolescents' IA. While the relationship between parenting practices and adolescent behavioral patterns using the APQ is well-studied, fewer studies have been done on parenting practices measured by APQ in relation to adolescents' IA. By investigating the relationship between these variables, we enhance our understanding of the complex interactions between parental practices and adolescents' IA. This knowledge can facilitate the development of targeted IT interventions that not only address adolescent behavior but also incorporate parental practices. Therefore, IT interventions should consider the familial environment and its impact on internet addiction among the younger generation.

Another primary gap in the research is the insufficient investigation of adolescents' internet behaviors in Middle Eastern countries and Central Asia [10]. Henrich et al. [25] indicated that existing literature in psychology and behavioral sciences predominantly focuses on the datasets from Western, educated, industrialized, rich, and democratic populations, commonly known as WEIRD populations. An analysis of the top journals in the field of psychology has shown that 68% of samples came from the United States and 96% from developed Western countries, which together represent only 12% of the global population. Despite this limited demographic, researchers often universalize across the entire human population, neglecting variations among different populations [25]. Hence, this paper addresses the need to replicate these behavioral studies on non-WEIRD populations by examining adolescent IA in relation to their familial environment, using a dataset of the GCC population. The paper hence investigates the following research questions:

1. (RQ1): Is there an association between adolescents' IA score, parental practices, and frequency of arguments on the overuse of the Internet?
2. (RQ2): Can parental practices predict adolescents' IA?
3. (RQ3): Does the frequency of arguments on the overuse of the Internet mediate the relationship between Figure Descriptions.

## 2 MATERIALS AND METHOD

### 2.1 Participants and Procedure

Participants from the Arab world were recruited, and responses were collected through TGM (tgmresearch.com), an online platform known for its extensive reach across multiple nations. The survey itself was conducted digitally via the SurveyMonkey interface (surveymonkey.com) and incorporated strategic attention checks to validate the quality of the responses. The study's criteria require that respondents be residents of the GCC countries, occupy the dual roles of parents to adolescents aged 12 to 15, and be active internet users. Furthermore, participants were required to identify with Arab GCC cultural and societal norms. A pilot test involving a small group of participants from the Arabs of GCC was conducted to identify and eliminate any ambiguous or unclear expressions within the survey. The survey was translated from English to Arabic using the back-translation method to ensure the quality of the translation and preserve the original meaning of the survey content [26]. This pilot test was conducted before the main study.

Participants who did not meet the eligibility criteria were excluded from the study, while those who qualified were invited to complete the full survey. A response was deemed excessively fast if it was completed in 50% or less of the median time taken by all participants.

At the survey's outset, participants were presented with an overview of the study's aims, along with an information sheet and a consent form to ensure their informed engagement and their freedom to disengage at any point if they felt uncomfortable. In acknowledgment of their contribution, participants were offered monetary compensation upon successful completion, provided they passed the attention checks and exhibited no monotonous response patterns. If participants had more than one child, they were instructed to answer the questions with reference to the child closest to 12 years old. The protocol for this research received approval from the Research Ethics Committee at Bournemouth University.

The demographic profile of the sample included 236 parents, nearly evenly split between 123 males and 113 females, with ages ranging from 27 to 59 years old (Mean = 39.28, Standard Deviation = 6.50). Information regarding their children, provided by the parents, encompassed 136 males and 100 females, all within the specified adolescent age bracket of 12 to 15 years (Mean = 13.19, Standard Deviation = 0.97). Data was gathered over a period from mid to late November 2023.

### 2.2 Measures

The survey gathered information on participants' demographics, parenting practices, their children's internet addiction, the frequency of arguments about the child's technology usage, parents' occupation, monitoring practices, etc. However, for this study, we will focus our analysis on the following measures: participants' demographics, parenting practices, their children's internet addiction, and the frequency of arguments about the children's technology usage.

#### *2.2.1 Parental Version of Young Diagnostic Questionnaire (PYDQ).*

The PYDQ [27] is an adaptation of the Internet Addiction Diagnostic Questionnaire (IADQ) [4] tailored to evaluate Internet addiction in young individuals based on parental observations. This version retains the IADQ's eight-question format, requiring binary 'no' or 'yes' answers, with each question aimed at identifying a symptom of IA. The total PYDQ score, which ranges from 0 to 8, is tallied by summing the responses, where a higher total suggests

an increased risk of PIU among adolescents. The PYDQ does not alter the substance of the IADQ questions. Instead, it reformulates the IADQ items, originally designed for self-assessment, to allow parents to report on their child's internet use behaviors. For example, an IADQ item asking the individual about their own attempts to quit internet usage ("Have you repeatedly made unsuccessful efforts to control, cut back, or stop Internet use?") is rephrased in the PYDQ to ask the parent about their child's attempts ("Has your child repeatedly made failed efforts to control, reduce, or eliminate Internet use?") [28].

Both the IADQ and PYDQ cover the same eight dimensions of problematic Internet usage, which include: 'preoccupation' with the Internet (Q1), developing a 'tolerance' for prolonged use (Q2), repeated 'unsuccessful efforts to limit or stop' usage (Q3), experiencing 'withdrawal' symptoms when not online (Q4), 'loss of control' over time spent online (Q5), risking or losing significant 'relationships or opportunities' due to internet use (Q6), 'lying' to hide the extent of involvement with the internet (Q7), and using the internet as a way of 'dysfunctional coping' with other problems (Q8). The reliability of the PYDQ scale in the present sample was assessed using Cronbach's alpha, with  $\alpha = 0.78$ , indicating an acceptable value of reliability [29].

### *2.2.2 Short form of the Alabama Parenting Questionnaire (APQ-SF).*

The APQ-SF is a streamlined version of the Alabama Parenting Questionnaire, a measure designed to assess various dimensions of parenting practices that are relevant to the development and behavior of children and adolescents [30]. This concise form comprises nine items rated on a 5-point Likert scale ranging from 'Never' to 'Always'. Each item aligns with one of three core parenting constructs: Positive Parenting, Inconsistent Discipline, and Poor Supervision. The Positive Parenting construct evaluates the expression of parental support and positive reinforcement; Inconsistent Discipline assesses the irregular application of rules and consequences; and Poor Supervision measures the lack of parental oversight and awareness of a child's activities. Scores on the APQ-SF are obtained by summing responses within each construct, yielding a range of scores for each dimension. The total of each parenting practice score ranges from 3 to 15, with higher scores indicating a higher level of the respective construct. These cumulative scores provide insights into parenting practices and potential areas for intervention. While there is no single cutoff point established for problematic parenting practices, higher scores in Positive Parenting are generally indicative of more effective parenting strategies, whereas higher scores in Inconsistent Discipline and Poor Supervision are suggestive of areas needing improvement. The APQ-SF has been validated across diverse populations and is utilized in both research and clinical settings to understand parenting behaviors and to inform strategies for family interventions. In our study, the internal reliability of the APQ-SF, as measured by Cronbach's alpha, was 0.55. This value is higher than the internal reliability of 0.44 reported in the original study [30].

### *2.2.3 Arguments over Internet use of the child.*

The survey inquired about the regularity with which parents entered into serious arguments with their adolescents regarding their overuse of the Internet, distinguishing between weekdays and weekends. Parents responded to queries assessing the average number of times they engaged in arguments about their child's internet usage during a typical school day and a non-school day on a 4-point Likert scale; (1 = "0 times," 2 = "1-2 times," 3 = "3-4 times," 4 = "more than 4 times"). These responses were then averaged to determine the typical frequency of arguments, and the score ranged from 1 to 4.

### 3 RESULTS

The dataset was processed for cleaning and scoring using Excel. JASP software version 0.17.3, was used to analyze the data [31]. To examine the association between adolescents' IA scores, parental practices, and the frequency of arguments on the overuse of the Internet, the Pearson correlation was utilized. Additionally, we conducted an assessment of all variables to verify that they conform to the normality assumptions necessary for parametric statistical testing. Both skewness and kurtosis values were reviewed, and all variables displayed values within the acceptable range of less than  $\pm 2$  for skewness and kurtosis, suggesting a normal distribution. Consequently, we decided to proceed with a parametric approach for the subsequent analysis. To determine predictive factors for adolescent IA, indicated by the PYDQ scores, a linear regression analysis was carried out. This encompassed the parental practices measured by APQ-SF. Prior to the regression, there was a thorough check of the underlying assumptions. Normality and equal variance of residuals, assessed via histogram inspection and Q-Q plot analysis, were confirmed. Collinearity diagnostics indicated the absence of multicollinearity, with a Variance Inflation Factor (VIF) maximum value of 1.059, and Tolerance statistics ranging from 0.945 to 0.984. The Durbin-Watson statistic was 2.048, indicating that the independence of residuals was within acceptable limits. Standardized residual analysis verified that no data points were extreme outliers, as all were contained within the  $\pm 3$  range. A mediation analysis was subsequently conducted to examine if the connection between parental practices and adolescent IA outcomes was mediated by the average frequency of arguments over internet usage. This analysis controlled for parental gender, shedding light on the indirect pathways influencing adolescent internet use behaviors.

#### 3.1 Descriptive Statistics

Descriptive statistics of our participants show that of the 236 participants in our study, 65.25% were from Saudi Arabia (n= 154), and 26.27 % were from the United Arab Emirates (UAE) (n= 62). Oman, Bahrain, and Qatar samples represented 3.39% (n= 8), 3.39% (n= 8), and 1.7% (n= 4) respectively. Table 1 presents the descriptive statistics of the parenting practices measured by APQ-SF, the PYDQ, and the Frequency of Serious Arguments over internet overuse.

Table 1: Descriptive statistics of parenting practices, PYDQ, and average number of arguments

	Positive Parenting Score	Inconsistent Discipline Score	Poor Supervision Score	PYDQ Score	Frequency of Serious Arguments
Mean	13.581	9.081	5.907	3.479	1.958
Std. Deviation	1.504	2.143	2.052	2.266	0.745
Minimum	8.000	3.000	3.000	0.000	1.000
Maximum	15.000	15.000	11.000	8.000	4.000

#### 3.2 Associated Variables with PYDQ Scores

In addressing RQ 1, Pearson's correlation was used to investigate the relationships between adolescents' IA scores, indicated by the PYDQ scores, and various independent variables. The results shown in Table 2 indicated significant correlations across multiple factors. These findings suggest that parents' gender, the average number of arguments over internet overuse, and parental practices are significantly associated with IA among adolescents except for poor supervision which showed a p-value approaching significance.

Table 2: Pearson's Correlation Between PYDQ Scores, Parenting Practices, and Frequency of Serious Arguments over Internet Overuse

Variable	1	2	3	4	5
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1. PYDQ Score	—					
2. Inconsistent Discipline Score	0.332***	—				
3. Positive Parenting Score	0.197**	-0.066	—			
4. Poor Supervision Score	0.127	0.211**	-0.119	—		
5. Frequency of Serious Arguments	0.576***	0.222***	-0.189**	0.056	—	

\* p < .05, \*\* p < .01, \*\*\* p < .001

### 3.3 Predictors of the PYDQ Scores

To investigate the influence of parental practices and parent gender on the PYDQ scores among adolescents, a linear regression analysis was executed. This model was statistically significant,  $F(3, 232) = 12.848$ ,  $p < 0.001$ , indicating a robust relationship between the predictors and PYDQ scores. The model accounted for 15.1% of the variance in PYDQ scores, as evidenced by an  $R^2$  value of 0.142, with an adjusted  $R^2$  of 0.131 after accounting for the number of predictors in the model. This suggests a moderate level of explanatory power of parental practices on adolescent internet addiction. Noticeably, as shown in [Table 3](#), the Positive Parenting Score was negatively associated with PYDQ scores, with a significant p-value ( $\beta = -0.171$ ,  $p = 0.006$ ). Inconsistent Discipline Score showed a positive association with PYDQ scores ( $\beta = 0.312$ ,  $p < 0.001$ ). Poor supervision was not reported as a predictor of adolescents' IA.

**Table 3:** Linear Regression Analysis for Predicting PYDQ

	R2= 0.142,	R2Adj= 0.131,	F (3, 232) = 12.848
Predictors	Standardized $\beta$	t	p
Poor Supervision Score	0.041	0.649	0.517
Inconsistent Discipline Score	0.312	5.014	< 0.001
Positive Parenting Score	-0.171	-2.796	0.006

### 3.4 Influence of Parenting Practices and Communication on PYDQ Scores

In the mediation analyses that investigate parenting practices and their effects on adolescent internet addiction (PYDQ). Parents' gender was controlled in the analysis to account for potential effects. We found that positive parenting has an indirect effect on reducing internet overuse among adolescents. Even when not directly significant ( $\beta = -0.088$ ,  $p = 0.101$ ), positive parenting was linked to fewer serious arguments about internet use, which in turn, was connected to lower levels of problematic internet in adolescents (indirect effect  $\beta = -0.098$ ,  $p = 0.007$ ). Even though positive parenting did not show a direct significant effect on adolescents' internet addiction, the total effect through the frequency of serious arguments was significant ( $\beta = -0.186$ ,  $p = 0.003$ ). This indicates a full mediation as shown in [Figure 1](#). On the other hand, inconsistent discipline behavior directly relates to more internet addiction issues in their children (direct effect  $\beta = 0.219$ ,  $p < 0.001$ ). Moreover, this inconsistency also seems to cause more serious arguments about internet use, which further contributes to the problem (indirect effect  $\beta = 0.115$ ,  $p < 0.001$ ). The total effect was also significant for inconsistent discipline (total effect  $\beta = 0.334$ ,  $p < 0.001$ ). This indicates a partial mediation as seen in [Figure 1](#). For poor supervision, the analysis showed no effect linked to internet addiction among adolescents.

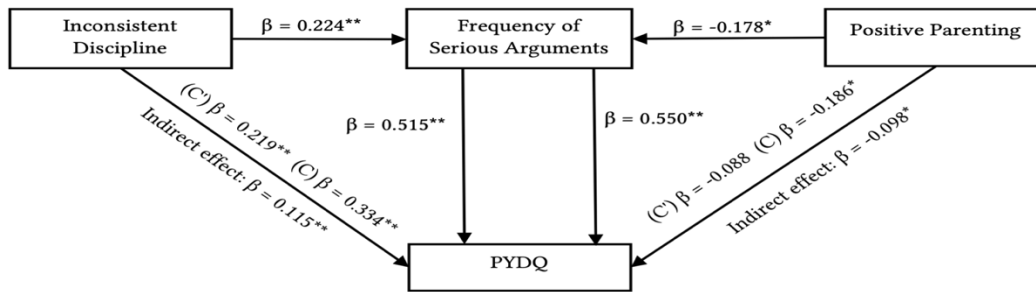


Figure 1: The Mediation Effect of Serious Arguments on the Relation Between Positive Parenting (Right) and Inconsistent Discipline (Left) and PYDQ: (C) Total effect, (C') Direct effect,  $p^* < 0.05$ ,  $p^{**} < 0.001$

#### 4 DISCUSSION

Existing research findings underscore the profound influence of social media and excessive internet usage on adolescents' behavior and mental health. Investigations [4, 10] have elucidated that the surge in internet utilization has precipitated addictive behavioral manifestations, commonly denoted as PIU and IA. Numerous research papers have examined the environmental determinants contributing to internet addiction among adolescents, with particular emphasis on the family system. For instance, one study posited that the lack of social fulfillment within the family environment drives adolescents towards excessive internet use as a form of compensation [32]. Similarly, Tang et al. [33] further elaborated that adolescents reared in high-stress family environments exhibit higher tendencies towards PIU as a coping mechanism.

This study aims to advance our comprehension in three distinct domains. Firstly, it utilizes the APQ-SF, a tool that remains relatively unexplored in relation to adolescents' IA. Secondly, the research investigates the mediating role of arguments pertaining to internet overuse in the relationship between parenting practices and adolescent IA. This aspect of family dynamics holds significance, as excessive regulation of a child's behavior and constraints on their autonomy can increase conflicts and, consequently, deleterious behavioral outcomes. Lastly, this study is among a few that focus on the Arab community, a non-WEIRD population, which provides insights into how differences in familial contexts in this underrepresented population influence adolescent internet behaviors. By addressing these gaps, the research aims to foster a more comprehensive understanding of adolescents' IA among non-WEIRD populations and inform more effective IT intervention strategies.

Significant differences were observed in parenting practices scores among Arab parents. Descriptive statistics revealed that the mean score of positive parenting was 13.7, which possibly reflects balanced behavioral control, clear disciplinary measures, a high level of support, and effective communication [34]. Inconsistent Discipline had a mean score of 9.2, and Poor Supervision had a mean score of 5.9. Higher scores in inconsistent discipline suggest that many parents may struggle with maintaining consistent rules and punishment, which can lead to frequent conflicts that lead to behavioral issues among adolescents [24]. Poor supervision scores indicate poor monitoring and lack of supervision can increase high-risk behaviors among adolescents as they become more likely to fall into negative behavioral habits [35]. Noticeably, poor parenting was the only aspect that parents reported that never reported the maximum score, i.e. 15; this may indicate possible bias in parents' self-reporting regarding their parenting practices. The PYDQ score averaged 3.48, which reflects the risk of dependence on the internet among adolescents within the sample. The average number of serious arguments about internet usage was 1.958 on a scale;



this highlights that parent-adolescent conflicts regarding internet use are fairly common among the sample population

Pearson correlation analysis revealed a strong association between inconsistent discipline and higher levels of IA among adolescents. Research by Dwairy [36], indicated that inconsistent parental discipline contributes to various behavioral and psychological issues by creating an unpredictable environment. This finding aligns with previous research by Stormshak et al. [37], which identified inconsistent disciplinary practices as a significant predictor of behavioral problems among adolescents. Moreover, our results showed that positive parenting practices were found to mitigate the risk of IA among adolescents. This observation is consistent with the findings of [7, 10] which demonstrated that positive parenting fosters a healthy approach to internet use, thereby reducing the likelihood of addiction. Furthermore, research by Morris et al. [38] supported the concept that positive parenting practices enhance self-regulation skills in adolescents, which are important in preventing IA. However, poor supervision did not display a significant relation with internet addiction, despite other studies showing a negative correlation between parental monitoring levels and excessive internet use among children [13, 35]. In Middle Eastern countries, parenting tends to be more authoritative, with a strong emphasis on family cohesion and respect for parental authority. This contrasts with Western contexts, where the APQ-SF was developed, and parenting is characterized by greater leniency, and less authority [39]. This contrast aligns with previous research findings that persistent conflicts between parents and adolescents negatively impact the development of adolescents' self-control [40].

The regression analysis yielded results consistent with those of the Pearson correlation analysis, identifying positive parenting and inconsistent discipline as major predictors of IA among adolescents. Additionally, inconsistent discipline has been associated with an increased risk of IA. A study by Shek et al. [41] showed that adolescents exposed to unpredictable disciplinary measures were more prone to excessive internet use as they were more likely to seek solace in online activities. These findings underscore the importance of consistent parenting practices in preventing the development of IA among the younger generation. Although studies by Lin et al. [42] and Zhu et al. [43] have suggested that poor supervision or monitoring can lead to increased IA among children, it was not a significant predictor of adolescents' IA in our sample. This discrepancy highlights the need to consider contextual factors and differences when examining the impact of parental supervision on adolescent IA.

Our mediation analysis revealed a notable direct and indirect association between inconsistent discipline and adolescents' IA, with the frequency of arguments fully mediating between the two variables. The mediation analysis, however, did not show a direct effect of positive parenting on adolescents' IA. Instead, it showed an indirect effect in reducing IA among adolescents. Therefore, the frequency of conflicts or arguments partially mediates the relationship between positive parenting and adolescents' IA. Additionally, poor supervision neither directly nor indirectly affected adolescents' IA. The findings underscore that the quality of the parent-child relationship, the specific parenting practices employed, and the number of arguments between them can predict their children's IA. This supports the family systems theory, which posits that family interactions and conflicts play a crucial role in shaping adolescent behaviors [44]. Eijnden et al. [45] emphasize that the high number of conflicts negatively impacts the parent-child relationship due to ineffective communication. This exacerbates adolescents' tendency to use the internet as a coping mechanism and as a means of escaping an unsatisfactory relationship and a stressful familial environment [7, 10, 24].

The results highlight the importance of considering the differences in underrepresented populations in psychological research to develop responsive IT interventions. Following the line of research in [7] and our new

study, we posit that effective IT interventions necessitate a supportive environment too. Specifically, the design of digital parenting and digital well-being tools should prioritize enhancements to the family environment through the promotion of positive parenting practices and consistent disciplinary strategies. This approach, corroborated by its efficacy in improving eating and physical activity behaviors in adolescents [21], holds promise in mitigating the risk of IA among adolescents by addressing the underlying family dynamics that influence their online behavior. Parental control applications that rely mainly on parents' perceptions may be insufficient. It suggests that for such interventions to be effective, a more holistic approach that considers the broader family perspectives.

To improve discipline consistency and positive parenting, incorporating joint goal-setting that includes both parents and children in parental control applications can enhance adherence to the established discipline and goal-oriented framework. Evidence from pediatric rehabilitation has been found to improve outcomes by aligning family efforts toward common objectives [46]. However, these techniques are faced with some challenges such as parents often feeling overwhelmed by the responsibility of defining specific and measurable goals, which can lead to self-doubt and questioning their capabilities. Moreover, monitoring features offer several benefits, including enhancing parental knowledge through real-time updates and reminders and helping parents keep track of their children's activities and progress to strengthen adherence to the discipline strategy [47]. This study suggests including joint monitoring between parents and children, allowing both to stay informed about each other's progress toward shared family goals. However, these features can also have drawbacks if it is not based on mutual agreement between the child and their parents. Excessive monitoring and control can make children feel overly controlled, resulting in poorer psychological outcomes like increased depressive symptoms and lower self-confidence. High levels of surveillance might reduce adolescents' sense of autonomy, potentially leading to resistance and less open communication with parents [47].

Our study has a few limitations. Although the questions of the APQ-SF were translated into Arabic and face-validated, we acknowledge potential cultural differences in interpreting questions related to Poor Supervision. Additionally, the reliance on self-report measures is a limitation, as these can be subject to social desirability bias and inaccuracies in reporting. Future studies should consider employing multiple methods of data collection, such as observational methods or surveys involving both parents and children within the same household, to obtain a more comprehensive understanding of the factors influencing IA. Despite these limitations, our study provides valuable insights into the dynamics of IA among adolescents in the GCC countries, a population that has not been extensively researched.

## 5 CONCLUSION

This study advances the understanding of internet addiction among adolescents in the Middle Eastern context by emphasizing the significance of parenting practices and family dynamics. The findings suggest that interventions aimed at preventing IA in adolescents should account for the family environment. Moreover, this study underscores the necessity to develop family-centered control interventions, moving beyond a child-centric approach.

Emphasizing environmental factors is crucial for promoting healthier internet usage, achieved through the design of IT solutions that account for family factors and facilitate positive parenting and consistent discipline practices. By integrating these family aspects, IT can be adapted to support better usage patterns and mitigate IA risks among adolescents, ultimately, fostering effective and context-aware interventions and preventions. Furthermore, the reduced impact of poor supervision on adolescent IA among Arab populations suggests that other parenting practices may have a more critical influence on the parent-child relationship. Hence, future research

should further explore these dimensions to develop a more holistic understanding of the factors shaping IA in diverse cultural settings. For instance, studies could investigate the role of extended family members, such as grandparents, who often play a significant role in childcare within Middle Eastern countries [48].

This study contributes to the existing literature by examining the importance of family-centered interventions in mitigating adolescent IA. This is achieved by highlighting the role of family factors, as exemplified by parenting practices and frequency of conflicts over internet overuse, with the aim of proposing IT solutions that adopt inclusive approaches to promote healthier internet usage patterns within the family system.

## 6 DATA SHARING STATEMENT

The dataset is available at Open Science Framework at the following link: <https://osf.io/g3fcr/>

## ACKNOWLEDGMENTS

This publication was supported by NPRP 14 Cluster grant [#NPRP 14C-0916-210015](#) and by the Graduate Student Research Award [#GSRA9-L-1-0525-22044](#) from the [Qatar National Research Fund](#). The findings herein reflect the work and are solely the responsibility of the authors.

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