

Virtual Reality Games and their Relationship to Mental Health of Adolescents

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Abstract

Objectives: This study aimed to examine the relationship between virtual reality (VR) games and mental health among adolescents, highlighting the significance of understanding the potential psychological impacts of this emerging digital activity.

Methodology: A descriptive correlational approach was used. The study sample consisted of 150 male and female adolescents who played VR games at centers offering these games in Amman. To achieve the study's objectives, two validated and reliable tools were used: the Mental Health Inventory-18 and the Post-VR Questionnaire. Data were analyzed using the Statistical Package for the Social Sciences (SPSS).

Findings: The level of VR game use among adolescents was high. A direct relationship was found between VR game use and both behavioral control and positive affect. An inverse relationship was found between VR game use and anxiety and depression. No statistically significant differences were found in VR game use or mental health variables based on gender, age, economic status, family marital status, or parental education level.

Implications: The findings suggest that VR games may have both beneficial and protective effects on certain aspects of adolescent mental health, such as reducing anxiety and depression and enhancing behavioral control. These results contribute to a broader understanding of how digital technologies influence adolescent well-being and may inform mental health practitioners, educators, and policymakers about the potential of VR as a supportive tool.

Conclusions: The study highlights the complex interplay between VR gaming and adolescent mental health, reinforcing the importance of further research to explore long-term impacts and practical applications.

Key words

Virtual Reality Games, Mental Health, Adolescents.

Introduction

The rapid advancement of technology, particularly virtual reality (VR), has introduced individuals especially adolescents to immersive and interactive digital environments. VR games have become a prominent aspect of youth entertainment, prompting concern about their impact on adolescents' physical and mental health. Adolescence, spanning roughly from ages 11 to 18, is a transitional stage marked by significant biological, cognitive, emotional, and social development. It involves a shift from dependency to growing independence, requiring adaptation to social expectations and cultural norms (Al-Zoubi, 2020).

The concept of VR was introduced by Jaron Lanier in 1989, though its use predates this in various fields such as military training, PTSD treatment, aviation, and space exploration. NASA, for instance, has applied VR in scientific research, while companies like SEGA and Nintendo have implemented it in gaming. VR games utilize advanced technologies, including headsets, controllers, audio systems, and compatible hardware to create three-dimensional, immersive experiences where users can interact with or compete against others (Sherman & Craig, 2022).

Video games, in general, involve user interaction through various input devices to produce visual and auditory feedback. They often feature avatars customizable characters that represent users in virtual worlds facilitating exploration and engagement (Hamal, 2022).

Studies show that how individuals present themselves through avatars can influence real-life behavior. Virtual environments thus serve as platforms for experimentation, modeling, and adopting new identities (Yoon & Vargas, 2014).

Mental health, defined as a stable state of satisfac-

tion, peace, and personal effectiveness, contributes to overall well-being and positive social functioning (Abdel-Khalek, 2021).

Recent research highlights both the potential benefits and risks of VR gaming among adolescents. For example, Chiu and Yen (2021) demonstrated that VR-based exergames can enhance mood and cognitive functioning.

While Clara et al. (2024) found that digital games may improve mental health when designed with positive engagement features.

Other studies have cautioned against excessive immersion and its possible emotional consequences (Halldorsson et al., 2021). These findings emphasize the importance of understanding VR's psychological implications in contemporary adolescent life.

However, growing concerns link VR gaming to negative psychological outcomes in adolescents, including anxiety, depression, and social withdrawal. These concerns highlight the urgent need for research to assess the true psychological effects whether beneficial or harmful of VR games on adolescent mental health.

Problem Statement

Adolescence is a formative stage characterized by substantial physical, emotional, psychological, and social changes. In recent years, adolescents have increasingly immersed themselves in virtual reality (VR) games, raising concerns about the impact of such experiences on their mental health.

According to Data Reportal in 2023, there were 9.95 million internet users in Jordan at the beginning of 2023, with an internet penetration rate of 88.0%. The total population of Jordan reached 11.32 million in January 2023. The data also indicate that the pop-

ulation increased by 59,000 people (+0.5%) between 2022 and 2023 (Kemp, 2023).

Globally, 3.26 billion people play video games, with individuals aged 18–34 making up 38% of gamers (Marko, 2023).

In an analysis by Thunstrom et al. (2022), 735 visits were recorded across 565 games, of which only 32% met inclusion criteria. Many excluded games featured violent or inappropriate content, raising concerns about the nature of the games adolescents may encounter.

Mental health issues affect a significant portion of the adolescent population. The World Health Organization (2021) reports that one in seven individuals aged 10–19 suffers from mental disorders. In Jordan, over 1.75 million people experience mental health conditions, including anxiety and depression. Among adolescents, anxiety affects 3.6% of those aged 10–14 and 4.6% of those aged 15–19; depression affects 1.1% and 2.8% in the same age groups, respectively.

However, not all findings point to negative outcomes. Lee et al. (2021) found that socially isolated users with low self-esteem experienced increased social connectedness and reduced anxiety and depression through VR gaming.

Al-Rashidat (2017) highlighted the central role of mobile devices in adolescents' internet use and emphasized the family's role in guiding responsible usage.

Motivated by a personal interest in VR games and their emotional impact, this study seeks to explore the relationship between virtual reality gaming and adolescent mental health.

Boundaries of the Study

This study focused on specific human, geographical, and temporal parameters. The human boundaries were defined by the inclusion of adolescents aged 15 to 18 years. The geographical boundaries were limited to virtual reality gaming locations within Amman, the capital city of Jordan. Regarding the time frame, data collection occurred over a three-month period, from January to March 2024.

Limits of the Study

The limits of the study are primarily related to the research instruments employed. The findings are based on data obtained through the Mental Health Inventory-18 and the Post-VR Questionnaire, both of which have established validity and reliability. However, the generalizability of the study's results is confined to populations that closely resemble the study sample. This limitation stems from the representativeness of the sample and the scope of the tools used.

Theoretical Framework:

Adolescence

Adolescence is a developmental stage characterized by the gradual attainment of physical, cognitive, psychological, and social maturity. It is distinct from puberty, which specifically refers to physical reproductive maturity through the development and activation of sexual glands. Adolescence, by contrast, encompasses a broader and more continuous developmental process (Al-Jabali, 2016).

The duration and experience of adolescence vary across cultures. Scholars typically divide it into three stages: early adolescence (12–14 years), marked by rapid biological changes; middle adolescence (14–17 years), where biological changes stabilize; and late adolescence (17–21 years), when individuals begin to resemble adults in both appearance and behavior (Ghorab, 2015).

Physical development during adolescence includes noticeable changes in body shape and size, which differ by gender. In males, shoulder broadening and muscle growth are typical, while in females, hip widening and breast development occur. Hormonal secretions by glands play a major role in influencing physical growth, emotional balance, behavior, and cognitive functions. Sexual maturity also varies, with the onset of menstruation marking female maturity and increased testicular size indicating male maturity. These physical developments often evoke complex emotional reactions, such as surprise or anxiety, especially during first-time experiences (Kipke, 1999).

Adolescents may face various challenges during this period. Physical and hormonal changes can cause confusion and negatively affect self-image. Psychological and social development may involve identity exploration and efforts toward independence, often leading to conflict with authority figures and difficulties managing peer pressure. Mental health concerns such as anxiety, depression, and eating disorders are also common, fueled by academic and family pressures. Additionally, technology use, including video games and social media, can contribute to mental health risks by increasing social isolation and reducing physical activity (Woolfolk & Perry, 2014).

Theories Explaining Adolescence

Several theoretical perspectives provide insights into the developmental stage of adolescence. The biopsychological perspective, supported by Stanley Hall and Freud, emphasizes the role of biological changes in shaping adolescent behavior. This view considers adolescence as a turbulent period marked by significant physiological transformations that influence both self-perception and social interactions. Hall attributed the confusion and emotional volatility of this stage to rapid bodily changes, while Freud identified the onset of reproductive capability as its defining fea-

ture. Emotions during adolescence, according to this view, often swing dramatically between energy and fatigue, joy and sadness, or tenderness and intensity (Al-Zoubi, 2010).

Field Theory, developed by Kurt Lewin, conceptualizes adolescent behavior as the result of complex interactions between internal traits (e.g., needs, beliefs, values) and external factors (e.g., the environment). Lewin describes adolescence as a transitional period involving shifts in group affiliation from childhood peer groups to more adult associations and the adoption of new values and goals. The adolescent's growing self-awareness and internal conflicts may lead to anxiety and psychological tension, especially when new goals remain unmet (Cooper, 2023).

Jean Piaget's cognitive theory, as cited in Al-Zghoul (2010), focuses on the development of mental processes such as memory, perception, imagination, and reasoning. Piaget emphasizes that a healthy cognitive balance is achieved when adolescents apply their abilities effectively in response to environmental demands. However, if any cognitive domain is underdeveloped or impaired, this mismatch can lead to psychological and behavioral problems.

In summary, adolescence is a critical developmental stage marked by physical, emotional, and cognitive change. With rising exposure to modern technological influences, such as virtual reality (VR) games, adolescents are now engaging with tools that serve not only as entertainment but also as potential educational and psychological interventions. Understanding the impact of VR on adolescent mental and behavioral health is essential, making it a valuable area for further study.

Virtual Reality Games

Virtual reality (VR) is a digitally simulated en-

environment created through computer systems and programming, designed to reproduce or imitate real or fictional worlds. VR games are interactive, computer-generated experiences that immerse users in three-dimensional environments. These simulations involve multimedia elements and are experienced through specialized tools such as VR headsets, joysticks, controllers, headphones, and sensors. These peripherals engage users' senses and provide a strong sense of presence, allowing them to navigate and interact with the virtual world as if it were real (Evans, 2019).

VR technology replaces the user's perception of the real world with an artificial one, and various types of VR exist based on the level of immersion and interaction. Non-Immersive VR offers limited engagement through traditional interfaces like monitors, keyboards, and mice. Semi-Immersive VR, used in flight simulators and education, provides a more immersive experience via panoramic screens and interactive tools. Fully Immersive VR, the most advanced form, employs headsets like the Oculus Rift or HTC Vive with motion-tracking systems, enabling users to interact naturally using hand and body movements (Sherman & Craig, 2018).

Other types include Augmented VR, which overlays virtual elements onto the real world, allowing users to interact with both simultaneously frequently used in training and education. Collaborative VR facilitates real-time interaction between multiple users within a shared virtual environment, promoting teamwork and communication (Jerald, 2015). Mobile VR relies on smartphones and accessible headsets like Google Cardboard, offering lower-cost entry into VR experiences, albeit with reduced performance. Lastly, Partial Immersive VR provides a limited yet engaging experience through high-resolution screens and basic interaction, common in educational and gaming sys-

tems (Ralf et al., 2022).

VR continues to evolve as both an entertainment medium and a psychological and educational tool, supporting its relevance for further research on its impact especially among adolescents.

Characteristics of Virtual Reality Games

Virtual reality (VR) games are distinguished by several essential features that enhance user experience and engagement. One key feature is three-dimensionality (3D), where environments are designed using geometric dimensions that mimic real-world spaces. Real-time responsiveness is another core aspect, ensuring that the system reacts instantly to user input, maintaining immersion. Realism refers to the simulation of real-life objects, actions, and social contexts, enabling users to feel present in lifelike scenarios. The immersive nature of VR engages multiple senses, allowing users to respond to virtual elements as though they were real. Finally, interactivity allows users to engage dynamically with virtual models and alter the environment through movement and control tools (Burdea & Coiffet, 2003).

Despite its benefits, VR presents several challenges. Health concerns include cybersickness (nausea and dizziness), eye strain, physical fatigue, and risks associated with sedentary behavior such as obesity and diabetes. Psychological risks include social isolation, reduced communication skills, and escapism, which may exacerbate conditions like anxiety and depression. Technical challenges involve the need for expensive, high-performance hardware and issues like system latency, which can disrupt immersion (de Zambotti et al., 2022).

Ethical and legal concerns also arise, including data privacy risks and exposure to inappropriate content, such as violent or sexual material issues particularly

troubling for young users (González-Tapia, 2023).

Economic barriers stem from the high cost of VR devices, limiting access to educational and medical applications (McCauley & Sharkey, 1992).

In addition, educational limitations include a lack of well-developed content and the need for educators to receive proper training in using VR tools (Hettinger & Haas, 2003).

Among the most popular VR games in Amman-based venues for teens are Beat Saber on Stem (2019), Half-Life: Alyx on Stem (2019), The Walking Dead: Saints & Sinners on Stem (2020), Superhot VR on Stem (2017), and VR Ring on Stem (2016). These games are widely played due to their immersive and engaging gameplay experiences.

Mental Health

Mental health encompasses a broad range of psychological conditions and factors that contribute to an individual's emotional, psychological, and social well-being. It can be classified into three primary domains: positive mental health, preventive mental health, and mental disorders.

Positive mental health involves emotional well-being, such as experiencing happiness, satisfaction, and optimism; psychological and social functioning, including forming meaningful relationships and community involvement; and psychological resilience, or the ability to adapt to stress and challenges (Csikszentmihalyi, 2014).

Preventive mental health emphasizes the importance of strong social support systems, healthy lifestyles (balanced nutrition, physical activity, and sleep), and essential life skills like stress management and communication (Nichols & Davis, 2021).

Mental disorders, as outlined in the DSM-5-TR (American Psychiatric Association, 2022), include a wide range of conditions. Common categories are anxiety disorders (e.g., generalized anxiety, panic disorder, OCD), mood disorders (e.g., depression, bipolar disorder), and eating disorders (e.g., anorexia nervosa, bulimia nervosa, binge-eating disorder).

Several factors influence mental health. Biological factors include genetics and neurochemical balances (e.g., serotonin and dopamine), along with physical health behaviors such as diet, exercise, and sleep (Lovallo, 2015).

Psychological, social, and environmental factors such as coping skills, optimism, social support, and engagement in meaningful relationships also contribute significantly. Cultural beliefs, spiritual practices like meditation and yoga, and a supportive home and work environment play vital roles in promoting well-being (Uchino, 2004).

Economic stability, quality education, and mental health awareness further enhance individual resilience, reduce anxiety, and promote early recognition and intervention for mental health issues (Linley et al., 2010).

Understanding these factors is essential for promoting mental health and addressing the psychological needs of adolescents, particularly as they navigate the challenges of modern technology and virtual environments.

Theories Explaining Mental Health

Alfred Adler (1937) viewed humans as inherently social beings, whose sense of mental health is influenced by overcoming feelings of inferiority through positive social upbringing and the pursuit of purposeful life goals. This process builds a resilient character

capable of handling life's challenges.

Carl Rogers (1989) emphasized the importance of self-awareness and congruence between self-perception and actions. A positive self-concept, according to Rogers, reflects good mental health.

Abraham Maslow (1943), a central figure in humanistic psychology, argued that mental health can only be achieved when individuals satisfy basic to advanced needs (physiological, safety, love, esteem, and self-actualization) as outlined in his hierarchy of needs.

Cognitive theorists, such as Daniel (2023), conceptualize mental health as the capacity to interpret life events constructively. Mental well-being involves a sense of self-efficacy, effective coping strategies, hopefulness, and adaptive cognitive evaluations. Conversely, poor mental health results from distorted perceptions, helplessness, and ineffective problem-solving.

From a behavioral perspective, mental health is understood as the ability to respond appropriately to environmental stimuli, free from anxiety and psychological stress. Effective adaptation and learning of healthy behavioral responses are seen as indicators of good mental health (Tahan, 1996).

In conclusion, mental health is not a fixed condition but a dynamic process of psychological adaptation that enables self-actualization. It manifests in several ways, including cognitive flexibility, emotional regulation, social adaptability, self-understanding, and goal orientation. It encompasses both an individual's internal relationship with the self and their external relationship with society, involving accurate self-perception, emotional insight, and secure engagement with the surrounding environment (Calhoun & Acocella, 1983).

Literature Review

In a study conducted by Clara et al. (2024), this systematic review aimed to evaluate the effectiveness of digital games in promoting youth mental health across individuals aged 2 to 29. The study included reviews and descriptive analyses of research published between 2012 and 2022, using databases like Scopus, Google Scholar, PubMed, and Cochrane Library. The results indicated that digital games generally have a positive effect on mental health. However, their effectiveness depends on specific content features, and many studies lacked experimental validation.

In a study conducted by Chen et al. (2023), this review analyzed 59 experimental studies conducted between 2013 and 2023, focusing on enhancing mental health in children and adolescents through digital technology. The findings showed a growing trend in using mobile applications, VR, serious games, and telehealth services to address issues such as anxiety, depression, bullying, and low emotional competence. VR was found to have a moderate to large effect in improving mental health outcomes.

Halldorsson et al. (2021), this study explored the effectiveness of digital application games and virtual reality interventions for treating mental health issues in children and adolescents under the age of 18. It included 19 studies targeting symptoms such as anxiety, depression, and phobias. Results showed that application-based games helped reduce depression symptoms in adolescents, although limited research existed on the effectiveness of VR interventions in younger populations.

In a study conducted by Pallavicini and Pepe (2020), this study investigated the role of body engagement in VR games in enhancing positive emotions and reducing anxiety. Thirty-six participants played two VR games: one with low physical involvement (Fruit Nin-

ja VR) and another with high physical involvement (Audioshield VR). Results indicated a significant increase in happiness and a reduction in anxiety, fear, and sadness especially in the high-body involvement game highlighting the emotional benefits of immersive gameplay.

Al-Tamimi (2020), this study evaluated the effectiveness of VR-based exposure therapy for treating social and specific anxiety disorders. Seven participants underwent a program of gradual desensitization through VR exposure sessions. The results showed a reduction in fear and anxiety levels, with participants improving from moderate anxiety to low or no fear, demonstrating VR's potential as a psychological intervention tool.

The current study differs from previous studies in that it aims to explore the relationship between virtual reality games and mental health among a sample of adolescents. Additionally, there is a lack of sufficient studies on virtual reality games in this context.

Study Population and Sample

The study targeted a population of 210 male and female adolescents who regularly use virtual reality games at VR gaming centers in Amman during the 2023/2024 academic year. From this population, a purposive sample of 150 adolescents aged 15 to 18 years was selected. Participants were recruited from various VR centers in Amman, including The Terminal VR, VR Zone Events Center, The Switch Escape Room & VR, Another World, MSK Gaming Center and Score Gaming Lounge.

A total of 27 individuals were excluded due to incomplete questionnaire responses. The final sample was selected based on purposive sampling, ensuring that participants were active users of VR games. The demographic distribution of the sample is presented

in Table (1), categorized by gender, age, economic level, family marital status and parental education level.

Table (1): Distribution of the Study Sample

Variable	Variable Levels	Number	Percentage
Gender	Male	87	58.0
	Female	63	42.0
Agy	Age 15	38	25.3
	Age 16	22	14.7
	Age 17	33	22.0
	Age 18	57	38.0
Family Economic Level	Low	16	9.3
	Medium	99	67.3
	High	35	23.3
Parents' Marital Status	Married	109	72.7
	Separated	41	27.3
Mother's Educational Level	High school	72	48.0
	Bachelor's	59	39.3
	Postgraduate	19	12.7
Father's Educational Level	High school	67	44.7
	Bachelor's	59	39.3
	Postgraduate	24	16.0
Frequency of Virtual Reality Use	Daily	39	26.0
	Twice a week	35	23.3
	Once a week	27	18.0
	Once every two week	49	32.7
Total		150	100.0

Study Tools

First: Mental Health Inventory-18 (MHI-18)

To achieve the objectives of the current study, the Mental Health Inventory-18 (MHI-18) was used. This tool, developed by McHorney et al. (1992) as a short version of the original MHI-38 by Veit and Ware (1983), was adopted in its Arabic-translated version by Momani (2020). The MHI-18 is designed to assess both the positive and negative dimensions of mental health and consists of 18 items across four clinical subscales:

- Anxiety: Items 1–5
- Depression: Items 6–9
- Behavior Control: Items 10–13
- Positive Affect: Items 14–18

Participants respond to each item on a 5-point

Likert scale: Always (5), Often (4), Sometimes (3), Rarely (2), and Does Not Apply (1).

The scale demonstrates strong internal consistency, with Cronbach's alpha values for the subscales ranging from 0.90 to 0.95, and an overall reliability of 0.95 (McHorney et al., 1992).

Face Validity

The Arabic version of the Mental Health Inventory-18 (MHI-18), translated by Momani (2020), was evaluated for face validity by presenting it to 10 expert judges specializing in clinical psychology, psychological counseling, and educational counseling. The purpose was to assess the clarity, appropriateness, and relevance of the items in measuring the intended constructs.

A consensus rate of 80% agreement among the judges was adopted as the criterion for acceptance. Based on their feedback, several modifications were made to enhance item clarity and ensure the scale's appropriateness for the target sample. Table (2) presents the judges' suggested modifications and how they were incorporated into the final version of the scale.

Table (2): Expert Modifications MHI – 18

Item Number	Item Before modifications	Item After modifications
1	I felt excessive anxiety	I feel anxious
2	I felt very tense and agitated	I feel very tense and agitated
3	I was able to regain my calm without difficulties	I am able to regain my calm without difficulties
4	I felt tightness in my chest	I feel tightness in my chest
5	I was preoccupied with thoughts	I feel preoccupied with thoughts
6	I felt depressed	I feel depressed
7	I felt sad	I feel sad
8	I felt pessimistic about people and situations	I feel pessimistic about people and situations
9	I felt that my mood was disturbed	I feel that my mood is disturbed
11	I felt emotionally stable	I feel emotionally stable
12	I did not have any future aspirations	I do not set future goals or aspirations
13	I felt that I was in a difficult crisis and nothing made me happy	I feel that I am in a difficult crisis and nothing makes me happy
15	I felt loved	I feel loved
16	I felt calm and peaceful	I feel calm and peaceful
17	I felt cheerful and happy	I feel cheerful and happy
18	I felt that I was a happy person	I feel that I am a happy person

Construct Validity

To verify the construct validity of the scale, it was applied to a sample consisting of 33 adolescents, selected from outside the study sample but from the same population, as shown in Table (3).

Table (3): Item-Dimension Correlation Coefficients for the MHI-18

Anxiety		Depression		Behavior Control		Positive Effect	
Item	Dimension	Item	Dimension	Item	Dimension	Item	Dimension
1	0.833**	6	0.851**	10	0.690**	14	0.848**
2	0.824**	7	0.852**	11	0.507**	15	0.621**
3	0.651**	8	0.822**	12	0.492**	16	0.428*
4	0.856**	9	0.847**	13	0.794**	17	0.660**
5	0.793**					18	0.846**

*Statistically significant at $\alpha \leq 0.05$
 **Statistically significant at $\alpha \leq 0.01$

Table (3) shows that the reliability coefficients of the scale dimensions are acceptable, as all values were above (0.60). Accordingly, the scale was approved in its final form consisting of (18) items.

Second: Post-VR Questionnaire

To fulfill the objectives of the current study, the Post-Test version of the Post-VR Questionnaire, developed by Paul, Bullock, and Bailenson (2020), was utilized. The scale was translated into Arabic using clear and straightforward language, and it was adopted with adaptations to align with the local research context. The adapted version used in this study consisted of 25 items distributed across seven clinical dimensions:

1. Presence (Items 1, 2, 3)
2. Physical Symptoms (Items 4, 5, 6, 7, 8, 9)
3. Discomfort (Items 10, 11, 12)
4. Perceived Usefulness (Items 13, 14, 15)
5. Ease of Use (Items 16, 17, 18)
6. Attitude Toward Use (Items 19, 20, 21)
7. Willingness to Use (Items 22, 23, 24, 25)

Participants responded to each item using a five-point Likert scale, with the following options: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), Strongly disagree (1).

Construct Validity

To verify the construct validity of the scale, it was administered to a sample of 33 adolescents from within the study population but outside the main study sample. The correlations between each item and its corresponding dimension, as well as with the total scale, were calculated. These correlations are presented in Table (4).

Table (4): Item-Dimension and Total Score Correlation Coefficients for the Post-VR Questionnaire

Presence			Discomfort			Attitude Toward Use		
Item Number	Dimension	The Scale as a Whole	Item Number	Dimension	The Scale as a Whole	Item Number	Dimension	The Scale as a Whole
1	0.567**	0.201	11	0.887**	0.488**	19	0.840**	0.639**
2	0.469**	0.138	12	0.848**	0.439*	20	0.867**	0.678**
3	0.412*	0.169	Correlation of the Subscale with the Total Scale		0.535**	21	0.867**	0.624**
4	0.393*	0.482**			Perceived Usefulness	22	0.815**	0.602**
5	0.550**	0.567**	13	0.701**	0.444**	Correlation of the Subscale with the Total Scale		0.750**
Correlation of the Subscale with the Total Scale		0.694**	14	0.667**	0.368*			Willingness to Use
		Physical Symptoms	15	0.873**	0.727**	23	0.657**	0.675**
6	0.876**	0.529**	16	0.873**	0.585**	24	0.578**	0.061
7	0.842**	0.532**	Correlation of the Subscale with the Total Scale		0.683**	25	0.781**	0.406*
8	0.787**	0.377*			Ease of Use	Correlation of the Subscale with the Total Scale		0.562**
9	0.790**	0.460**	17	0.928**	0.646**			
10	0.718**	0.443**	18	0.900**	0.656**			
Correlation of the Subscale with the Total Scale		0.584**	Correlation of the Subscale with the Total Scale		0.711**			

The data presented in Table (4) indicate that the correlation coefficients between individual items and the total score of the scale ranged from (0.061 to 0.727). The correlation coefficients between the items and their respective dimension ranged from (0.393 to 0.928), while the correlation coefficients between the dimension and the total score of the scale ranged from (0.535 to 0.750). An item was considered acceptable if its correlation with the corresponding dimension was higher than (0.30). Therefore, the final version of the scale retained all (25) items.

Reliability of Post-VR Questionnaire

To ensure the reliability of the scale, the internal consistency coefficients for the scale's dimensions were calculated using Cronbach's alpha. The scale was first administered to a pilot sample on 10/01/2024, and test-retest reliability was assessed with a two-week interval, with the second administration conducted on 24/01/2024. The pilot sample consisted of 33 adolescents from outside the main study sample but from the same population. Table (5) presents the reliability coefficients for the dimension and the total scale.

Table (5): Reliability Coefficients of the Post-VR Questionnaire Dimensions and the Overall Scale

Dimensions	Internal Consistency Reliability Coefficient	Test-Retest Reliability
Overall Scale	0.858	0.849
Presence	0.728	0.751
Physical Symptoms	0.860	0.711
Discomfort	0.668	0.710
Perceived Usefulness	0.780	0.792
Ease Of Use	0.799	0.728
Attitude Toward Use	0.865	0.801
Willingness To Use	0.701	0.696

Results

Q1. What is the level of virtual reality game usage among adolescents?

To answer this question, means and standard deviations were calculated for the level of virtual reality game usage among adolescents. Table (6) presents the results:

Table (6): Means and Standard Deviations of the Level of Virtual Reality Game Usage

Number	Dimensions	Rank	Mean	Standard Deviation	Level
5	Ease Of Use	1	4.30	0.788	High
6	Attitude Toward Use	2	4.23	0.700	High
7	Willingness To Use	3	3.99	0.896	High
3	Discomfort	4	3.58	1.152	Moderate
4	Perceived Usefulness	5	3.50	0.788	Moderate
1	Presence	6	3.33	0.396	Moderate
2	Physical Symptoms	7	3.32	1.072	Moderate
Level of Virtual Reality Game Usage			3.68	0.454	High

These findings suggest that adolescents perceive VR games as highly engaging and easy to use, which may explain their high usage levels. The ease of use and immersive design of VR systems can increase users' motivation and emotional engagement, contributing to positive gaming experiences.

The results of this question showed the mean score of adolescents' responses who use virtual reality games on the Post-VR Questionnaire. The level of virtual reality game usage was (3.68), indicating a high level. The mean scores of the dimensions ranged between (3.32–4.30), with the highest being the Ease of Use dimension at (4.30), while the lowest was the Physical Symptoms dimension at (3.32).

The results show that users find virtual reality games and ease of use to be at a high level, which may indicate that the design of the games and virtual reality devices is characterized by flexibility and

ease of interaction, enhancing the adolescent's experience. The users, among adolescents, show a positive attitude toward using virtual reality games, indicating broad acceptance of this technology and a desire to use it. The results show a strong desire or high intent to use virtual reality games among adolescents, reflecting the appeal of these games and their ability to attract users, as well as their ease of use and accessibility. However, despite the high levels of usage and positive intent, the Discomfort scale indicates that some users experience some discomfort during gameplay, possibly due to technical or interactive issues within the games. As for the Perceived Usefulness of using virtual reality games, they are at a medium level, suggesting that users see certain benefits, but these are not strong enough to motivate intensive use. This Perceived Usefulness may be related to the educational and entertainment value of the games.

These results may be attributed to the significant similarity between virtual reality and real-life experiences in terms of content and context, combined with technological advancements that provide the virtual experience with additional features not found in reality itself. Furthermore, the ease of use, accessibility and relatively reasonable cost of VR games contribute to their popularity. Additionally, adolescents' motivations for using electronic games are often centered around entertainment, enjoyment and filling their free time.

Q2. What is the level of mental health among adolescents who use virtual reality games?

To answer this question, the mean scores and standard deviations for the dimensions of mental health among adolescents were calculated. Table (7) presents the results:

Table (7): Means and Standard Deviations of the Levels of Mental Health Dimensions

Number	Dimensions	Rank	Mean	Standard Deviation	Level
4	Positive Effect	1	3.82	1.014	High
3	Behavior Control	2	3.36	0.732	Moderate
1	Anxiety	3	2.97	0.964	Moderate
2	Depression	4	2.64	1.031	Moderate

The results indicate that adolescents who frequently play VR games experience more positive emotions and a moderate level of behavioral control, along with lower levels of anxiety and depression. This pattern may suggest that VR gameplay provides an emotional outlet, helping adolescents manage stress and enhance mood regulation.

Answer It is clear from Table (7) that the mean scores for the dimensions of mental health among adolescents ranged between (2.64-3.82). The first rank was for the dimension of Positive Effect with a mean score of (3.82), indicating a high level. This was followed by the dimension of Behavior Control with a mean score of (3.36), indicating a medium level. Next came the dimension of Anxiety with a mean score of (2.97), also at a medium level. Lastly, the dimension of Depression ranked the lowest, with a mean score of (2.64), indicating a medium level.

This means that the mental health level of the adolescents in the study is high in terms of Positive Effect. These results may be attributed to the fact that virtual reality can serve as an outlet for the pressures and stress associated with adolescence, providing the adolescent with an immersive sensory experience that enhances positive emotions and reduces anxiety and depression. Additionally, Behavior Control is at a moderate level, indicating that the games present challenges in self-regulation, especially when interacting with virtual environments. It appears that ad-

olescent users of virtual reality games enjoy a high level of positive effect, which may be due to the positive interactions with games that offer enjoyable, motivating and interactive experiences.

Q3. Is there a statistically significant relationship at the level of ($\alpha=0.05$) between the use of virtual reality games and mental health among adolescents?

To answer this question, Pearson's correlation coefficient was used to assess the relationship between the use of virtual reality games and mental health among adolescents. Table (8) shows the results:

Table (8): Pearson Correlation Coefficients Between Virtual Reality Game Usage and Mental Health

Variable	Virtual Reality Games Usage	
	Correlation Coefficient	Significance Level
Anxiety	-0.194*	0.017
Depression	-0.300*	0.000
Behavior Control	0.191*	0.019
Positive Effect	0.281*	0.000

*Statistically significant at $\alpha \leq 0.05$

The positive correlations between VR gaming and behavioral control and positive affect suggest that interactive and immersive elements of VR may foster emotional stability and social competence. Conversely, the inverse relationships with anxiety and depression highlight the potential protective role of VR engagement when used in moderation.

It is evident from Table (8) that there is a direct relationship between the use of virtual reality games and both Behavior Control and Positive Effect, with correlation coefficients of (0.191, 0.281). There is also an inverse relationship between the use of virtual reality games and both Anxiety and Depression, with correlation coefficients of (-0.194, -0.300). All of these values are statistically significant at the level (0.05).

There is a direct relationship between the use of virtual reality games and behavior control, meaning that adolescents who use virtual reality games more frequently show a higher level of behavior control. Additionally, there is a direct relationship between the use of virtual reality games and positive mental health effects, indicating that as the use of virtual reality games increases, the positive impact on adolescents' mental health also increases. This relationship can be attributed to the interactive and engaging elements in virtual reality games that provide an enjoyable experience and reduce psychological stress. There is an inverse relationship between the use of virtual reality games and anxiety, meaning that using the games may slightly contribute to lowering anxiety levels among adolescents. This may be due to the interactive and positive effects of the games, which provide an outlet for psychological pressure and anxiety. As for the relationship between the use of virtual reality games and depression, it is also inverse, indicating that the games may have a positive impact on reducing symptoms of depression among adolescents. Engaging in games can have therapeutic effects, helping to improve mood and reduce feelings of depression.

These findings can be interpreted through the lens of Flow Theory (Csikszentmihalyi, 2014), which proposes that when individuals are fully immersed in an activity that matches their skills and interests, they experience a state of engagement that enhances enjoyment and reduces negative emotions. Virtual reality (VR) games provide an optimal environment for such flow experiences, as they stimulate sensory, cognitive, and emotional systems simultaneously. This immersion allows adolescents to temporarily detach from daily stressors, thereby reducing anxiety and depressive symptoms while fostering positive affect and self-control. From a neuropsychological perspective, VR gaming activates reward pathways associated with dopamine release, which contributes to mood

improvement and emotional regulation.

This result can be attributed to the fact that virtual reality games, like other types of games, may enhance the release of reward hormones such as dopamine and serotonin in the brain. The impact of virtual reality games is theoretically greater because they are highly realistic and provide an immersive experience, which in turn enhances positive emotions in adolescents and reduces negative states.

Q4. Are there statistically significant differences at the level of ($\alpha=0.05$) in the levels of mental health among adolescents who use virtual reality games that attributed to the variables of gender, age, economic level, family social status and parents' education level?

To answer this question, the mean scores and standard deviations of the levels of mental health among adolescents who use virtual reality games were extracted, attributed to the variables of gender, age, economic level, family social status and parents' education level. Table (9) shows the results:

Table (9) shows that there are apparent differences in the levels of mental health among adolescents who use virtual reality games, attributed to the variables of gender, age, economic level, family social status and parents' education level. To determine whether these apparent differences are statistically significant, a Multivariate Analysis of Variance (MANOVA) was conducted, and Table (10) presents the results:

Table (10) shows that there are no statistically significant differences at the significance level ($\alpha = 0.05$) in the use of virtual reality games and the level of mental health among adolescents who use virtual reality games, attributed to gender, age, economic level, family social status and parents' education level, as

the values of "F" were statistically significant higher than (0.05).

The results of this question show the mean scores of adolescent users of virtual reality games regarding the use of virtual reality games and mental health according to the variables of gender, age, economic level, family social status and parents' education level. There were apparent differences in the responses, but to confirm whether these apparent differences are statistically significant, a multivariate analysis of variance (MANOVA) was conducted. The analysis revealed that there were no statistically significant differences at the ($\alpha=0.05$) level in the use of virtual reality games and mental health among adolescent users, based on gender, age, economic level, family social status and parents' education level. The "F" value was statistically significant higher than (0.05).

These results can be attributed to the fact that the virtual reality experience pulls the adolescent out of their current reality and immerses them in a different context, causing external differences to blur within the virtual reality, allowing the individual to shape the reality they desire. Therefore, there was no impact of the different variables on the results of the scales.

The lack of significant differences by gender or age may be attributed to the universal appeal of VR technology, which transcends demographic boundaries by offering similar experiences of immersion and enjoyment for both males and females.

These findings are consistent with previous studies emphasizing the therapeutic and emotional benefits of VR. Pallavicini and Pepe (2020) found that VR games with physical involvement increase happiness and reduce anxiety.

While Lee et al. (2021) observed that social VR

experiences enhance connectedness and self-esteem, reducing depressive symptoms. This suggests that immersive technologies can promote mental health when used for constructive and socially engaging purposes.

In addition to these findings, the current study found no statistically significant differences in VR use or mental health variables according to gender, age, or socioeconomic factors. This may indicate that the immersive nature of VR provides similar psychological experiences across demographic groups, suggesting that its impact on mental health is driven primarily by the quality of the experience rather than by individual characteristics.

In summary, the discussion highlights that virtual reality gaming can have a meaningful psychological impact on adolescents, promoting emotional regulation, positive affect, and behavioral control when used moderately and purposefully. The results collectively suggest that VR is not merely a form of entertainment but also a potential tool for enhancing mental well-being. However, excessive or unstructured use may diminish these benefits and increase the risk of psychological dependency. Therefore, it is essential to approach VR integration with awareness and balance, ensuring it serves as a positive psychological and developmental experience for young users.

Recommendations

In light of the study results, several recommendations can be proposed:

1. Integrate virtual reality games into psychological treatment programs to enhance therapeutic outcomes and provide effective therapeutic experiences.
2. Conduct more research on the uses of virtual reality games and their impact on mental health, includ-

ing children and adolescents in the study samples.

3. Raise awareness among mental health service providers in the community about the benefits of virtual reality games for mental well-being.
4. Emphasize ethical and safe practices when using virtual reality games, ensuring both psychological and physical safety.
5. Develop culturally adapted VR content that supports healthy psychological and social development among Arab adolescents.

Table (9): Means and Standard Deviations of Virtual Reality Game Usage and Mental Health According to Gender, Age, Economic Level, Family Marital Status and Parental Education Level

Variable	Variable Levels		VR Games Usage	Anxiety	Depression	Behavior Control	Positive Effect
Gender	Male	Mean	3.72	2.93	2.60	3.41	3.85
		Standard Deviation	0.40	1.02	1.06	0.78	1.02
	Female	Mean	3.62	3.02	2.68	3.29	3.78
		Standard Deviation	0.51	0.88	0.99	0.66	1.01
Age	15	Mean	3.80	3.06	2.82	3.20	3.74
		Standard Deviation	0.38	0.95	1.08	0.75	1.09
	16	Mean	3.63	3.07	2.80	3.36	4.09
		Standard Deviation	0.44	1.03	1.13	0.61	0.90
	17	Mean	3.56	2.97	2.63	3.65	3.77
		Standard Deviation	0.46	0.74	0.77	0.90	0.89
	18	Mean	3.68	2.86	2.46	3.29	3.79
		Standard Deviation	0.49	1.07	1.09	0.62	1.07
Economic Level	Low	Mean	3.60	3.31	3.20	3.11	3.46
		Standard Deviation	0.46	1.12	0.89	0.34	1.25
	Medium	Mean	3.68	2.90	2.57	3.40	3.77
		Standard Deviation	0.46	0.93	1.03	0.78	1.02
	High	Mean	3.72	3.00	2.56	3.35	4.11
		Standard Deviation	0.43	0.98	1.03	0.71	0.80
Family Marital Status	Married	Mean	3.68	2.94	2.59	3.37	3.78
		Standard Deviation	0.47	0.91	1.01	0.74	0.98
	Separated	Mean	3.67	3.04	2.76	3.32	3.92
		Standard Deviation	0.41	1.10	1.09	0.73	1.12
Mother's Educational Leve	High school and below	Mean	3.64	3.09	2.81	3.29	3.76
		Standard Deviation	0.43	1.06	1.05	0.68	1.08
	Bachelor's	Mean	3.70	2.77	2.46	3.39	3.78
		Standard Deviation	0.49	0.88	1.02	0.80	1.01
	Postgrad-uate	Mean	3.78	3.12	2.53	3.51	4.18
		Standard Deviation	0.45	0.74	0.91	0.73	0.64
Father's Educational Level	High school and below	Mean	3.61	3.02	2.72	3.21	3.74
		Standard Deviation	0.43	1.10	1.09	0.59	1.06
	Bachelor's	Mean	3.74	2.90	2.56	3.42	3.76
		Standard Deviation	0.46	0.85	1.05	85.	1.00
	Postgrad-uate	Mean	3.71	2.99	2.59	3.60	4.17
		Standard Deviation	0.50	0.83	0.81	0.73	0.86

Table (10): Multivariate Analysis of Variance (MANOVA) of Differences in Virtual Reality Game Usage and Mental Health According to Gender, Age, Economic Level, Family Marital Status and Parental Education Level

Source of Variance	Dependent Variable	Sum of Squares	Degrees of Freedom	Mean Squares	F Value	Statistical Significance
Gender	VR Game Use	0.440	1	0.440	2.131	0.147
	Anxiety	1.256	1	1.256	1.327	0.251
	Depression	1.319	1	1.319	1.254	0.265
	Behavioral Control	0.273	1	0.273	0.530	0.468
	Positive Effect	0.263	1	0.263	0.255	0.615
Age	VR Game Use	1.034	3	0.345	1.668	0.177
	Anxiety	0.676	3	0.225	0.238	0.870
	Depression	2.817	3	0.939	0.892	0.447
	Behavioral Control	4.048	3	1.349	2.617	0.054
	Positive Effect	3.048	3	1.016	0.986	0.401
Economic Level	VR Game Use	0.049	2	0.025	0.119	0.887
	Anxiety	1.784	2	0.892	0.942	0.392
	Depression	4.126	2	2.063	1.961	0.145
	Behavioral Control	1.241	2	0.620	1.203	0.303
	Positive Effect	3.419	2	1.709	1.659	0.194
Family Marital Status	VR Game Use	0.002	1	0.002	0.007	0.932
	Anxiety	0.218	1	0.218	0.230	0.632
	Depression	0.997	1	0.997	0.948	0.332
	Behavioral Control	0.044	1	0.044	0.085	0.771
	Positive Effect	0.127	1	0.127	0.124	0.726
Mother's Educational Level	VR Game Use	0.077	2	0.039	0.187	0.829
	Anxiety	3.210	2	1.605	1.695	0.187
	Depression	2.384	2	1.192	1.133	0.325
	Behavioral Control	0.011	2	0.005	0.010	0.990
	Positive Effect	0.109	2	0.055	0.053	0.948
Father's Educational Level	VR Game Use	0.368	2	0.184	0.890	0.413
	Anxiety	0.239	2	0.120	0.126	0.881
	Depression	0.282	2	0.141	0.134	0.875
	Behavioral Control	1.924	2	0.962	1.866	0.159
	Positive Effect	1.306	2	0.653	0.634	0.532
Error	VR Game Use	28.505	138	0.207		
	Anxiety	130.633	138	0.947		
	Depression	145.181	138	1.052		
	Behavioral Control	71.148	138	0.516		
	Positive Effect	142.199	138	1.030		
Total	VR Game Use	30.693	149			
	Anxiety	138.326	149			
	Depression	158.323	149			
	Behavioral Control	79.927	149			
	Positive Effect	153.115	149			

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