Review

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Early Maladaptive Schemas and Technology-Related Addictive Behaviors: A Systematic Review

Erken Dönem Uyumsuz Şemalar ve Teknolojiyle İlişkili Bağımlılık Davranışları: Sistematik Bir Derleme

Buse Nur Koluaçık[1], Sanem Alarslan[1], Elif Üzümcü[1]

[1]Başkent University, Ankara

ABSTRACT

The objective of this study was to systematically synthesize the findings on the relationship between early maladaptive schemas and technology-related addictive behaviors such as online gambling, impulsive and compulsive online buying, video gaming, online compulsive sexual behaviors, and problematic use of social media, the Internet, or smartphones. The inclusion criteria were containing early maladaptive schemas and technology-related addictive behaviors, being published in a refereed journal in the English language, using validated instruments, and being a research article. The exclusion criteria were being in a language other than English, lacking relevance, not containing online addictive behaviors, not using the Young Schema Questionnaire, and being a source other than a research article. Electronic database searches were conducted via Scopus, ProQuest, PubMed, and Web of Science using comprehensive terms such as "maladaptive schemas", "internet addiction", "smartphone addiction", "social media addiction", "technology addiction", "online gaming", "online gambling", "online buying", and "online pornography". A total of 11 studies were included. While technology-related addictive behaviors were associated with all five schema domains, the Disconnection and Rejection, and Impaired Limits domains were the domains most strongly associated with technology-related addictive behaviors. In general, this review indicates that little is known regarding the relationship between early maladaptive schemas and technology-related addictive behaviors. Therefore, further studies are needed to better understand this relationship.

Keywords: Early maladaptive schemas, schema, technology, behavioral addictions

ÖZ

Bu çalışmanın amacı, erken dönem uyumsuz şemalar ile çevrimiçi kumar, dürtüsel ve kompulsif çevrimiçi satın alma, video oyunları oynama, çevrimiçi kompulsif cinsel davranışlar ve sosyal medya, internet veya akıllı telefonların sorunlu kullanımı gibi teknolojiyle ilişkili bağımlılık yapıcı davranışlar arasındaki ilişkiye dair bulguları sistematik olarak sentezlemektir. Çalışmaya dâhil edilme kriterleri çalışmaların erken dönem uyumsuz şemalar ve teknoloji ile ilişkili bağımlılık yapıcı davranışlar içermesi, hakemli bir dergide İngilizce dilinde yayınlanmış olması, geçerliliği kanıtlanmış ölçüm araçlarının kullanılması ve görgül araştırma makalesi olmasıdır. Dışlama kriterleri ise İngilizce dışında bir dilde olması, konuyla ilgili olmaması, çevrimiçi bağımlılık davranışlarını içermemesi, Young Şema Ölçeği'ni kullanmaması ve görgül araştırma makalesi dışında bir makale türü olmasıdır. Elektronik veritabanı taraması Scopus, ProQuest, PubMed ve Web of Science aracılığıyla "uyumsuz şemalar", "internet bağımlılığı", "akıllı telefon bağımlılığı", "sosyal medya ekleme", "teknoloji bağımlılığı", "çevrimiçi oyun", "çevrimiçi kumar", "çevrimiçi satın alma" ve "çevrimiçi pornografi" gibi kapsamlı terimler kullanılarak yapılmıştır. Toplam 11 çalışma dâhil edilmiştir. Teknolojiyle ilişkili bağımlılık yapıcı davranışlar ile beş şema alanının tümü arasında bir ilişki bulunmasına rağmen, Kopukluk ve Reddedilme şema alanı ve Zedelenmiş Sınırlar şema alanı teknolojiyle ilişkili bağımlılık yapıcı davranışlar ile en fazla ilişkili olan şema alanlarıdır. Genel olarak bu derleme erken dönem uyumsuz şemalar ile teknoloji ile ilişkili bağımlılık yapıcı davranışlar arasındaki ilişki hakkında çok az şey bilindiğini göstermektedir. Bu nedenle bu ilişkiyi daha iyi anlamak için daha fazla çalışmaya ihtiyaç duyulmaktadır.

Anahtar sözcükler: Erken dönem uyumsuz şemalar, teknoloji, davranışsal bağımlılıklar

Address for Correspondence: Elif Üzümcü, Başkent University Faculty of Science and Letters Department of Psychology, Ankara, Türkiye
e-mail: euozdemir@baskent.edu.tr
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Introduction

Addiction can be characterized as a process in which a behavior that can be used to both relieve internal discomfort and provide pleasure is repeatedly engaged in, with an inability to control the behavior and a persistence of the behavior despite serious adverse effects (Goodman 1990). Scientists in behavioral science disagree with the widespread notion that addiction is limited to dependence on chemicals such as alcohol, and suggest that any behavior that provides stimulation has the potential to cause addiction (Alavi et al. 2012). Behavioral addictions involve activities such as gambling (Griffiths 1990), playing video games (Griffiths and Davies 2005), eating foods (Pelchat 2009), using the Internet (Young 2009), exercising (Berczik et al. 2014), shopping (Maraz and Costa 2022), and using smartphones (Panova and Carbonell 2018). Behavioral addictions are characterized by repeated and prolonged engagement in specific behaviors that become problematic over time and lead to significant impairments in daily functioning. Potenza (2006) suggested that both chemical and behavioral addictions share core indicators such as an inability to control one's behavior before compulsively engaging in the addictive behavior, a desiring state before engaging in that behavior, and continuing to engage in that behavior despite negative outcomes.

As a form of behavioral addiction, technology addiction has been receiving increasing attention from both researchers and mental health professionals due to its widespread impact on people's daily life activities in the digital age. Technology addiction is an umbrella term that describes the inability to control the desire to use technological devices (Kugler 2020). This broad term consists of many technology-related addictive behaviors, such as problematic use of the Internet, and online gambling (Ryding and Kaye 2018). Chóliz et al. (2012) suggested that technology addiction includes some criteria, including the demand for using the technological devices more (tolerance), an unusually long period of emotionally severe discomfort when using the technological device is interrupted or stopped (withdrawal), using technological devices for longer periods than initially intended, wanting to cease using technology but are unable to accomplish so, investing excessive amounts of time in technology-related activities, and giving up on other interests to spend more time on technology-related activities despite the negative outcomes.

Table 1. Early maladaptive schemas (EMSs) and schema domains

Schema Domains	Early Maladaptive Schemas
1) Disconnection and Rejection	Abandonment, Mistrust, Emotional Deprivation, Defectiveness, Social Isolation
2) Impaired Autonomy and Performance	Dependence, Vulnerability to Harm or Illness, Enmeshment, Failure
3) Impaired Limits	Entitlement, Insufficient Self-Control
4) Other-Directedness	Subjugation, Self-Sacrifice, Approval Seeking
5) Overvigilance and Inhibition	Negativity, Emotional Inhibition, Unrelenting Standards, Punitiveness

A potential contributing factor to the emergence and maintenance of behavioral addictions such as technology addiction is the triggering of early maladaptive schemas (EMSs) (Vieira et al. 2023). EMSs are characterized as self-defeating emotional and cognitive patterns that are formed early in childhood and persist throughout an individual's life (Young 1990, Young et al. 2003). EMSs emerge when fundamental emotional needs such as a sense of secure attachment, feelings of autonomy and independence, the opportunity to express emotions and needs freely, spontaneity and play, and the development of realistic boundaries and self-discipline, are not met during childhood (Young et al. 2003). EMSs are rooted in early experiences with caregivers, where these needs were either unmet, boundaries were absent, or excessive overprotection/overindulgence was present. Young et al. (2003) categorized 18 schemas into five divergent schema domains (see Table 1 for EMSs and schema domains). The "Disconnection and Rejection" domain is related to the difficulties in forming a secure bond with caregivers, and attachment difficulties are the essential characteristics of all schemas in this domain (Arntz and Jacob 2013). The "Impaired Autonomy and Performance" refers to a deficiency of autonomy and competence, and schemas of this domain are characterized by difficulties with autonomy and achievement potential (Arntz and Jacob 2013). The "Impaired Limits" domain is related to the deficiency of adequate internal limits, and individuals with schemas of this domain have difficulty in setting realistic limits and a lack of self-discipline (Arntz and Jacob 2013). The "Other-Directedness" domain is associated with the deficiency of freedom to state needs,

and individuals with schemas of this domain prioritize the needs and desires of other people over their own. The "Overvigilance and Inhibition" is related to the deficiency of spontaneity and play, and people with schemas of this domain suppress their spontaneous feelings and try to adhere to their rigid internalized rules about their own performance.

Individuals cope with EMSs through three maladaptive strategies: surrender, avoidance and overcompensation. Individuals conform to the schema without avoiding or fighting it when they are in surrendering coping style. Avoidance involves avoiding situations, thoughts, and feelings that trigger the schema, while overcompensation involves fighting against the schema by acting in extreme and exaggerated ways (Young et al. 2003). Schema modes are immediate emotional states and coping reactions triggered by EMSs and categorized into four subtypes called "dysfunctional child modes", "dysfunctional parent modes", "dysfunctional coping modes" and "healthy adult mode" (Young et al. 2003, Arntz and Jacob 2013). Dysfunctional coping modes emerge when individuals exhibit behaviors in an attempt to overcompensate for, avoid, or surrender to the feelings associated with parent and child modes (Young et al. 2003, Arntz and Jacob 2013). Researchers in the relevant literature have suggested that both chemical and behavioral addictions are associated with avoidant and detached protector coping modes in which individuals distance themselves from distressing emotions and experiences through emotional numbing (Boog et al. 2018, Basile et al. 2019).

According to Young et al. (2003), addictive behaviors like overeating may result from strategies to cope with EMSs. Young et al. (2003) have been consistently supported by the findings of research in the literature. A meta-analysis conducted by Sakulsriprasert et al. (2023) indicated that substance misuse was strongly associated with the insufficient self-control schema in the Impaired Limits domain. EMSs are not only associated with chemical addictions but also with behavioral addictions. Most of the research conducted so far has focused on the relationship between chemical addictions and EMSs, but recently, the relationship between behavioral addictions and EMSs has also begun to be studied. Vieira et al.'s (2023) systematic review demonstrated that behavioral addictions were correlated with Disconnection and Rejection, Impaired Limits, Impaired Autonomy and Performance, Other-Directedness, and Overvigilance and Inhibition schema domains, respectively, from strong correlation to weak correlation. Additionally, results from a recent meta-analysis suggested that behavioral addictions had the largest effect size with Disconnection and Rejection, and Impaired Autonomy and Performance schema domains (Sakulsriprasert et al. 2023). The systematic review articles by Vieira et al. (2023) and Sakulsriprasert et al. (2023), which synthesized the relationship between behavioral addictions and EMSs, examined behavioral addiction as a whole, both technology-related addictive behaviors, such as problematic Internet use, and nontechnology-related addictive behaviors, such as compulsive exercising. However, no review article has been found in the current literature that specifically synthesizes the relationship between technology-focused addictive behaviors and EMSs.

Technology-related addictive behaviors have become widespread in most societies with the development of technology and continue to spread (Bicen and Arnavut 2017, Serenko and Turel 2020). These addictive behaviors are becoming a serious problem for all individuals, especially youths (Bicen and Arnavut 2017). For this reason, it is essential to examine technology-related addictive behaviors with a comprehensive approach and address them within the context of schema therapy, which provides a functional approach to the treatment of addictions. In line with this, this study aimed to systematically review the existing literature and present a synthesis of the findings on the relationship between technology-related addictive behaviors and EMSs. Additionally, this study sought to provide clinical insights related to the treatment of technology-related addictions.

Method

Information Sources and Search Strategy

This systematic review article which is about EMSs and technology-related addictive behaviors is based on the PRISMA 2020 Statement (Page et al. 2021). Electronic database scanning was conducted between

December 3 and December 10, 2023, through Scopus, ProQuest, PubMed, and Web of Science. A search was made on articles published between November 1998 and November 2023. While scanning the databases, a comprehensive query was used: ("maladaptive schemas" OR "Young's schema model" OR "Schema Therapy") AND ("problematic internet" OR "excessive internet" OR "internet addiction" OR "internet dependence" OR "compulsive internet" OR "problematic smartphone" OR " excessive smartphone" OR "compulsive smartphone" OR "smartphone addiction" OR "smartphone dependence" OR "cell phone" OR "problematic mobile phone" OR "mobile phone addiction" OR "excessive mobile phone" OR "compulsive mobile phone" OR "mobile phone dependence" OR "online gaming" OR "video gaming" OR "excessive gaming" OR "gaming disorder" OR "compulsive gaming" OR "gaming addiction" OR "Internet gaming disorder" OR "problematic gaming" OR "video game" OR "online gambling" OR "internet gambling" OR "pathological gambling" OR "gambling" OR "addictive behav*" OR "online pornography" OR "cybersex*" OR "sexual addiction" OR "online sexual behav*" OR "internet pornography" OR "problematic social media" OR "excessive social media" OR "Facebook" OR "Instagram" OR "Youtube" OR "Whatsapp" OR "Twitter" OR "Snapchat" OR "Telegram" OR "Tinder" OR "Netflix" OR "social media addiction" OR "social media dependence" OR "online shopping" OR "online buying" OR "compulsive buying" OR "impulsive buying" OR "compulsive shopping" OR "impulsive shopping" OR "Internet shopping" OR "Internet buying " OR "shopping addiction" OR "shopping dependence" OR "behav* addiction" OR "nonchemical addiction" OR "non-chemical addiction" OR "behav* dependence" OR "technology addiction" OR "addictive online behav*" OR "problematic technology use" OR "problematic technology usage"). In this database query, the "*" symbol is used to include words derived from the same root, such as "behav*" encompassing both "behavior", "behaviour", "behavioral", and "behavioural". Additionally, search results were limited to peer-reviewed journals and research articles before the selection process. (see PRISMA Flow Diagram in Figure 1).

Eligibility Criteria

Some inclusion criteria were applied during the selection phase of the articles before they were synthesized. Articles that contain EMSs in Young's Schema Model (Young 1990, Young et al. 2003) as well as technology-related addictive behaviors were included. Other inclusion criteria were being published in a refereed journal and in the English language, using validated instruments, and being a research article. Being in a language other than English, not relevant, not containing online addictive behaviors, not using the Young Schema Questionnaire (YSQ), being a literature review or meta-analysis, a book, a letter, or a conference paper were the exclusion criteria.

Selection Process

The authors independently screened the searched articles' titles and abstracts and decided which ones met the eligibility criteria. The articles that were irrelevant or did not meet inclusion criteria were excluded during the selection process. The full-text versions of the studies that were considered to meet the eligibility criteria were independently reviewed and evaluated for inclusion in this article. Disagreements between the authors about the selection process were solved by discussion.

Data Collection Process

In the current article, two authors independently took part in the data collection phase, reviewed all of the database records, and cautiously screened the full texts of the selected articles. Finally, they consulted with the third author to review whether the selected articles met eligibility criteria.

Data Items

Data were collected from the selected articles in terms of authors and publication year, types of technology-related addictive behaviors, study objective, sample, measurements, and results.

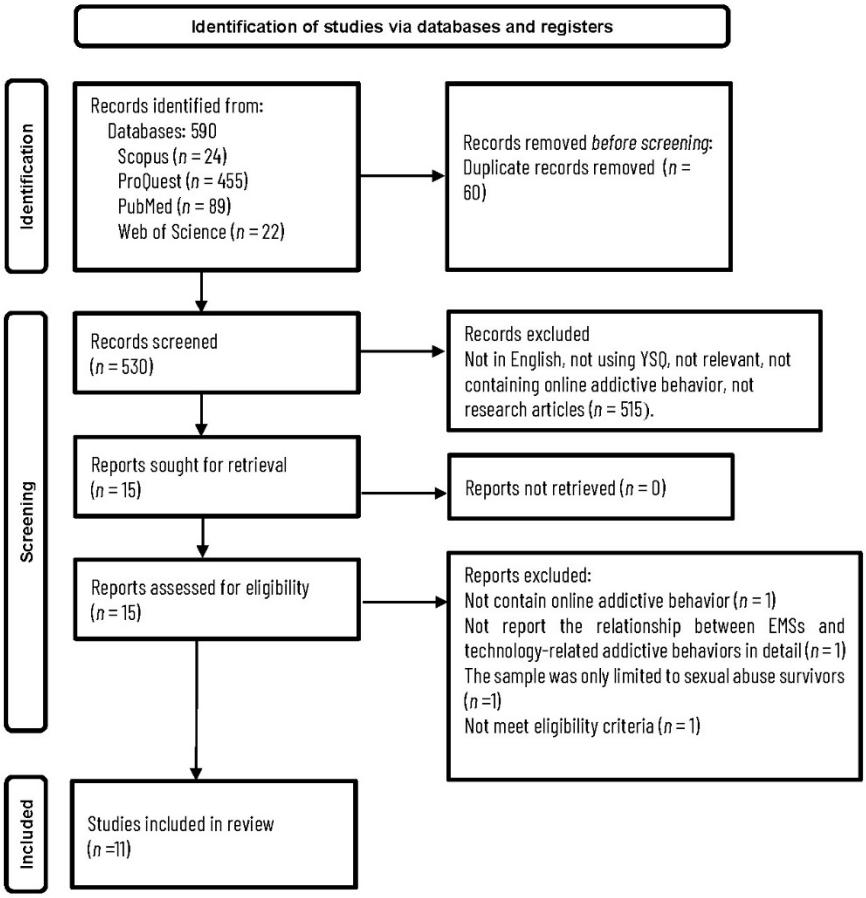

Figure 1. PRISMA flow diagram

Risk of Bias and Quality Assessments

The risk of bias and quality assessments of the included studies were conducted by the Appraisal Tool for Cross-Sectional Studies (AXIS), which was developed by Downes et al. (2016) and covers the assessment of the introduction, method, results, discussion, and other information sections of the studies. The reviewers independently assessed each study according to the AXIS and rated each question in the AXIS for each selected study as "yes", "no" or "don't know".

Synthesis Methods

The authors determined which studies were eligible for synthesis based on the types of technology-related addictive behaviors and types of EMSs or schema domains that were measured in each study. The data was prepared for the synthesis of the current article by extracting the summary of the studies. To assess the robustness, reviewers independently repeated the narrative synthesis until they confirmed that the results of the synthesis were consistent.

Reporting Bias Assessment

The authors of the current article assessed the risk of reporting bias by examining the original articles of the included studies. To evaluate outcome reporting bias, the outcomes of the selected papers were carefully compared with the synthesized outcomes of this review article.

Certainty Assessment

To assess certainty and the reliability of results, Grading of Recommendations, Assessment, Development, and Evaluations (GRADE), which was developed by the Grade Working Group (Guyatt et al. 2008) was used.

The certainty assessment of the study was done by the five domains of the GRADE approach: risk/possibility of bias, ambiguity/imprecision, inconsistency, indirectness, and potential bias of publication. Each study was evaluated at four different levels as very low, low, moderate, and high (Guyatt et al. 2008).

Results

Study Selection

Initially, a total of 590 results were found from Scopus (n = 24), ProQuest (n = 455), PubMed (n = 89), and Web of Science (n = 22). 60 duplicate records were deleted, and 515 articles were excluded because they met the exclusion criteria. Then, the remaining 15 articles were sought for retrieval and were evaluated in detail. 4 articles were excluded because they did not include technology-related addictive behaviors (Shorey et al. 2012, Arpaci 2023), did not separately report the association between EMSs and substance abuse and behavioral addictions (Efrati et al. 2023), and included a sample that was limited to sexual abuse survivors (Estévez et al. 2019). The remaining 11 studies were included in this article (Figure 1).

Characteristics and Results of Included Studies

Table 2 tabulates the characteristics and results of the included studies.

Table 2. Characteristics and results of included studies

Authors (Year)	Technology-Related Addictive Behaviors	Objectives	Samples	Measures	Summary of Results
Aksu et al. (2023)	Problematic Instagram use/ Instagram addiction	Examining the association between EMSs and problematic use of Instagram.	A total of 162 (51 men, 111 women) participants who use Instagram.	Young Schema Inventory (YSQ-SF3), and Instagram Addiction Scale.	Although all schema domains were positively correlated with the problematic use of Instagram, only the schema domain called Impaired Autonomy and Performance positively predicted (β = .39, p < .001) problematic use of Instagram.
Aloi et al. (2020)	Problematic Internet use and gambling (both online and offline)	Examining relationships between certain behavioral addictions, life quality, and EMSs of late adolescents and young adults.	637 females and 438 males (total of 1075) individuals between the age of 17–24 years.	Young Schema Questionnaire Short Form-3 (YSQ-S3), Internet Addiction Test, South Oaks Gambling Screen, Yale Food Addiction Scale 2.0, and Short Form-12 Health Survey.	Impaired Autonomy and Performance schema domain positively predicted (B = .484, p < .001) gambling behaviors of adolescents and young adults. Also, problematic use of the Internet was predicted by all schema domains, except for Impaired Autonomy and Performance.
Arpaci (2021)	Problematic smartphone use	Examining the moderation of mindfulness in the association between EMSs and problematic use of smartphone.	481 women and 179 (a total of 660) smartphone users between the ages of 17 and 32.	Young Schema Questionnaire-3 (YSQ-3), Smartphone Addiction Inventory, and Mindful Attention Awareness Scale.	For infrequent users of the smartphone, EMSs called social isolation (β = .11, p < .05), mistrust (β = .11, p < .05), approval seeking (β = .27, p < .001), and abandonment (β = .12, p < .05) positively predicted, but the schema of unrelenting standards (β = -.12, p < .05) negatively predicted problematic use of the smartphone. On the other hand, for addicted individuals, EMSs called approval-seeking (β = .16, < .05) and entitlement

					(β = .25, p < .01) insufficient self-control (β = .25, p < 0.01) positively predicted, but self-sacrifice (β = -.33, p < .001), defectiveness (β = -.37, p < .001), and emotional inhibition (β = -.21, p < .05) negatively predicted problematic use of smartphone.
Cudo et al. (2020)	Problematic Facebook use	Examining EMSs that are related to problematic use of Facebook.	619 (568 female, and 51 male) Facebook users with the age of 18 to 30 years.	Facebook Intrusion Scale, and Young Schema Questionnaire (YSQ–S3).	Insufficient self-control (β = .11, p < .05) and approval seeking (β = .25, p < .001) positively predicted problematic use of Facebook, whereas social isolation (β = -.19, p < .01) and self-sacrifice (β = -.10, p < .05) negatively predicted problematic use of Facebook.
Cudo et al. (2022)	Problematic video gaming	Investigating the association between problematic video gaming and EMSs in women and men gamers.	673 (391 women and 282 men) individuals who actively play video games. The age range of these participants was 17 to 38 years old.	Internet Gaming Disorder Scale–Short-Form, Hospital Anxiety and Depression Scale, and Young Schema Questionnaire (YSQ-S3).	Dependence schema positively predicted (β = .25, p < .01) women gamers' problematic video gaming behavior; whereas vulnerability to harm or illness (β = .18, p < .01), enmeshment (β = .23, p < .01), and subjugation (β = .22, p < .01) positively predicted men gamers' problematic video gaming behavior.
Cudo et al. (2023)	Problematic Facebook use	Examining the mediating role of perceived stress in the association between problematic Facebook use and EMSs.	505 female, and 488 male (a total of 993) Facebook users. The age range is 18 to 35 years.	Facebook Intrusion Questionnaire, Young Schema Questionnaire (YSQ-S3), and Perceived Stress Questionnaire.	Problematic use of Facebook was positively predicted by insufficient self-control (β = .10, p = .004) approval seeking (β = .08, p = .039), dependence (β = .16, p = .009), enmeshment (β = .22, p = .001), and entitlement (β = .09, p = .018) schemas; was negatively predicted by social isolation (β = -.25, p = .001), and mistrust (β = -.13, p = .04).
Elmquist et al. (2016)	Compulsive sexual behaviors (both online and offline)	Investigating the association between EMSs and compulsive sexual behaviors in individuals who are diagnosed with substance use disorders.	198 male, and 62 female (total of 260) individuals who were admitted to a substance use treatment center with a mean age of 41.4 years old.	Young Schema Questionnaire Long Form Third Edition (YSQ-L3) Sexual Addiction Screening Test-Revised, Alcohol Use Disorders Identification Test, and Drug Use Disorders Identification Test.	All of the five EMS domains; Disconnection and Rejection (r = .31, p = .01), Impaired Autonomy and Performance (r = .29, p = .01), Impaired Limits (r = .29, p = .01), Other-Directedness (r = .24, p = .01), Overvigilance and Inhibition (r = .33, p = .01) were found to be positively correlated with compulsive sexual behaviors.
Estévez et al. (2023)	Gambling (both online and offline)	Investigating the moderating roles of gambling and sex in the association between EMSs and the perceived impact of COVID-19.	160 participants with 80 gamblers (40 male, and 40 female), and 80 non-gamblers (40 male, and 40 female). The	Young Schema Questionnaire (YSQ-3), The South Oaks Gambling Screen, and Questionnaire of	Gamblers (M = 11.92, SD = 6.78) had higher scores of emotional deprivation than non-gamblers (M = 9.65, SD = 5.64), t = -2.21, p < .05. Also, gamblers (M = 10.32, SD = 5.75) had higher score of failure than non-gamblers (M = 8.05, SD = 3.80), t = -2.74, p < .01.

			mean age of the sample was 35.46 years old.	Perceived Effect of COVID-19.	
Ostovar et al. (2021)	Problematic Internet use	Examining the association between EMSs and problematic Internet use and the predictive role of EMSs on Internet addiction.	301 men and 413 women (a total of 714) adults between the ages of 18 and 68 years.	The Young Schema Questionnaire Short Form, and Internet Addiction Scale.	Two different schema domains called the Disconnection and Rejection domain (β = .27, p < .01) and Impaired Autonomy and Performance domain (β = .21, p < .01) positively predicted problematic use of the Internet in adults.
Rocha et al. (2023)	Impulsive-compulsive buying	Examining the relationship between EMSs and impulsive-compulsive buying tendencies of young adults (college students).	365 college students (72.1% female, 29.9% male). The mean age of this research sample was 22.41 years.	Young Schema Questionnaire Short Form 3, Impulsive Buying Tendency Scale, Richmond Scale for Compulsive Purchasing, Hospital Anxiety and Depression Scale.	The schemas in the Overvigilance and Inhibition domain positively predicted both impulsive buying (β = .48, p < .001) and compulsive buying (β = .46, p < .001); whereas Impaired Limits domain negatively predicted both impulsive buying (β = –.29, p < .001) and compulsive buying (β = -.18, p < .01).
Shajari et al. (2016)	Problematic Internet use	Examining the association between EMSs and Internet Addiction among university students.	195 university students (107 female, and 88 male) between the age of 25 to 29 years.	The Young Schema Questionnaire-Short Form (YSQ-SF), and Generalized Problematic Internet Use Scale.	The problematic Internet use was positively correlated with EMSs called emotional deprivation (r = .25, p = .001), abandonment (r = .25, p = .004), mistrust (r = .16, p = .011), social isolation (r = .30, p = .001), defectiveness (r = .35, p = .001), failure (r = .30, p = .001), dependence (r = .25, p = .001), vulnerability to harm or illness (r = .36, p = .001), enmeshment (r = .25, p = .001), subjugation (r = .40, p = .001), self-sacrifice (r = .26, p = .001), emotional inhibition (r = .36, p = .001), unrelenting standards (r = .26, p = .001), entitlement (r = .23, p = .001), and insufficient self-control (r = .33, p = .001).

Results of the Syntheses

The total sample of the 11 included studies was 5876 participants and was comprised of both male and female participants. The included articles consisted of different types of technology-related addictive behaviors: problematic use of social media such as Facebook (n = 2) and Instagram (n = 1), impulsive and compulsive buying (both online and offline) (n = 1), gambling (both online and offline) (n = 2), video gaming (n = 1), compulsive sexual behaviors (both online and offline) (n = 1), problematic Internet use (n = 3), and problematic smartphone use (n = 1).

In this study, it was found that there was a relationship between technology-related addictive behaviors and all of the five schema domains and the schemas in these domains (Elmquist et al. 2016, Shajari et al. 2016, Aloi et al. 2020, Aksu et al. 2023). In addition, it was found that technology-related addictive behaviors were more frequently associated with the Disconnection and Rejection domain and the Impaired Limits domain (Elmquist et al. 2016, Shajari et al. 2016, Aloi et al. 2020, Cudo et al. 2020, Arpaci 2021, Aksu et al. 2023, Cudo et al. 2023). When technology-related addictive behaviors were examined separately, it was found that gambling was related to the Impaired Autonomy and Performance, and the Disconnection and

Rejection domains (Aloi et al. 2020, Estévez et al. 2023). Problematic social media use was associated with every schema domain, but it was most associated with the Disconnection and Rejection, Impaired Limits, and Other-Directedness domains (Cudo et al. 2020, Aksu et al. 2023, Cudo et al. 2023). The results showed that impulsive and compulsive buying was associated with the Overvigilance and Inhibition, and Impaired Limits domains (Rocha et al. 2023). There is an association between Impaired Autonomy and Performance and video gaming (Cudo et al. 2022), while compulsive sexual behaviors were related to all schema domains (Elmquist et al. 2016). The results indicated that problematic smartphone use was associated with the Disconnection and Rejection, Other-Directedness, and Overvigilance and Inhibition domains (Arpaci, 2021). Finally, it was found that all schema domains were associated with problematic internet use, but the Disconnection and Rejection was most strongly related to problematic use of the internet (Shajari et al. 2016, Aloi et al. 2020, Ostovar et al. 2021).

Risk of Bias in Studies

The two reviewers independently rated the introduction, method, results, discussion sections, and other information parts of each question in Downes et al.'s (2016) AXIS tool. All included studies had a low risk of bias and were of high methodological quality.

Heterogeneity among Study Results

The heterogeneity among the included studies can probably be explained by the fact that some of these studies examined technology-related addiction behaviors that were different from other included studies. For this reason, some of the studies used different measurement tools to measure technology-related addictive behaviors. However, since technology-related addictive behaviors are concepts that cover different subtypes, it was inevitable that the scales measuring these addictive behaviors would be different in the included studies. Additionally, to reduce heterogeneity among included studies, the eligibility criteria were chosen very carefully and were strictly applied when the inclusion of the studies.

After the reviewers independently repeated the narrative synthesis until they found the same results. It was found that the results of the sensitivity analyses were consistent with the main synthesis of this review article. This indicated that the results of the synthesis of the current review article were robust and were not affected by the inclusion of heterogeneous studies.

Reporting Biases

After the results of the included studies were carefully compared with the synthesized results of this review article, it was found that there was no incompatibility between the originally reported outcomes and the current review article's synthesized results.

Certainty of Evidence

The GRADE approach, which was developed by the Grade Working Group (Guyatt et al. 2008), guided the assessment of the certainty and reliability of the current review article's synthesized results. All outcomes of this article were evaluated and graded by two reviewers independently, according to four different levels (very low, low, moderate, and high). It was found that the certainty of the evidence for the outcomes of this review article was moderate to low quality. Moderate to low certainty of evidence resulted from the fact that all 11 included studies were non-randomized controlled trial (non-RCT) studies. Because non-RCT studies cannot be graded as high-quality evidence (Guyatt et al. 2008).

Discussion

The aim of our systematic review was to synthesize the findings on the association between EMSs and technology-related addictive behaviors. In this review, it was found that there was a relationship between technology-related addictive behaviors and all five schema domains and EMS domains significantly predicted problematic use of the Internet, social media and smartphones, problematic video gaming,

gambling, compulsive buying, and compulsive sexual behaviors. However, it is particularly noteworthy that the Disconnection and Rejection and Impaired Limits schema domains were most frequently associated with technology-related addictive behaviors. These results are consistent with those of Vieira et al. (2023) and Sakulsriprasert et al. (2023), which highlight the relationship between behavioral addictions (both technology-related and non-technology-related) and EMS domains, especially Disconnection and Rejection, Impaired Limits, and Impaired Autonomy and Performance.

Individuals who have traumatic childhood experiences including neglect, abuse, and lack of warmth, support, stability, or safety are more likely to have EMSs in the Disconnection and Rejection domain. In schema therapy model, maladaptive coping strategies (avoidance, surrender, and overcompensation) are used to reduce the emotional distress, anxiety, anger, or shame associated with the schemas (Young 1990). Addictions are conceptualized as avoidance strategies in which individuals attempt to cope with the pain of their unmet emotional needs and the feeling of "emptiness" by soothing themselves with substances and alcohol (Arntz and Jacob 2013, Knapík and Slancová 2020). Currently, technology-related addictions are also regarded as maladaptive coping and self-soothing strategies. In the context of schema modes, these addictive behaviors that help to soothe, stimulate, or distract from feelings are now called detached protector or detached self-soother mode (Jacob et al. 2015). According to the results of our review, early experiences of rejection, abuse, and lack of support are strongly associated with problematic internet, smartphone, and social media use. Individuals likely attempt to cope with the emotional pain associated with their schemas by immersing themselves in social media and digital applications. This often involves spending an extensive amount of time scrolling through pictures and videos and analyzing the lives of others which distracts from one's emotional pain and personal experiences. In addition, the findings indicate that gambling and compulsive sexual behaviors may also be viewed as a form of self-stimulation and self-soothing associated with the Disconnection and Rejection domain. These behaviors provide immediate gratification and relaxation, yet, as with all other forms of addiction, they can have profoundly adverse consequences. Moreover, these addictions can perpetuate themselves due to the short-term relief they offer, leading to impaired functioning (Arntz and Jacob 2013).

Addictions and impulsive behaviors are strongly associated with Impaired Limits domain, especially insufficient self-control schema (Shorey et al. 2012; 2013). Individuals who have been raised by overly permissive parents who have not set clear boundaries and rules from an early age may experience significant challenges in regulating their emotions and impulses as well as maintaining self-discipline (Young et al. 2003). Results of the study indicated that technology-related addictive behaviors, especially video gaming, problematic social media use, and compulsive buying are closely related to the Impaired Limits domain. A person with schemas in the Impaired Limits domain, who has difficulties maintaining self-control, may utilize technology as an opportunity to avoid various responsibilities, difficulties, and emotions that arise, while impulsively engaging in unlimited gaming and shopping. Our review also highlighted that EMSs in Impaired Autonomy and Performance were identified as a potential risk factor for problematic internet and Instagram use, video gaming, and gambling. Early experiences characterized by overprotection, enmeshment, or emotional neglect are associated with an insecure sense of self, feelings of inadequacy and dependency, and difficulties in setting personal goals (Young et al. 2003). In line with the schema therapy model and the relevant literature, the results of this study indicate that the time spent online and gaming/gambling may be employed by individuals as a maladaptive method of coping with feelings of inadequacy and failure. Consequently, these technology-related addictive behaviors may represent manifestations of detached self-soother mode, a maladaptive coping strategy aimed at avoiding negative feelings associated with a wide range of EMSs.

This review has several limitations that should be taken into account. The included studies were only published in the English language, so evidence in other languages was excluded. All of the studies were correlational studies, not experimental studies. Therefore, it was not possible to infer a causal relationship. In addition, due to the inclusion of a limited number of studies, when interpreting these synthesized results, interpretation must be done with caution. To the best of the authors' knowledge, this study was the first study to examine the relationship between technology-related addictive behaviors and EMSs systematically, so comparison of the results with other review studies was limited. Additionally, a few of

the studies included in this review addressed both offline and online gambling (Aloi et al. 2020; Estévez et al. 2023) and compulsive sexual behaviors (Elmquist et al. 2016). As a result, these studies may not capture the unique aspects of online gambling and online compulsive sexual behaviors. Therefore, the syntheses conducted in this review do not fully represent online gambling and online compulsive sexual behaviors and the generalizability of these studies' findings to online gambling and online compulsive sexual behaviors is limited. Due to all these limitations, more research on the association between technology-related addictive behaviors and EMSs is needed to better understand the underlying mechanisms of technology-related addictive behaviors. Moreover, there is also a need for research on the effectiveness of schema therapy techniques for people with technology-related addictive behaviors.

The findings of the current study may have significant implications for practice and policy. A key practical implication includes that clinicians should assess the individuals' EMSs to understand the underlying mechanisms of technology-related addictive behaviors and help individuals overcome the maintenance of these behaviors. In addition, parenting styles should also be evaluated as they may significantly contribute to the development and persistence of such behaviors. Another practical implication of this study is that mental health professionals should help parents set realistic limits for their children and establish secure attachments with them. This, in turn, may reduce individuals' tendency in adulthood to engage in technology-related addictive behaviors as a way of coping with EMSs. Within this framework, there is a significant need to develop schema therapy-based intervention programs for the prevention of technology-related addictions.

Conclusion

Technology is an integral part of human life worldwide, and similarly, technology-related addictive behaviors are a global problem affecting people of almost all ages and cultures. Although the behavioral addiction literature has provided findings regarding the existence of a relationship between EMSs and technology-related addictive behaviors, it does not provide sufficient information about the risk of individuals with EMSs developing technology-related addictive behaviors. The results of our review highlighted that technology-related addictive behaviors were most strongly associated with the domains of Disconnection and Rejection, and Impaired Limits. In line with these findings, it can be concluded that a lack of secure attachment in childhood, and the failure of parents to set sufficient realistic limits in childhood can increase individuals' tendency to engage in technology-related addictive behaviors in adulthood. In addition, all of these results can be interpreted as technology-related addictive behaviors, which have become a worldwide problem, are used by individuals as a dysfunctional way of coping with EMSs.

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