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Youth Digital Technology Use and Self-Esteem: Exploring Social Causation, Social Selection, and Reciprocal Dynamics

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Abstract

This paper explores the complex relationship between problematic digital use and self-esteem among children and adolescents, with an emphasis on how social causation, social selection, and reciprocal hypotheses shape this dynamic. In the current digital landscape, young individuals are exposed to both opportunities and risks that can significantly influence their psychological well-being. This study draws on empirical data and case studies to illustrate how excessive digital engagement can negatively impact self-esteem, while also considering the role of external factors such as family dynamics, socioeconomic status, and offline social interactions. Through a critical review of the literature, we examine how social and ecological factors contribute to problematic digital use and how these factors interact with self-esteem. In addition to discussing the theoretical frameworks, this paper offers practical recommendations for intervention strategies aimed at mitigating digital addiction. These strategies include guidance for parents, educators, and mental health professionals to help promote healthier digital habits among young people. While focusing on the potential risks of digital engagement, we also highlight its positive aspects, such as fostering social connections, learning, and self-expression, which can enhance youth development. Ultimately, this paper provides a holistic view of digital engagement and self-esteem, offering actionable insights for addressing these issues in both research and practice.

Keywords: Problematic Digital Use, Self-Esteem, Social Causation, Social Selection, Reciprocal Influences

Introduction

Living in the Digital Age, particularly since the rise of the internet in the late 20th century and the proliferation of smartphones in the 2000s, has introduced a wealth of exciting and constructive opportunities that enrich our lives. We now enjoy unparalleled access to vast reserves of knowledge and entertainment, remote education systems, online financial services, and social platforms that connect us with a global community. Key developments during this period, such as the rise of social media platforms like Facebook, Instagram, and X (formerly Twitter), have fundamentally reshaped how we interact with technology and each other. However, these opportunities are accompanied by significant risks, particularly the excessive use of social media and technology, which can disrupt various aspects of life. This issue is especially pressing for young people [1]. Children and adolescents, in particular, are vulnerable to the detrimental effects of excessive social media use, including a decline in self-esteem, as they navigate the complex interplay of physiological, psychological, and environmental factors, which calls for further investigation in relation to their digital behavior.

This paper critically reviews the bio-social-ecological factors contributing to problematic digital use in childhood and adolescence, with a specific focus on its impact on self-esteem. The relationship between digital technology and self-esteem is intricate and multifaceted, with technology exerting both positive and negative influences on one's self-esteem [2]. For instance, while Meggsauer [3] highlights the positive aspects of social networking, there are also significant harms to well-being associated with dependency and emotional attachment to technology. To unravel this complex relationship, existing literature investigates various precursors such as individual usage patterns, the content users engage with, and their psychological disposition [4, 5].

While much attention has been given to the social causation hypothesis, which posits that problematic digital use influences various spheres of youth functioning, it is crucial to also consider the reverse causation hypothesis known as social selection [6, 7]. Social selection is a hypothesis that suggests individuals with certain pre-existing characteristics are more likely to engage in specific behaviors or activities [6, 8]. In the context of digital use, social selection implies that people who already possess particular traits, such as low self-esteem, social anxiety, or a tendency towards impulsivity, are more likely to become heavy users of digital platforms and technologies [9]. This perspective contrasts with the social causation hypothesis, which argues that the use of digital technologies itself influences and changes individuals' characteristics and behaviors. This bidirectional perspective is crucial for understanding the complex interplay between digital use and human functioning, as it acknowledges that both pre-existing traits and the influence of technology contribute to the overall impact on an individual's life.

This paper takes a further step beyond the concepts of social causation and social selection by recognizing a potential reciprocal web where digital use and human functioning continuously influence each other through a compilation of current studies of both technology usage trends and self-esteem determining factors. More specifically, it critically reviews literature on the link between digital technologies and the self-esteem of children and adolescents in the Digital Age. It explores biological, physiological, psychological, and environmental factors through three distinct hypotheses: social causation, social selection, and reciprocal influences. To our knowledge, this paper is among the first to review not only the commonly explored psychological and social factors but also the biological and physiological factors that have not been extensively considered in association with these three competing and complementary hypotheses.

This dynamic interaction suggests that problematic digital use and individual characteristics are not isolated phenomena but part of a complex feedback loop, where each element can perpetuate and exacerbate the other. Understanding this reciprocal web is crucial for developing more effective interventions and strategies to mitigate the negative impacts of digital addiction on youth.

Operational Definitions of Key Study Concepts

Finding universal terminology to describe addictive or problematic digital use in the current body of literature has been a challenge, highlighting a gap that further research needs to address. The present study regards *excessive digital use and digital technology addiction* as interchangeable terms, using them as umbrella diagnoses encompassing sub facets such as gaming, pornography, and social media addictions [10]. For instance, "Problematic Internet Use (PIU)" encompasses destructive online behaviors that include excessive use, viewing problematic content, and impulsivity [11].

Although many different addictions and dependencies have been studied in this realm, the present study adopts the definition of PIU that is used to describe digital technology usage that may be associated with detriments to personal wellbeing and quality of life or related to online behaviors that are not sustainable for long-term self-esteem maintenance. In addition, the present study primarily focuses on excessive social media use within the context of digital technological use among the studied populations. By narrowing the scope to social media, we aim to provide a more detailed examination of how this particular form of digital interaction impacts the self-esteem of children and adolescents. This focus allows for a deeper understanding of the specific ways in which social media, as a pervasive element of digital life, contributes to the broader phenomenon of problematic digital use. When attempting to understand the relationship between social media, self-esteem, and the reciprocity of their respective effects, we must distinguish the difference between social causation, social selection, and vulnerability of PIU.

Social causation and social selection are two well-known, competing yet complementary hypotheses in the social sciences that explain the relationship between various social factors and a wide range of individual outcomes, including health, performance, wealth, and socioeconomic status [6, 12]. These hypotheses highlight different directions of causality in terms of how social factors and individual characteristics interact and influence each other. Social causation suggests that social factors such as ethnicity, poverty, and adverse family and school experiences have detrimental impacts on individual welfare and functioning [8]. According to this perspective, individuals from lower socioeconomic backgrounds, marginalized racial or ethnic groups, or disadvantaged genders may face social barriers that limit their opportunities and resources, leading to negative outcomes, such as poor health, lower income, or social disadvantage [13]. Social causation hypothesis emphasizes the impact of social factors on individual outcomes and views societal structures and systems as the driving force behind these differences in individual adjustments and outcomes. Thus, in this paper, the social causation hypothesis posits that problematic digital technology use significantly detracts from the self-esteem of children and youth. This hypothesis highlights these effects without considering the self-esteem levels prior to excessive technology use.

In contrast, the social selection hypothesis asserts that individual characteristics and outcomes can influence social factors. According to this perspective, individuals with certain characteristics of intelligence, physical health, or social skills may be more likely to achieve higher socioeconomic status, access better resources, and enjoy higher social status [6]. Social selection emphasizes the role of individual characteristics in shaping social outcomes and views individuals as active agents who can shape their social environment. For instance, individuals with better physical health may be more likely to engage in physical activities [14], which can lead to higher levels of fitness and better access to employment opportunities [15]. Similarly, individuals with higher levels of education may be more likely to access higher-paying jobs even during turbulent economic times, which can lead to higher socioeconomic status [16]. Social selection theories focus on how individual characteristics can impact social outcomes and contribute to social stratification. In the context of this paper and in relation to PIU, the social selection hypothesis suggests that youth with preexisting low self-esteem may be at higher risk of problematic digital usage through social media engagement due to the façade of social control or other chemical draws.

The hallmark of this paper is its attempt to extend previous research on social causation and social selection by shedding light on the reciprocal loop between problematic digital technology use and the self-esteem of children and youth. Instead of determining the initial cause and effect between the two, this reciprocal perspective emphasizes the self-perpetuating cycle of problematic digital technology use and deteriorating self-esteem [17]. The following sections will discuss the research evidence for these three competing yet complementary perspectives.

Evidence for Social Causation Hypothesis

A substantial body of research exists within the framework of social causation. This section reviews and synthesizes evidence from the social causation perspective, examining how biological, social, and ecological factors contribute to problematic digital technology use and its impact on the self-esteem of children and youth. By integrating findings from these diverse domains, we aim to provide a comprehensive understanding of the multifaceted influences on digital technology use and self-esteem.

Biological Influences

Dopamine is a neurotransmitter that is a critical component in movement, emotional regulation, and internal reward systems [18]. In order for the hormone to express itself, it passes through the synapse and is received by a receptor protein [19], specifically, dopamine receptors, and depending on the receptor, carries out different functions in the body [18]. There are 5 types of receptors (D1, D2, D3, D4, and D5), but this paper will be focusing on the function of the D2 receptor. This receptor plays its main roles in movement, attention, sleep, memory, and learning [18]. They are expressed primarily in the striatum, which is a brain structure mainly involved in voluntary movement and is also important for the development of dopamine neurons [20, 18].

Individuals who have an excessive or addictive digital technology use have shown to have a decrease in dopamine D2 receptor availability of binding potential, and the availability of the receptors was directly inversely correlated with the severity of the addiction [21]. The reduction of binding potential is similar to that which has been associated with “reward deficiency syndrome,” and this may narrate increasing need for stimulation in genetically reward deficient individuals dopaminergic (involved in the releasing of

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dopamine) reward pathways [21]. This may provide biological motivation to increased time, and therefore increased risk of PIU, as digital technology can be used to fulfill those neural pathways for a sense of satisfaction. Satisfaction and pleasure while engaging online was also the largest predictor of digital addiction adoption, so there may be a genetic component to those using the digital use for dopamine release leading to addiction [21]. This addiction response is noted in the same literature as the dopamine D2 decrease in drugs, food, and other behavioral addictions with dependent dopamine reward responses [22, 23].

Dopamine transporters of the striatum (DAT), which are proteins in the presynaptic end of neurotransmitter transactions, are responsible for the reabsorption of the neurotransmitter, and are vital in dopamine regulation [24], have been found to present abnormality in shape in individuals with Digital addiction, and thus causing a reduction in expression. Furthermore, this may result in a terminal deficit in dopaminergic performance, which is also seen in substance addictions [24]. The spike in dopamine following continuous stimulation causes a dampening of sensitivity in the D2 receptor, and this creates a decrease in pleasure leading to a need for more and more stimulation to obtain pleasure and a dependence on technology usage as the stimuli [22]. Extracellular dopamine in the striatum is associated with euphoric responses to given stimuli, which may be relevant to Digital addicted individuals as well. Additionally, high concentrations of dopamine over prolonged periods have been noted to cause permanent injury to dopamine terminals and the shrinking of dopaminergic cell bodies. These findings can indicate damage to the dopaminergic neural system from digital addiction [24]. While dopamine production is not directly linked to self-esteem, it contributes to the significance of PIU prevalence and provides insight on the draw of digital platforms.

There is growing research in this area of study, but there is merit found in the notion that certain digital addictions such as Internet gaming or Internet pornography, produce deficits in decision making. When given a more advantageous choice, individuals with these addictions were more likely to choose something that was riskier, but that would feed a part of their addiction in the Iowa Gambling Task [25]. Similarly, risk-taking, impulsivity, and novelty-seeking has been used to characterize PIU. PIU is used to describe those who experience multiple symptoms and consequences of digital abuse and is found congruent with Substance Use Disorder literature [25].

Moreover, the CC variant of the CHRNA4 gene has been associated with higher levels of anxiety and a predisposition to smoking [26]. The CC variant of the CHRNA4 gene refers to a specific genetic variation in the CHRNA4 gene, where an individual has two copies of the cytosine (C) nucleotide at a particular position in the gene sequence [27]. The CHRNA4 gene encodes a subunit of the nicotinic acetylcholine receptor, which is involved in neural signaling. Variations in this gene, such as the CC variant, have been studied for their association with various psychological and behavioral traits, including higher anxiety levels and a predisposition to smoking [27]. This variant can influence how the nicotinic acetylcholine receptors function, potentially affecting neurotransmitter release and neuronal communication, which in turn can impact anxiety and addictive behaviors.

Smoking is directly associated with *CHRNA4*, and Digital addiction, along with other behavioral addictions may have connections to it as well [26]. Another article replicates the previous study and confirms their findings [28]. It was shown that there was a significant difference in the frequency of genetic expression between those with and without the CC variant. This genetic connection may influence individuals with Digital addiction through personality traits and genetic predispositions [26]. However, there is racial and ethnic discrepancy in findings regarding genetic susceptibility, as those with certain Asian heritage carrying these genes were not shown to have differences in addictive tendencies as those shown in Western studies were, but more research is needed to confirm this notion [29]. This same study found a significant relationship between the AA genotype of a different gene and gaming disorders [29], and while this is not the aim of this analysis, it can show relevance as it is a sub facet of Internet or technology addiction. This study also notes that early intervention for PIU is needed to prevent adverse genetic effects such as cardio-metabolic health outcomes and psychiatric distress after adolescence [29].

It is worth considering findings of research on Internet gaming addiction because there seems to be the widest scope of literature around it, and the results may constitute similar research extending to other technology dependencies. Some of these studies have found that serum levels of glutamate are significantly lessened in those with an Internet gaming disorder, which may " modify dopaminergic reward processing and reconsolidate addictive behavior-related memories in [Digital gaming disorder]" [30], as well as, shortened leukocyte telomere length, which parallels heroin and crack cocaine addictions, and is associated with plasma epinephrine levels, which are directly influential to autonomic functioning [31].

Environmental Influences

The alternative influences on addiction are the environmental influences. Peer victimization, which this study defines as the personal negative experiences from bullying or other peer involved social victimization. These experiences are closely linked to risk for PIU and Internet addiction both directly and in the indirect forms of anxiety, depression, and perceived security. When bullying occurs and there is a lack of social connectedness, lowered self-esteem, as well as other negative effects and lead to a need for social control in the form of social media and digital technology usage, which is much more governable [32]. These findings may indicate significant predictors of adolescent digital addiction. Additionally, self-compassion, which refers to intrapersonal kindness and mindfulness, is associated negatively with addiction [32]. This may also act as a buffer for the negative effects of peer victimization when self-compassion is expressed at high levels. Females were found to be at greater risk for addiction, likely in causation of heightened reliance on social media networking to maintain relational satisfaction and connection [32] Females also are shown to generally have less self-compassion than males due to more negative self-views [32].

Bullying attacks some of the basic life necessities such as social support and safety. When adolescents or children experience bullying on a severe scale, exclusion and rejection are experienced in high dosages and may lead victims to learn self-medication at early ages that can follow them into adulthood [33]. Low self-esteem individuals are more likely to be avoided by others, often do not have the confidence to protect themselves, and are more likely to think of themselves in a lower power status, which reinforces the bully's mindset [34]. This may predict a cycle of peer victimization leading to lower self-esteem, and thus perpetuating more risk for peer victimization as their self-image and confidence lessens [34]. Bullying victims also have decreased relational quality because they tend to have a lack of trust in others and in their relationships. Many victims report feeling bullied by friends, which in turn, reinforces their distrust in their peer interactions [33]. Weak belongingness can result from lower quality relationships with both peers and family members. Low social competence, poor relational quality, anxiety, and depression have been shown to be positively correlated with PIU, and furthermore, may lead to digital addiction [35].

Parenting styles play a role in this as they have much influence on child development. Harsh parenting along with forms of abusive parenting have also been linked to risk of digital addiction. Youth with parental relationships in which they cannot lean on the parental unit for support tend to be at risk for digital addictions due to poorer

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social support systems and lower relational quality. Online relationships are seen to be easier to obtain, maintain, and control, which is appealing to those who feel a lack of control over their social circumstances [36].

Negative conversations between parents and children regarding digital usage were causally linked to significantly greater PIU [37]. While adolescents are searching for autonomy, they may turn to the technological world and limit interactions with parents while simultaneously avoiding contact regarding their excessive digital use, and conversely, parents may withdraw themselves due to the expectation of an unpleasant interaction with the child. PIU is also seen negatively correlated with parental involvement, but this can differ from developmental stages. Adolescents with high PIU are more likely to experience distress, academic struggles, and relational stress, which makes parenting more difficult when the child pushes them out of the line of intervention, and thus leading to lower parental involvement. In sum, parental involvement is indirectly associated with PIU through the parent-child interactions [37].

Parental Internet supervision tactics are very influential in digital addictions, as well. The assertive approach, which claims limitations on time spent on devices while providing alternative activities or distractions was not shown to produce much digital addiction, and instead only dealt with at-risk adolescents. This approach also is utilized by parents who are Internet independent. The assertive approach seems to be in line with the authoritative parenting style [38]. Conversely, the aggressive approach is utilized by parents who are at-risk for Internet addiction, while their children are addicted [38]. This parenting style displays high levels of control over devices such as locking them away at certain times or limiting access to the Internet, and this approach was shown to cause frequent arguments along with digital addiction [38]. Addiction is directly associated with parental negative views on the Internet and may be escalated by strict attempts at control [38]. Additionally, parental behavior is shown to be more effective than parental limits on devices. Children seeing their parents behave in healthy ways with their devices is more effective than rule setting in addiction prevention. These parenting tactics align with the authoritarian parenting style [38]. However, the antithesis of this parenting style is the “lenient approach” which shows little control over devices and time spent on them, and it is in line with permissive parenting styles [39]. Low parental control or supervision is positively correlated with Digital addiction, and it is not an effective mode of prevention as it shows the highest rates of dependency [39].

Socioeconomics is another factor in Internet addicted adolescents. Depending on one’s status, it could be a precursor to addiction or a mediator. Father’s level of education is directly associated with PIU, while high familial income, frequency of music and video entertainment, and students’ relationship with teachers and academic use of the Internet were all indirectly affiliated with PIU [40]. The father’s low level of education appears to correlate with higher digital literacy, which adolescents may inherit and subsequently use to self-stimulate, potentially leading to greater digital dependency [40] Higher family income was shown to produce more PIU and greater risk of addiction [40] due to greater usage of social media leading to more time spent weekly online, but more research on this association is needed to confidently make this claim.

These findings may be influenced by other indirect effects, so they must be approached with caution of possible limitations. Technology is also more accessible to higher income families and children may be more inclined to spend more time online when both parents are working, which may give reasoning for the link as well [40]. More usage of these social media sites, music, or video entertainment sites is also linked to greater PIU severity. PIU was shown in the reverse effect in relation to high family income because youth of higher income families tend to have better relationships with academic administrators and have more academic use of technology, which tends to lead to less PIU [41]. There is more research required to fully understand the susceptibilities of various socioeconomic factors in relation to PIU and its impacts on self-esteem, but it is observed that there is, at least, an indirect connection between the two.

Evidence for Social Selection Hypothesis

There is considerably less research evidence available from the social selection perspective. Contemporary theory suggests that emotional and behavioral problems may reduce social competencies [6]. For example, youth with low self-esteem may seek validations and approvals from others on social media, which in turn, puts them at risk for PIU and internet dependencies. The body, in the age of technology, has been harshly scrutinized by peers, which has led to behaviors on social media such as deceptive like-seeking (e.g., buying followers and photo editing) in order to promote one’s image. These behaviors were also associated with weakened peer belongingness and low self-esteem that propel youth to subscribe to peer desirability and expectations by gradually increasing their deceptive popularity and like-seeking behaviors [42]. It is also observed that for those active on platforms, like Snapchat, the mere act of being visually seen by peers promotes social status by elevating visibility and recognizability to promote their rank among hierarchical power dynamics with peers [43]. The assumption taken from this information could be, in an attempt to gain peer approval and recognition on social media, youth with low self- esteem are likely to engage in PIU and/or social media overuse. We also suspect a correlation between this and spending more time on social media as a consequence of the attempt to control public impression, but there is more research that is needed to support this claim.

Within this time spent on social media, the content of the platforms is being ingested and digested. There is a contrast between realistic body expectations and the images most predominantly advertised online. When images that are candid, unedited, and unposed are depicted, the bodily dissatisfaction in the consumer was notably decreased. Increased self-esteem and general mood were also observed in response to commercial advertisements illustrations [44, 45]. It is speculated that individuals who have low self-esteem regarding their body image may experience a steeper decline in self-esteem if they are intaking doctored photos and unrealistic expectations, and this may be worsened by increased social media time [46]

Studies have also shown that individuals with lower self-esteem and poor health spend more time on social media sites than those with higher and healthier levels. This produces control over self-presentation and allows for a sense of security [46]. These individuals attempt to escape from their stress-risen circumstances towards platforms that compensate for daily stressors at home and school. The sense of control and catharsis sets a basis of increasing allegiance to social media activity. Digital and social media dependence and addiction are prevalent among adolescents. In one study, 38% were measured to be generally addicted to technology, 43% recorded mild dependency, 15.9% had medium dependence, and 2% had severe dependence [47]. Other research likens overuse of technology to a mere change in culture rather than an addiction, which, by definition, causes harm to the addicted individual. These findings suggest that media use does not significantly impact one’s life satisfaction, but the reciprocal notion was shown to have significant effects [48, 49]. In light of this, impulse control, distraction, social influences, and satisfaction are predictors of technology addiction [48, 50]. These findings could indicate that addicted individuals may have preexisting and deep-rooted life dissatisfactions that may drive the impulse of technology addiction [50].

Among the explanations for technology and social media dependence, the range of impulse control, distraction, social influence, and satisfaction are listed as highly correlated with addiction [48].

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Additionally, parental psychological control and control of basic needs is found to be a positive predictor of technology addiction or dependence. Psychological control from parents was found to have a direct path to Digital, gaming, and social media addiction. It also creates frustration in basic needs by inhibiting adolescent functioning. Conversely, parental support while youth seek autonomy is found to have a positive effect on adolescent functioning, leading to the satisfaction of basic needs, and ultimately decreasing addiction probability [51]. Emotional intelligence also plays a role in the ability to self-regulate time spent online. Those with higher levels of emotional intelligence were seen to have a greater ability to regulate technology use than those with lower emotional intelligence scores [47].

Evidence for Reciprocal Influences Hypothesis

The exploration of reciprocal influences between PIU and self-esteem is sparse, yet understanding how they mutually influence each other can provide valuable insights into their complex relationship dynamics. This section of the critical literature review is guided by a contemporary theory proposing that social stress at one point in time predicts increased later maladjustment, and this maladjustment, in turn, is expected to amplify stress in a reciprocal process [7, 52]. For example, research evidence shows that those engaging in PIU may experience decline of their self-esteem over time [5]. Individuals of low self-esteem may pursue peer acceptance that exists in cyberspace rather than in real life. This self-perpetuating cycle seems to create a pathway for PIU users to get addicted to technology such as social media.

Since lower self-esteem is linked to more time spent on social media [46], and increased time spent on social media is correlated positively with the lowering of self-esteem [5], there seems to be a cyclical response that leads to the continual escalation of social media consumption. More consumption may lead to a greater need to control public impression, and consequently, further engulfing one in their media presence along with possibly advancing to digital addiction.

Vicious cycles are a perpetual system of behaviors in which the last phase propels the beginning of the cycle in a progressive direction [53]. In the context of this paper, the vicious cycle that is observed is that an adolescent with low self-esteem spends more time online to bolster their self-esteem, the increased usage time may lead to lowering the self-esteem further, and this triggers the beginning of the cycle again. This kind of process is found in addictions such as drug use as addicted individuals introduce drugs into their systems, experience withdrawal, anticipate the reward of the drug, and repeat their cycle to feed their addiction more. There is a perceived want or need that the individual consciously or unconsciously seeks to pursue, and this is followed by behaviors in line with the desire to plummet the cycle into motion [54]. Vicious cycles can be extremely hard to break out of due to their self-perpetuating nature, but certain therapeutic modalities and practices can assist in reshaping behaviors to lead to more positive habits [55].

Discussion

Self-esteem in adolescents and young adults is of increasing cause for worry, especially following the COVID-19 pandemic. It should be of paramount concern, not only for the identified population, but also for parents, policy makers, and the general community with a care for the next generation. Digital technology has simultaneously become increasingly essential for daily living and personal entertainment. While this has many benefits, and has expanded the opportunity for business growth, telecommunication, and many other facets of economic and social wellbeing, there have been notable detriments to self-esteem in adolescents as technology and digital dependence has progressed to PIU, and even addiction, for many.

As discussed in the biological influences section, when brains get overwhelmed by dopamine, the D2 receptors lose functioning performance, and this can be terminal [24]. As observed in the social causation hypothesis, these biological responses to digital stimulation may perpetuate a perceived need for increased time and engagement on digital platforms, and in turn, contribute to the continuation of the vicious cycle of low self-esteem and PIU. Screens overwhelm our lives in many facets such as entertainment, communication, news, research, and even academia, and there are many social, societal, and economic benefits to digital access. However, in this manuscript, it is crucial to observe the risk of problematic digital use, meaning use of digital platforms that harm the individual user, their relationships, or quality of life.

The advancements in the Information and Technology (IT) field have been immense and quite impressive, and a solution to overcoming PIU and digital addiction should not come at a cost to IT progressions. However, for the personal wellbeing of the public, there should be amendments to our approach to device usage practices. Further research could identify addictive properties among certain technological algorithms, and possibly produce a warning for the app or site, so that the public can be aware of the detriments that could affect their brain functioning.

Also as highlighted in the social causation hypothesis, bullying and adverse life circumstances can lead to a reliance on technology, specifically social media platforms, as youth seek to gain control over the image that is portrayed to peers [32]. Social media provides an ideal modality of this control as there is a great deal of customizability and editing that allows the maximum amount of regulation of one's self-portrayal. While this can be a creative mode of self-expression, but in the context of PIU and self-esteem, it is seen that this aspect of social media may act as a primary draw to those who lack positive peer relationships. Deceptive like-seeking is seen as a symptom of this perceived control as those with a desire to alter their public opinion may falsify their own images [42]. While the social causation hypothesis does not aim to consider self-esteem as causation to technology usage, by this research, there are positive correlations between self-esteem and technology usage, which the customizable nature of social media may contribute to.

Social media usage has become ubiquitous among young people, making it challenging to label as excessive when compared to previous generations due to the heightened reliance on technology in recent years. Beyond serving social connectedness and entertainment purposes, social media plays integral roles in business promotion, public awareness, news dissemination, and more [56]. These functionalities contribute positively to society, with social connectedness bolstering self-esteem. However, caution is warranted as prolonged social media use has been linked to negative impacts on self-esteem, depending on users' intentions, motivations, and content consumption. For instance, individuals with a negative self-perception may excessively engage on social media to control their public image, leading to detrimental comparisons and further declines in self-esteem. The instant gratification and dopamine hits from social media may obscure these effects initially, emphasizing the importance of user control, self-awareness, and a cultural shift towards less damaging content, such as realistic portrayals and the popular "Instagram vs. Reality" trend [45].

Social selection offers the notion that low self-esteem individuals may be at a higher risk for PIU due to their preexisting state. PIU may lead to continual exposure to unrealistic expectations of appearance or other factors of social acceptance. This may be especially damaging to those who have experienced bullying or lack positive peer relationships as it may worsen their self-esteem further [45]. These comparisons that are made between self and others online paired with the dopamine release of using engaging digital platforms pose a challenge to individuals' ability to regulate their own self-esteem.

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While achieving such cultural shifts is challenging in a perception-focused society, increased public awareness of the link between social media and self-esteem could prompt content creators and users to be more mindful of their online presence's impact. Although maintaining self-esteem is ultimately an individual responsibility, external factors, such as unrealistic content perpetuated by industries like marketing and fitness, pose challenges. Promoting authenticity and realistic portrayals can be a collective effort, fostering a supportive environment where genuine self-expression thrives. Public figures and influencers, given their platform, have a pivotal role in leading this cultural change towards greater self-acceptance. Practical steps to break the cycle of low self-esteem and excessive technology use include taking breaks, engaging in purposeful activities, and fostering prosocial behaviors and positive mindsets.

This study highlights the reciprocal relationship between self-esteem and technology usage, which can lead to adverse effects such as problematic Internet use (PIU) or technology addictions. Individuals with lower self-esteem may engage more with technology, perpetuating a cycle that further diminishes their self-esteem. This cycle is critical to understand when conceptualizing the influence of technology on the self-esteem of today's youth. Social causation aims to provide insight into the impact of environmental and biological factors on PIU, and the paralleling theory of social selection shows the impacts of low self-esteem on PIU as well. Both act together with reciprocity that is seen to create a less than ideal environment for the mental wellbeing of youth. While these findings are hypothesized in this analysis, further research is necessary to substantiate them. Nevertheless, this topic holds significant implications with practical applications. It not only advances research in the field but also provides insights that are relevant to the general population.

Increasing awareness about the risks associated with excessive digital use and promoting preventive measures are crucial steps in safeguarding the mental health and well-being of adolescents. Parents and caretakers play a pivotal role in this process by fostering a supportive environment that promotes healthy self-esteem and responsible digital habits. Regular check-ins, promoting physical activity, nurturing positive peer relationships, and maintaining open communication about technology use are all essential strategies to consider. Despite the challenges and unpredictability of adolescence, proactive efforts to understand and address the interplay between self-esteem and digital technology can contribute to healthier developmental outcomes for youth.

Conflicts of Interest: The authors declare no conflict of interest.

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