Various Types of Screen Time and Their Influences on Adolescents' Depression

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Abstract: Depression has continued to influence adolescents across the world. Out of variables related to depression, the variable of screen time, or media usage, is relatively new and needs continuous studies. This paper aims to review the relationship between depression and screen time. This paper first reviewed research tendencies along this field of works. Then, discussed different media types' individual impacts on depression of adolescents. At last, three potential mediators between depression and screen time were covered, including physical activity, social isolation, and self-regulation. It is important that knowing more about the underlying mediators to facilitate interventions and related assistance.

1. Introduction

Depression (major depressive disorder, MDD) is a mental disorder involving substantial declining in mood, interests, or pleasure [1]. As the most common psychological disorder worldwide, such disease affects 6% of population across the world every year [2-3]. It considerably affects patients psychologically, emotionally, and behaviorally. Thus, depression is recognized by the Global Burden of Disease Consortium as the second burdensome disease [2]. This disease affects adolescents substantially. Adolescents at transitional period are more vulnerable to the depression compared to other ages' individuals [3-4]. In 2016, an estimated 12.8% of USA adolescents had been diagnosed with MDD [5]. The depression then leads to various issues for adolescents, like family conflicts, school performance decrease, and especially suicide [2][6]. Depression based suicide is the second leading cause of adolescents in USA [5]. It is important for researchers to continue to explore on this field of work and to find more effective methods to cope with this disease for adolescents.

However, causes of depression are multifaceted. Such disease connects to too many types of individual dysfunctions, including but not limited to genetics, social environment, and brain functioning [7]. Out of all kinds of variables, one factor, screen time use, strongly correlates with depression symptoms [8]. Screen time refers to the time of individuals spending on television, phone, computer, and other media. In general, the more screen time a person has, the more likely s/he has depression symptoms [8-9].

Adolescents' screen time use also becomes more and more problematic. Since 2010, adolescents spent more and more time on screen based activities [10-11]. All these factors combine to illustrate an unhealthy psychological environment for adolescents. Besides other research activities on environmental and personal variables impacting adolescents' depression, the screen time stands out as an important environmental factor and needs thorough studies as well. With the direct and indirect correlation between screen time and depression, it is important for researchers to understand underlying mechanisms in order to develop related prevention methods [12-13].

The aim of this paper is to investigate the relationship between different types of screen time and depression symptoms for adolescents. Then to discuss related underlying mediators, the topics will be divided into three parts: physical activity, social isolation, and self-regulation.

2. Literature Review

In general, total screen time is associated with more depression symptoms. The idea of screen time's influences first started with studies in the relationship between television use and depression [14]. The use of television was studied as a coping method for depression in the research. 116 college students in psychology classes were asked to fill in questionnaires about depression and television use. The results were television's positive influence over depression as a coping method. This early study demonstrates negative correlation between depression and television use. It seemed to be contradictory to later studies. The research done by Primark et al. [15] showed out the association between screen time and depression symptoms, especially for young men compared to young women. Around 4800 final participants were followed from 1994 to 2002 for this study. This difference could be explained by two factors. The first difference between them is the study design. The later studies became to use a larger sample size and a longitudinal design. Secondly, the later studies' focused on the side of screen time's addiction properties rather than the side of coping for depression. This study focus variation might lead to varying measurements and analysis of data, and thus differentiate the results.

The larger sample size started to become a trend as later studies usually relied on public studies of mass population. The research by Kremer et al. [16] extracted data from a national study in Australia, including around 8000 adolescents. The levels of depression within the sample is high, with 30 percent meeting the criteria of moderate to severe symptoms. With this high percentage of targeted population out of the large scale of sample, the study's results demonstrates the association between more screen time viewing and depression.

As the large sample size studies always provided more and more accurate indication of relationship, research began to elaborate on it by examining bidirectional influences and related confounding variables. Gunnel et al. [17] tried to find bidirectional impacts between screen time and depression. It is a 7-year longitudinal study with around 200 participants completing all questionnaires. On one hand, the results did not come across any bidirectional connection. Initial high screen time does not predict increase in depression symptoms nor vice versa. On the other hand, screen time is increased alongside the increase in depression symptoms, confirming lasting correlations across time.

With more in-depth studies carried on, some confounding variables, like high academic stress, are considered to interfere with the relationship between screen time and depression as these variables substantially affect symptoms of depression [18-19]. Twenge et al. [11] tried to rule out this confounding variable in the study. The research extracted data from two national surveys in USA during the period from 1999 to 2015. The results show that more screen time is correlated with more depression symptoms in general without impacts of academic stress and has a larger impact of adolescent girls' (and female adults later) depression symptoms. Based on these previous

studies, this paper would discuss various forms of screen time's influences and the underlying mediators under the relationship.

3. Different Types of Screen Time

Studies on various types of screen time mainly fall into four categories: television, social media, phone,and computer. For the use of computer, the form of playing video games is usually addressed individually across research. Different categories seem to have varying effects on depression for adolescents.

It is noticeable that television viewing is found to be linked to depression in multiple studies. The research by Grøntved et al. and Bickham's team [4][9] concluded that TV viewing in adolescence were positively associated with depression score in young adulthood. The research by Boers et al. [20] exhibits similar results. The within-person correlation data show that more television viewing is associated with more depression symptoms for adolescents.

Secondly, social media's association with depression symptoms for adolescents is confirmed across studies [11][15][21]. There are also gender-specific findings concerning social media use. Twenge et al. [11] discovered that adolescent girls' depression symptoms were more impacted by social media compared to boys. This specific finding can be explained by two components. First of all, depression is a disorder that women are more vulnerable than men [2]. Secondly, more females tend to use social media than males, especially for famous platforms like Facebook and Instagram [22]. Females tend to be addicted to social media as well [23]. These two factors can make adolescent girls a specific target of social media's negative influences on depression.

For the use of phone, studies concerning with the behavior of problematic phone use normally find out this behavior's association with depression [3][24-26]. For adolescents with problematic phone use, this behavior tends to be one major part of their habits rather than a transient event [24][26]. Problematic phone use can indirectly influence depression. It can mediates with other aspects of adolescents' lives, like sleeping quality and procrastination behaviors. These factors then play a role in depression symptoms' development [3][25].

It is worth noticed that there was little association between computer use in adolescence and depression score in young adulthood, including the form of playing video games [4][9][20]. For such a variance between computer and other three types of screen time media, researchers offered an explanation of content exposure. It was discovered that TV viewing is a passive activity and related to attention problems, learning difficulties, antisocial behavior, and body dissatisfaction. Social media can lead to self-comparison to mass media's idealization messages and thus lower self-esteem [21]. Problematic use of social media can also be considered as a representative symptom of internet addiction, as social media usage is one form of internet usage. Problematic internet use is associated with depression symptoms [21][27]. The content of computer might not pose these negative connections compared to other media. In fact, video games are found to stimulate happiness for adolescents [9].

However, there were studies that discovered contradictory results regarding to the use of computer and television. The television is dissociated with depression, and playing video games is significantly correlated instead [10]. This distinguished contrast can be attributed to measurement methods and covariates. Bickham's study used multiple assessments of subjects' screen time, including questionnaires, diaries, and momentary assessment [4]. For Grøntved et al.'s data, 435 subjects completed all exposure and questionnaire, and were followed up from 1997 to 2010 [9]. While Maras' team did not use a longitudinal method nor assessments other than questionnaires, apart from included a large sample size [10].

It is not hard to find that the majority of media has negative impacts on adolescents' depression symptoms. The following paragraphs will attempt to discuss involving mechanisms in this relationship.

4. Mediators

4.1. Physical Activity

The first mediating factor to be discussed is the physical activity (PA). Screen time is connected with physical activity as when adolescents are growing up, they gradually spend more time on media use and less time on PA [17]. Besides longitudinal connection, cross-sectional data demonstrate imminent relationship as more screen time use is usually presented with less PA [8]. In addition, less PA is linked to more depression symptoms, and more symptoms of depression were associated with decreases in PA over time. These correlations may suggest multi-directional relationship between depression and PA [17]. Screen time may mediate through PA to influence depression and vice versa.

Less PA is found to have negative effects on depression [8][16-17]. It is worked out by negatively influencing levels of endorphin in human bodies . Endorphin is a type of neurotransmitters associated with feeling of well-being, and thus correlated with depression. Less endorphin secretion usually indicates depressive moods or symptoms [16][28]. Another underlying mechanism for less PA to associate with depression is lack of diversion. As individuals spend more time on exercising, they become less preoccupied with activities that might worsen depression, such as media use [28]. On the other hand, a certain amount of PA is used as treatments for depression in adolescents by promoting individuals' recovery from symptoms [28-29]. Thus, PA can have significant impacts on depression either in the positive or negative direction.

However, some research produces contradictory results on PA's impacts on depression. Certain studies include control group which is instructed for a placebo amount of PA, and control groups' depression symptoms are not significantly differentiated from exercise groups'. This circumstance indicates potential placebo effect in studies on PA [29]. Depression symptoms might be changed due to other variables or due to time elapse. Thus, less PA and more screen time are simply correlated with depression and have no causal relationship. Or rather depression has a one-way causation on PA and screen time as depression can predict PA's decreases [17]. To conclude, it is important for researchers to continue relating studies on the causal between screen time, PA, and depression.

4.2. Social Isolation

The second factor is social isolation influenced by screen time. The underlying mechanism was attempted to be explained by two hypotheses, augmentation and displacement hypotheses. Augmentation hypothesis states that people usually use media to develop social relations, and media usage enhances existing social relations [30-31]. Adolescents utilize media, especially social media, for these socialization functions. This kind of communication can partially improve adolescents' connectedness to others and alleviate depression symptoms [30-32]. For the time of COVID-19 induced lockdown and unavailability of physical communication, social media plays a role in helping adolescents to connect and stabling their mental health [33].

However, displacement hypothesis focuses on the negative side of media usage. It posits that media usage consumes a substantial amount of time of other socialization activities such as face-to-face communication without providing social relations facilitation, and thereby limits real-life social relations. It turns out augmentation hypothesis is partially correct, but the majority influences of media suggest the dominance of displacement hypothesis. Screen time promotes

people's connectedness online, but does not stop social isolation in real-life [30]. Moreover, social isolation, media usage, and depression are positively correlated with each other [31-32][34-35]. Although a certain degree of connectedness can be useful for confronting depression symptoms, social isolation tends to worsen depression symptoms [33][35]. Moreover, adolescents' mental health and depression symptoms seem to be more impacted by social isolation compared to other ages' people [33]. In conclusion, media use cannot play the role of physical communication. If provided with problematic usage, screen time will result in social isolation and depression symptoms.

4.3. Self-regulation

The third mediating factor is self-regulation impacted by screen time. This factor can include two sub-factors, procrastination and emotion regulation struggles, Whether on task management or on emotion, both involve personal control difficulties [36-37].

For procrastination, it mediates between excessive use of internet, phone, and SNSs and depression in adolescents. Specifically, excessive screen time may be a coping strategy for depressive adolescents, to cope with real-life issues [25]. Moreover, resulted procrastination is found to repairing moods in short-term [38].

Such coping strategy's influences can be divided into two stages. First of all, adolescents face problems and choose to excessively use media to cope and procrastinate [25]. Personal habits and motivations are strong factors to predict procrastination by media usage as well [37]. Such finding suggests that depressive patients may be more vulnerable to procrastinate due to their depressive conditions. Then, procrastination leads to more depressive symptoms. It is shown that procrastination produces rumination, and thus worsens the conditions [38-39]. This possible process indicates a bidirectional relationship between screen time, procrastination, and depression.

For emotion regulation, it is not only related to depression and media use, but also closely tied to procrastination and other factors [40-41]. The most representative regulation strategy of depressive patients is the rumination strategy [36]. In addition, excessive media usage seems to impair physiological structures, including gray and white matters which are partially in charge of emotion regulation [42].

4.4. Buffering Factors

Besides all these mediating factors between screen time and depression, there are buffering elements that can help adolescents to cope with negative influences. Social support can be a buffering factor for adolescents' depression. Adolescents' perceived social support can help these individuals to confront problematic media usage and related problems [25]. Support and regulation from parents can be more beneficial. Bickham's study indicates that parental ruling, especially on television usage, decreases the rate of depression for adolescents [4]. Depression can also be significantly mediated by parenting behaviors of adolescents. Adolescents with positive parenting experiences tend to have better emotion regulation and less problematic internet use [27].

5. Conclusion

Depression affects adolescents substantially across various aspects, from education to socialization [2-4][6]. Many elements can influence depression symptoms for adolescents. As adolescents become to spend more time in front of screen [10-11], media usage has became more and more relevant for such relationship. Screen time has various categories which emerged in recent times, mainly including social media, television, phone, and computer. The majority of them has association with depression in adolescents. However, there is controversies over the relationship

between computer usage and depression, suggesting possibility of context variations across different media [4][9][20]. This article then discusses three mediating factors between screen time and depression. They include physical activity, social isolation, and self-regulation. All three factors connect to screen time and depression in its own mechanisms, and some of them demonstrate potential bidirectional relationship. One buffering element, social support system, is included in the discussion as well. Sophisticated social support can help adolescents to face depression and related struggles [40-41].

6. Limitations and Future Research

Research included in this study has two major limitations. First of all, the majority of these studies did not consider to explore causal relationship. Their inferred connections between screen time and depression is mainly correlative. There are attempts to explore bidirectional relationship, but they cannot point to causality [17]. In addition, another limitation is the use of self-report questionnaires across studies. Self-report questionnaires are a reliable way to gather information from a large sample of population in a given period. However, the self-report property means that gathered results can possibly be influenced by subjective reflections of subjects.

Thus, it is important for future research to address these two limitations. Studies can include experiments towards problematic media usage groups to study causal relations. They can include basic psychological cares for control groups to fulfill ethnic requirements. For limitations of self-report data, studies can try to include various measurement methods. For example, one study included in this article not only uses self-report questionnaires and diaries, but also measure adolescents' media usage in real-life situation [4]. Secondly, there are limited research upon what endogenous factors can possibly mediate the relationship, compared to exogenous research. Studying endogenous elements may help more with understanding the relationship and providing interventions as this area focuses on stable individual characteristics rather than unstable environmental factors. For the examples of subjects, self-regulation can be further studied, and personality elements, such as extroversion, can be crucial for the relationship as well. At last, future research can focus on buffering factors for depression and screen time. It is important for researchers to address these elements in order to buffering practical interventions which are as crucial as studies in mediating elements.

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