

### INTRODUCTION

Digital media, or daily technology, includes cell phones, social media, television, and video games. It is ubiquitous and is used by all groups, especially young people; 50% of teenagers feel that they are addicted to their phones, and nearly half of all teenagers use digital media almost constantly.<sup>1,2</sup> Concerns were first raised about digital media addiction in the early 1990s.<sup>3</sup> Digital media addiction has been identified as a cause of physical effects such as weight gain, eye strain, and tension on the neck, as well as social and emotional effects such as poor relationship satisfaction and decreased civility.<sup>4</sup> Digital media addiction is also correlated with adverse mental health effects. Dependence on social media has been related to depression, anxiety, eating disorders, and bullying. To summarize the adverse mental health consequences of digital media addiction and dependence on social media, we reviewed the research findings on this subject from 2008 to 2019 using the following databases: PubMed, Science Direct, ClinicalKey, PsycNet, and Wiley Online Library.

### A TIMELINE OF SOCIAL MEDIA

Social Media Services by Launch Date	Monthly Users by Service, by End-of-Year																		
<p>1997 – <b>StuDiGra</b>, considered the first true social networking site, launches (defunct, 2000).</p> <p>1997 – <b>ADL Instant Messenger</b> (defunct, 2017).</p> <p>2002 – <b>Friendster</b>, a social gaming site (defunct, 2015).</p> <p>2002 – <b>LinkedIn</b>, a business-oriented platform.</p> <p>2003 – <b>MySpace</b>, the largest social networking site from 2005 to 2009.</p> <p>2004 – <b>Facebook</b>, initially for university students.</p> <p>2005 – <b>Reddit</b>, a news aggregator.</p> <p>2005 – <b>YouTube</b>, the current second most visited website in the world.</p> <p>2006 – <b>Facebook</b>, public version.</p> <p>2006 – <b>Twitter</b>, a social network in which individuals post short messages called “tweets.”</p> <p>2007 – <b>Tumblr</b>, a blogging site.</p> <p>2010 – <b>Pinterest</b>, a social networking site that focuses on hobbies and interests.</p> <p>2010 – <b>Instagram</b>, now owned by Facebook.</p> <p>2011 – <b>Google+</b>, Google’s social network (defunct, 2019).</p> <p>2011 – <b>Snapchat</b>, which allows users to send images that are deleted after some time.</p> <p>2013 – <b>Vine</b>, used to share looped videos (defunct, 2017).</p>	<table border="1"> <thead> <tr> <th>Facebook<sup>5,7</sup></th> <th>Twitter<sup>6</sup></th> <th>Instagram<sup>8</sup></th> </tr> </thead> <tbody> <tr> <td>2008 – 150 million</td> <td>2010 – 54 million</td> <td>2012 – 90 million</td> </tr> <tr> <td>2010 – 608 million</td> <td>2012 – 185 million</td> <td>2014 – 300 million</td> </tr> <tr> <td>2012 – 1.05 billion*</td> <td>2014 – 288 million</td> <td>2016 – 600 million</td> </tr> <tr> <td>2014 – 1.39 billion</td> <td>2016 – 318 million</td> <td>2018 – 1.0 billion</td> </tr> <tr> <td>2016 – 1.86 billion</td> <td>2018 – 321 million†</td> <td>2018 – 2.32 billion</td> </tr> </tbody> </table> <p>*Facebook was the first social network to reach 1 billion users †Twitter begins to decline in users after a peak of 336 million at the beginning of 2018 Instagram is owned by Facebook as of 2012</p> <p>A variety of social networking sites.</p>	Facebook <sup>5,7</sup>	Twitter <sup>6</sup>	Instagram <sup>8</sup>	2008 – 150 million	2010 – 54 million	2012 – 90 million	2010 – 608 million	2012 – 185 million	2014 – 300 million	2012 – 1.05 billion*	2014 – 288 million	2016 – 600 million	2014 – 1.39 billion	2016 – 318 million	2018 – 1.0 billion	2016 – 1.86 billion	2018 – 321 million†	2018 – 2.32 billion
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### ANXIETY

- Increasing digital media use in any way can result in *higher rates of anxiety* regardless of age or gender.<sup>9, 10, 11, 12, 13, 14, 15</sup>
- A lack of access to a cell phone, such as leaving it at home during school or work, leads to *heightened feelings of anxiety* in children and adults.<sup>11, 13</sup>
- Young adults use digital media devices as *avoidance tools*, which increases social anxiety in face-to-face situations.<sup>14, 15, 16</sup>
- Individuals feel most anxious when they are near their phone but are not permitted to use it.<sup>13</sup>
- A study found that students who had but could not use their phones in a class did as poorly on assessments as those who did use their phones in class. Students who did not bring a phone to class performed the best. Anxiety can increase from being unaware of received notifications but having close access to a phone.<sup>17</sup>

### DEPRESSION

- Higher rates of digital media use are *strongly correlated with higher rates of depression*.<sup>9, 10, 12, 16, 18, 19, 20, 21</sup>
- Digital media use often *substitutes for face-to-face interaction*, which increases the chance of developing depressive symptoms.<sup>9, 11, 14, 16</sup>
- Exposure to *depressive and graphic content online*, such as images of self-harm or violent films, can cause depression and anxiety in children.<sup>11</sup>
- Cyberbullying**, defined as any kind of aggressive or hurtful online behavior that targets an individual, can occur to all age groups. Teens are most vulnerable, with half of all US teens having experienced cyberbullying. Children and young adults are also more susceptible to developing depressive symptoms, more so than adults.<sup>22, 23, 25, 26, 27</sup>



- Individuals with higher levels of boredom, such as college students who avoid schoolwork, are *more likely to use digital media frequently and to develop depressive symptoms*.<sup>28, 29</sup>
- Nighttime-specific social media use before going to sleep can cause poorer sleep quality, which then *directly contributes to developing depressive symptoms*.<sup>10, 30</sup>

### MOOD

- Digital media use can have an *adverse effect on mood*, defined as the predominant emotion throughout the day.<sup>31, 32, 33, 34, 35</sup>
- Women are more susceptible to adverse self-esteem consequences due to social media use; posting self-images (selfies) and comparing them to the images of other women *decreases mood and self-esteem*.<sup>31, 34</sup>
- Viewing images of models with *disclaimers that state they are not accurate representations of real life* does not alter how individuals viewing those images feel, compared to images without the disclaimers.<sup>31</sup>
- Using digital media immediately before going to sleep can *cause reduced sleep time and a more negative mood* after waking up.<sup>32, 33</sup>
- Comparisons to others and the number of “likes” on a photo can *negatively affect mood and body image*.<sup>36, 37, 38, 39</sup>



Facebook’s and Instagram’s “like” buttons.

### EATING DISORDERS

- Individuals with higher rates of social media use are more likely to have *negative body image and lower self-esteem*.<sup>40, 41, 42</sup>
- Higher rates of social media use are correlated with *higher rates of eating disorder development*.<sup>40, 43, 44, 45, 46</sup>
- The greater the social media use, the greater the likelihood of developing poor body image or an eating disorder, *regardless of gender, race, or sexual orientation*.<sup>40, 41, 36</sup>
- Certain groups are *more susceptible to negative body image and development of eating disorders* due to social media, such as women, children, and homosexual men.<sup>42, 45, 47</sup>



People Magazine, 1996. The body image and media problem has been acknowledged for years.

### ATTENTION-DEFICIT HYPERACTIVITY DISORDER

- More time spent on digital media has been correlated with the symptoms of attention deficit disorder (ADHD), including difficulty focusing, impulsiveness, or lack of organization. Ongoing research may determine if there is a causal correlation.<sup>48, 49</sup>
- Children and teenagers with a confirmed diagnosis of ADHD are more likely to be addicted to digital media, such as video games and Facebook, than their non-diagnosed peers.<sup>50, 51</sup>

### INTERNET GAMING DISORDER

- 97% of teens aged 12-17 play computer, web, portable, or console video games. Video games can be a highly addictive form of media.<sup>52</sup>
- The current Diagnostic and Statistical Manual of Mental Disorders (DSM-V) labels Internet Gaming Disorder, or an addiction to video games that results in adverse health consequences, as needing further research to determine if it is a diagnosable condition.<sup>53</sup>
- Addiction to video games can lead to increases in symptoms of depression and anxiety in all age groups.<sup>54, 55, 56, 57</sup>
- The link between video games with themes of violence and aggression is contested. Researchers cannot agree if there is a causal link.<sup>58, 59, 60, 61</sup>
- The American Psychological Association’s official stance is that playing violent video games is one risk factor that can lead to aggressive behavior, such as anger or hostility towards others.<sup>61, 62</sup>



3 popular modern video game consoles: Xbox One, PlayStation 4, and Nintendo Switch.

### POTENTIAL SOLUTIONS

- Reducing time on social media platforms can *increase self-esteem and positive mood and reduce the risk of developing depression and anxiety*.<sup>63, 64, 65, 66</sup>
- Teaching that images on social media are often *not realistic representations of the body* can reduce the likelihood of developing poor body image.<sup>67</sup>
- Designing better websites that are less enticing to the user and putting restriction features on children’s social media accounts could *reduce the adverse effects of social media addiction* in children and adolescents.<sup>68</sup>
- For children, implementing household rules to reduce the amount of TV and digital media viewed, as well as monitoring the content viewed, can *reduce the likelihood of developing depressive symptoms*.<sup>20</sup>
- Cyberbullying can be reduced** by creating intervention programs in schools and reducing overall screen time.<sup>22</sup>

### CONCLUSIONS

There is an increasing amount of evidence that digital media can be harmful to mental health. Reducing overall screen time and exposure to digital media can be beneficial in preventing consequences such as depression, anxiety, and poor body image. Educational institutions, medical associations, public health departments, and business communities need to take steps to address the problem.

### JUULing

Addiction to digital media devices does not have to be confined only to social media, television, and video games. JUUL, an electronic cigarette that resembles a USB drive, can be viewed as an extension of digital media addiction. JUULs are marketed to fit a technological lifestyle and are popular with young adults, but can be physically addictive due to their high nicotine content.<sup>69</sup>