



Conceptualizing Digital Stress in Adolescents and Young Adults: Toward the Development of an Empirically Based Model

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Abstract

Existing literature provides a complicated picture of the relationship between digital media use and psychological outcomes. Both correlational and some experimental studies suggest that social media use specifically can be associated with diminished psychological functioning in adolescents and young adults. However, these effect sizes are not large, and must be considered in light of studies that suggest some positive outcomes associated with some uses of digital media, and a range of moderators of the identified associations. Although a growing body of evidence suggests that *digital stress* may be an important intervening factor between digital media use and psychosocial outcomes, this literature is complicated by multiple nomenclatures for similar or identical constructs. Our review of the literature suggests four potentially related components of digital stress, including *availability stress*, *approval anxiety*, *fear of missing out*, and *communication overload*. This conceptualization is consistent with recent published frameworks for understanding digital media's influence on peer relationships. Clinicians working with adolescents and young adults are encouraged to assess digital media use in the context of clients' overall psychological and social functioning, and in consideration of clients' specific uses of media. Future research is needed to examine the associations among components of digital stress and clinical outcomes, and to provide valid measures to assess digital stress in research and clinical settings.

Keywords Adolescents · Digital stress · Psychosocial outcomes · Social media · Technology use

Introduction

Recent surveys indicate that approximately 68% of adults in developed nations and 77% of adults in the U.S. own a smartphone (Pew Research Center 2018; Poushter 2016). These data reveal significant variability in adult smartphone ownership in the U.S. across gender, educational attainment, age, and income level. However, in contrast to the variability shown among adults, survey results indicate that 95% of adolescents in the U.S. (ages 13 to 17) report owning or having access to a smartphone (Anderson and Jiang 2018), and this estimate varies minimally across gender, race/ethnicity, and

income level of parents. The Pew Research Center reports that adolescent smartphone access in 2018 was 22 percentage points greater than what teens reported in 2014–2015 (Lenhart 2015). It is not hyperbole to say that nearly every teen that *can* have a smartphone *does* have a smartphone.

With the integration of a range of communication modes across social media platforms (e.g., Facebook, Instagram, Snapchat) and downloadable applications (i.e., “apps”) as well as basic mobile functionality (e.g., texting), the smartphone has fundamentally transformed the ways in which adolescents stay connected with their peers (Nesi et al. 2018). Indeed, a nationally representative survey found that approximately 45% of adolescents report being online “*almost constantly*” (up from 24% in 2014–2015), with another 44% indicating that they are online “*several times a day*” (Anderson and Jiang 2018). Such statistics support recent assertions that adolescents and adults in developed nations live in a *permanently online, permanently connected* world, wherein the online self is inextricably linked to offline consciousness, mental health, and well-being (Vorderer et al. 2017).

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With these dramatic changes in the adoption and usage of digital media, researchers and the lay public alike have sought to understand the nature, direction, and size of the association between online activities and psychosocial outcomes. Both now and in past ages of rapid adoption of new technologies, there is a critical need to explore such associations with scrutiny rather than jump to facile or presumptive claims of the unavoidable harms of technology (Baym 2010). The primary goal of this paper is to describe the role of *digital stress* in associations between digital media use and psychological outcomes. To do so, we first review the empirical literature on the associations between digital media use and psychosocial outcomes in adolescents and young adults. Then, we examine and identify four components of digital stress that appear in the literature, which reflect the ways in which adolescents experience, understand, and relate to their own digital media use. Finally, we examine the role of digital stress as a potential mediator and/or moderator of the association between social media use and psychosocial outcomes, as well as the clinical implications of digital stress.

Digital Media in the Smartphone Era

Classic definitions of computer-mediated communication (CMC) are inclusive of messages sent through mediated devices, commercial platforms and apps, and online games (Walther 2010). Prior to 2007, the vast majority of mobile phones supported only two modalities: voice calls and texting. Presently, smartphones place few limits on the modality of communication. Thus, the smartphone is best understood as the primary device through which mobile and internet-based communication flows, particularly for adolescents and young adults (Anderson and Jiang 2018). Although there is no single agreed-upon definition, “social media” also is not a singular mode of communication. Instead, social media is typically identified by a set of features built into a stand-alone online platform, particularly features allowing searchable and scalable peer-to-peer communication (Ellison and Vitak 2015). Social network sites (SNS) (e.g., Facebook) are the most ubiquitous and identifiable form of social media, but microblogs (e.g., Twitter) and photo and video sharing platforms (e.g., Snapchat, Instagram) are also included in the current conceptualization of social media (Ellison and Vitak 2015). Individuals can passively use social media by scrolling or browsing others’ content, or can actively use social media by sharing or posting their own content or responding to other users’ public content or they may communicate directly with other users privately. Social media platforms can be integrated with smartphones through platform-specific and stand-alone apps (i.e., many programs are built for

smartphones), both of which send alerts and notifications to the user through their smartphone device.

Given the diversity of modalities, platforms, and features and given the ever-changing media landscape, clear definitions are necessary to clarify research findings. We will use the term *digital media* to refer to CMC through all modalities and platforms, provided that communication is peer-to-peer or broadcasted by an individual. This will intentionally exclude communication from corporations and advertisers, and consumptive media content (e.g., TV streaming). Although we presume that much of CMC will flow through smartphones, our definition of digital media includes all other mediated devices (e.g., PC, tablets) because new mediated devices will undoubtedly emerge. The term *social media* will be used to refer to research conforming to the definition above. Research on other specific apps or modalities (e.g., texting, instant messenger) will be referred to by name whenever possible.

Digital Media and Psychosocial Functioning

The increased use of smartphones in general and social media specifically has been met with concerns about possible deleterious effects social media on health and well-being (Reinecke 2017), particularly for adolescents and young adults (Mihailidis 2014). Articles in the popular press (e.g., O’Gorman 2018) and from advocacy groups (Schurgin-O’Keefe and Clarke-Pearson 2011) warn parents and providers of the impact of smartphones on child and adolescent development. Even adolescents are concerned about the harms of smartphone and digital media use on their well-being. Jiang (2018) found that 54% of adolescents surveyed reported that they spend too much time on their mobile phones; 52% of surveyed adolescents say that they have cut back on their mobile phone use; and 57% report having cut back on social media use. In terms of the perceived impact of social media on peers, teens’ reports are mixed: 31% report a “mostly positive” effect, 45% report neither a positive nor a negative effect, and 24% report a “mostly negative” effect (Anderson and Jiang 2018). These statistics reinforce qualitative accounts that reveal a strong and enduring ambivalence among adolescents about their use of digital media in the past decade (Baron 2008; Mihailidis 2014).

Consistent with subjective reports, the empirical literature suggests a complicated association between digital media use and psychosocial functioning (Baker and Algorta 2016; Davila et al. 2012). Among adolescents, some empirical studies have suggested associations between social media use and depressive symptoms, loneliness, well-being, and quality of life (e.g., Shensa et al. 2017). In perhaps the largest meta-analysis to date, Hancock et al. (2019) reported that

social media use is negatively associated with measures of adolescent psychological well-being, and positively associated with symptoms of depression and loneliness. Consistent with these results, Barry et al. (2017) reported associations between number of adolescent social media accounts, the frequency with which adolescents checked those accounts, and parent-reported adolescent ADHD, anxiety, and depressive symptoms. Similarly, Woods and Scott (2016) found that adolescents with stronger emotional connections to social media use (e.g., “*I get upset when I can’t log on to social media*”) also reported poorer sleep quality and more symptoms of anxiety and depression.

More recently, Twenge et al. (2018) reported significant associations between screen activities in general (including, but not limited to the use of social media) and self-reported depressive symptoms and suicidal ideation. These associations were specific to both gender and type of screen activity: social media use was correlated with depressive symptoms among girls, but not among boys. Interestingly, adolescents who reported low levels of “in person” social interaction and high social media use indicated the highest levels of depressive symptoms. These results echo earlier findings that, among adolescents, associations between social media use and outcomes are moderated by user characteristics as well as specific uses of social media (e.g., Nesi and Prinstein 2015; Teppers et al. 2014).

Experimental studies on the effects of abstaining from social media are fewer in number and have yielded mixed results. Some studies have found that abstaining from or limiting access to social media (i.e., Facebook) may be associated with feelings of disconnection (Sheldon et al. 2011), but also with increased self-reported life satisfaction and positive affect, and/or decreased loneliness or depression (Hunt et al. 2018; Tromholt 2016). Such results appear greatest for previously “heavy” Facebook users and for participants with clinically elevated symptoms prior to the intervention (Turel et al. 2018). Other studies, however, have found no detectable association between Facebook abstinence and loneliness and affective well-being (Stieger and Lwetez 2018).

Summarizing the literature, Baker and Algorta (2016) suggested that the relationship between social media use and psychological outcomes may be mediated or moderated by a number of “usage” variables (p. 640), perhaps including quality, frequency, and type of social media use. For example, Hall (2018) and Verduyn et al. (2015) reported that *passive* Facebook use (e.g., browsing) is associated with decreased well-being, while *active* use (e.g., posting updates, sending private messages) shows no effect on subjective reports of well-being. These results are partially consistent with Hancock et al. (2019) meta-analytic results, which indicated that that passive social media use was positively associated with psychological distress, loneliness, symptoms of depression, and active use was positively associated with

psychological health. Similarly, Davila et al. (2012) noted that, among young adults, quality of social media use (i.e., the subjective experience of positive or negative social media interactions) was a better predictor of outcomes than social media usage per se.

Further, intra-individual characteristics (e.g., pre-existing psychosocial functioning, personality traits) appear to significantly moderate the impact of social media use on measured outcomes (Nesi and Prinstein 2015; Twenge et al. 2018). Indeed, in a structural equation model of meta-analytic results, Song et al. (2014) found that a model in which loneliness predicted more Facebook use was a better fit to the data than the reverse causal direction (i.e., in which social media use predicted loneliness). In a recent longitudinal study including adolescents and young adults, social media use did not predict depression, but depression predicted future social media use in general, and more strongly for adolescents than for young adults (Heffer et al. 2019). Similarly, Van der Eijnden et al. (2008) found that the association between instant messenger (IM) use and depressive symptoms depended on initial levels of loneliness: the association between IM use and depressive symptoms was significant for the high loneliness group, but not for the low-loneliness group. Taken together, these results suggest that a more complex and complete account of the association between social media use and outcomes in adolescents and young adults is necessary (Baker and Algorta 2016; Nesi et al. 2018).

Digital Stress

There is growing evidence that *digital stress* is an important factor in understanding the relationship between digital media use and psychosocial outcomes and may aid in understanding how digital media affects adolescents and young adults (Hall 2017; LaRose et al. 2014; Reinecke et al. 2017; Thomee et al. 2010). Digital stress has been defined as the “*stress resulting from a strong and perhaps almost permanent use of information and communication technology... that is triggered by permanent access to an inconceivable amount and diversity of (social) content*” (Hefner and Vorderer 2016, p. 237). The term is also used to identify the cognitive, affective, and physiological arousal that accompanies notifications from or actual use of social media (Thomee et al. 2010) and as a general term to describe stress resulting from specific aspects of social media use (e.g., Reinecke et al. 2017).

Consistent with Lazarus and Folkman’s (1984) conceptualization of psychological or psychosocial stress, we examine the concept of *digital stress* as the subjective experience of an event, condition, or stimulus (i.e., a “stressor”) in the context of the individual’s social and relational contexts and

coping resources. Receiving a large number of new messages or notifications on a smartphone *could be* perceived as a stressor, and “digital stress” is the individual’s *subjective response* to that stimulus (Hefner and Vorderer 2016). When presented with a common stressor (e.g., a given quantity of notifications) individuals’ experiences of “digital stress” should vary in accordance with their perceived coping resources and relational contexts. Individuals who experience manageable or no subjective distress resulting from a given level of social media use (e.g., a given number of notifications) would be expected to evidence few or no downstream symptoms (e.g., depression, anxiety), and may find their lives enhanced by social media. On the other hand, individuals who experience more digital stress than their coping resources can accommodate may be more likely to experience concurrent or subsequent psychological symptoms. Thus, as more fully described below, we view digital stress as an intervening variable that explains the relationship between qualitative or quantitative aspects of digital media use and behavioral or affective responses. Stress reactions (see Hefner and Vorderer 2016) might include physiological, affective, or behavioral responses to the subjective experience of digital stress.

Although a number of qualitative and quantitative studies speak to the concept of digital stress, the use of numerous terminologies for similar or identical constructs complicates the literature and makes a quantitative systematic review impractical. For example, general terms such as *Facebook Induced Stress* (Campisi et al. 2012), *Facebook Related Stress* (Beyens et al. 2016), *Social Network Site [SNS] Exhaustion* (Lo 2019), and *Digital Stress* (Hefner and Vorderer 2016; Reinecke et al. 2017) blend with descriptions of stress resulting from specific aspects of social media use, including *Communication Load* (Reinecke et al. 2017),

Connection Overload (LaRose et al. 2014), *Accessibility Stress/Availability Demands* (Thomee et al. 2010), and *Mobile Entrapment* (Baron 2008; Hall and Baym 2012; Hall 2017), often obscuring findings across studies. Consistent with calls in the literature for clearer measurement models (e.g., Hall 2017; Morin-Major et al. 2016) this review highlights and delineates components of digital stress as discussed by a multidisciplinary literature to offer a framework in which to consider the components of digital stress (see Table 1).

Components of Digital Stress

Availability Stress

One of the most frequently identified components of digital stress relates to availability demands placed on mobile device users (Baron 2008; Hall and Baym 2012; Mihailidis 2014). Although social and mobile media afford near constant access to sources of social contact (e.g., Lo 2019), they also create the opportunity for distress, including guilt and anxiety, resulting from internalized expectations that the individual respond to and be available to others in kind. For example, Thomee et al. (2010) identified availability demands as a predictor of current stress and symptoms of depression in adult mobile phone users. Among adolescents, Reinecke et al. (2017) identified social pressure (e.g., “My friends expect me to be constantly available,” p. 11) as a significant predictor of communication load, and in a qualitative study of university students, Fox and Moreland (2015) reported that Facebook users identified pressure to “stay connected to friends no matter the place or time” (p. 171) as a significant stressor. Highlighting the role of specific

Table 1 Published conceptualizations of digital stress

| Digital stress component | Working definition of the component | Similar or related constructs |
|--------------------------|--|--|
| Availability Stress | Distress (including guilt and anxiety) resulting from beliefs about others’ expectations that the individual respond and be available by digital means | Mobile entrapment (Baron 2008; Hall and Baym 2012); Mobile maintenance expectations (Hall and Baym 2012); Accessibility stress/availability demands (Thomee et al. 2010) Social pressure (Halfmann and Rieger 2019) |
| Approval Anxiety | Uncertainty and anxiety about others’ responses and reactions to one’s posts or to elements of one’s digital footprint | Social comparison (Fox and Moreland 2015) Digital self-presentation (Kim and Lee 2011; Morin-Major et al. 2016) Need to belong/need for popularity (Beyens et al. 2016) |
| Fear of Missing Out | Distress resulting from the real, perceived, or anticipated social consequences of others engaging in rewarding experiences from which one is absent | Fear of missing out (Przybylski et al. 2013; Reinecke et al. 2017) Fear of missing out (Beyens et al. 2016) |
| Connection Overload | Distress resulting from the subjective experience of receiving excessive input from digital sources, including notifications, text messages, posts, etc. | Availability demand (Thomee et al. 2010) Communication load (Reinecke et al. 2017) (Social) information overload (Hefner and Vorderer 2016) Information overload (Misra and Stokols 2011) |

features of digital platforms in the role of digital stress, Mai et al. (2015) reported a positive association between perceived obligations to respond in a digital platform (e.g., “seen” or “read” functions within Facebook) and anxieties regarding one’s belongingness in a social group (i.e., fear of ostracism).

Approval Anxiety

A second component of digital stress is *approval anxiety*, which we define as the degree of uncertainty and psychological (e.g., cognitive, affective, behavioral) arousal about others’ responses and reactions to one’s posts, photos, messages, and to the composite of one’s digital footprint (i.e., one’s digital profile). Although there are likely several reasons why a person might edit their profile picture, Morin-Major et al. (2016) argue that approval anxiety reflects the extent to which one edits one’s digital profiles to maintain a positive self-presentation. Research on CMC has long recognized that digital media affords users a wide range of opportunities to craft a highly controlled impression of the self that is strategic, controlled, and positive (Hall et al. 2014). As reviewed by Nesi et al. (2018), adolescents’ focus on peer approval and social validation is functionally related to social comparison, reflected appraisal, and feedback seeking, all of which are facilitated by numerous social media platforms and functions. Thus, there is significant social pressure to construct a desirable and attractive profile, while attending to the social sanctions against misrepresentation or lost opportunities for new relationship development by not presenting oneself accurately (Hall et al. 2014). Indeed, Kim and Lee (2011) examined the tension between producing a *positive* digital self-presentation and an *honest* digital self-presentation and found that while a positive self-presentation was directly associated with subjective well-being, an honest self-presentation was indirectly associated with subjective well-being through available social support.

Drawing from the available literature, we anticipate that approval anxiety is particularly salient in the context of constructing a profile, sharing new digital material, or in the context of understanding or interpreting new relational partners or communicative exchanges with uncertain outcomes (e.g., chatting with a potential romantic partner). Steers, Wickham, and Acitelli (2014) found that the association between time on Facebook and self-reported depressive symptoms was mediated by users’ social comparison behavior. Similarly, Nesi and Prinstein (2015) reported that technology-based social comparison and feedback seeking was associated with subsequent depressive symptoms among adolescents after controlling for overall frequency of technology use. This association was more robust among females and among youths with lower offline popularity. Females’ greater social expectations of social support, empathy, and

concern, compared to males (Hall 2011) likely exacerbate approval anxiety online, and those with a lack of friends or supportive others may seek to address those needs through CMC.

Fear of Missing Out

An emerging literature suggests that Fear of Missing Out (FoMO), or the *distress resulting from the real, perceived, or anticipated social consequences of others engaging in rewarding experiences from which one is absent*, may be a significant component of digital stress. Because many adolescents and young adults rely heavily on digital media to communicate with and learn about their peers’ lives (Nesi et al. 2018; Reinecke et al. 2017), digital media use is both a place where social interaction occurs and a means by which offline activities are presented for others’ consumption (Hall 2018). Thus, the above definition of FoMO uses the phrase “others engaging in rewarding experiences” to both refer to the communication that takes place online *and* the positive experiences of others advertised there. Przybylski et al. (2013) found that FoMO was associated with generally poorer mood and lower levels of life satisfaction, and that FoMO mediated the associations between mood and life satisfaction and social media engagement. Further, they reported that increased FoMO explained substantial variance in problematic social media use (e.g., using FB while driving) among university students as well as ambivalence toward social media use. Consistent with these results and the working model of digital stress noted above, Reinecke et al. (2017) suggested that FoMO may drive online communication patterns, thereby increasing information overload and increased risk for negative outcomes. This idea is supported by Barry et al. (2017) who reported that FoMO served as a moderator of the association between adolescents’ social media use and parent-reported symptoms of anxiety and depression. Similarly, Beyens et al. (2016) reported that FoMO mediated the association between adolescents’ “need to belong” and “need for popularity” and stress due to Facebook use.

Connection Overload

Unlike the previous three aspects of digital stress discussed above, a fourth manifestation of digital stress evident in the literature, *connection overload*, is not explicitly social. Although the messages and notifications that individuals may be overloaded by are often social in nature, past research suggests that the visibility of this information is often a product of the platform and specific smartphone settings, not just the frequency of the messages (Halfmann and Rieger 2019). A number of previous authors have commented on the stress that can result when the amount

of information available exceeds the capacity of the individual to process or handle it (e.g., Hefner and Vorderer 2016; LaRose et al. 2014; Reinecke et al. 2017). This construct is often operationalized in terms of objective units of communications (e.g., number of notifications or number of texts sent/received). However, in keeping with the working definition of digital stress proposed above, and consistent with early conceptualizations (Misra and Stokols 2011), we define connection overload as the distress resulting from the subjective experience of receiving excessive input from digital sources, including notifications, messages, and posts. Rather than a raw count of CMC input (e.g., messages, posts, “likes,” notifications), the present review suggests that the perception of being overloaded is a more suitable indicator of digital stress than the number of notifications received. Further, such a distinction avoids conflating ‘digital media use’ with the perception of distress resulting from that use.

The distinction between the *objective* quantity of communications received and the *subjective* experience of receiving too many is important, as individuals that receive equal numbers of communications may vary in terms of their subjective experience of stress. For example, in defining “connection demands” in terms of objective units (e.g., number of log-ins, followers, notifications, texts received), LaRose et al. (2014) found a *positive* association between connection demands and the psychological well-being of participants. However, when participants’ *subjective* experience of connection overload was taken into account, the model suggested *negative* outcomes (poorer mental health) associated with greater connection demands. Similarly, Reinecke et al. (2017) examined the association between “digital stress” and psychological health in a sample of college students, using a measure of communication load that incorporated both the subjective experience of receiving excessive input and objective data related to the number of emails and messages sent/received. Consistent with earlier findings (e.g., Chen and Lee 2013; Misra and Stokols 2011), results indicated that communication load was positively associated with

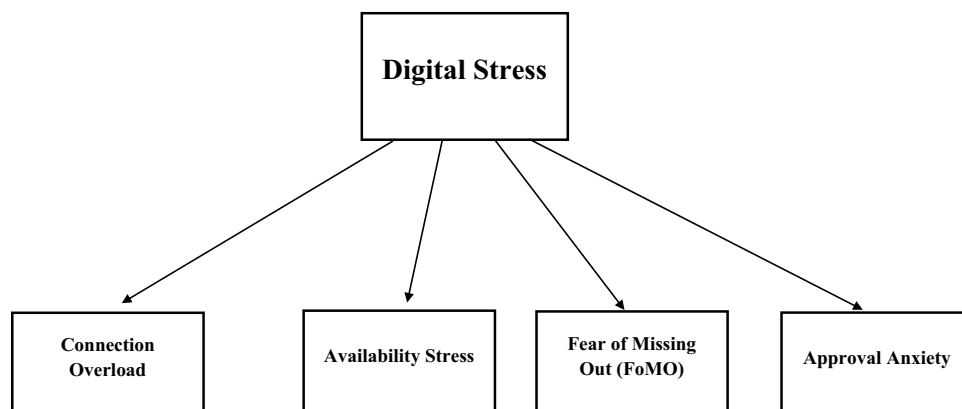
perceived stress, and was indirectly associated with higher self-reported burnout, depressive symptoms, and anxiety.

Digital Stress in the Context of Digitally Mediated Social Relationships

Mobile and social media have fundamentally transformed relational communication patterns and expectations, particularly among adolescents. Yet, there is a great deal of variation in the ways in which that mobile and social media can be used, with new mobile applications being released each day. Indeed, Baym (2010) offered seven ways in which CMC could vary, and Nesi et al. (2018) recently extended this typology to consider additional points of variation. Digital media modes and platforms and types of use within those platforms can be more or less permanent, publicly available, searchable, sharable, and interactive. Correspondingly, we view *digital stress* as a multi-faceted (and perhaps multi-factorial) construct, with each facet/factor of digital stress (e.g., availability stress, approval anxiety, fear of missing out, communication overload) responding differentially to variability among these features (see Fig. 1).

The synchrony and availability dimensions of mobile media identified by Baym (2010) and Nesi et al. (2018) may enhance the social pressure to be constantly available through one’s mobile device (i.e., availability stress). When a platform or program is more synchronous, the transmission of digital messages is nearly instantaneous, and when they are more available (i.e., high mobility), they are more accessible no matter where the user is geographically. Nesi et al. note that the dimension of availability is tied up with “expectations of constant availability,” which are not strictly a function of media, rather socially constructed norms or expectations (see Baron 2008; Hall and Baym 2012). Similarly, we expect that media that render shared content more *permanent* and *public* seem likely to lead to more approval anxiety than media that are ephemeral (e.g., Snapchat) or private (e.g., Telegram). This suggests that the key features of mobile platforms (e.g.,

Fig. 1 Conceptual model of components of digital stress



permanence, publicness) likely correspond to heightened and perhaps unique pressures toward approval anxiety. Further, platforms that encourage the sharing of photos (i.e., greater “visualness”) or steer users toward public acknowledgement (i.e., quantifying their ‘likes’ or ‘shares’) may pique users’ approval anxiety.

Some modalities, such as one-on-one texting, direct users toward more socially interactive experiences (Baym 2010), which tend to result in a stronger sense of relatedness than social media use generally (Hall 2018). This also may account for why *active* social media use, which includes posting, commenting on others’ posts, and sending direct messages, tends to have more positive outcomes than *passive* use (Hancock et al. 2019). Perhaps highly socially interactive digital media use is associated with less digital approval stress because such forms of use limit the number of communication partners (Hall 2017) and increases feeling of relatedness or connection (Hall 2018), compared to less interactive forms of use.

As a feature of many mobile platforms, “visualness” may particularly interact with specific aspects of cognitive and social development to render adolescents and young adults particularly vulnerable to experiencing digital stress. By mid-adolescence and continuing through young adulthood, peer networks have matched or outpaced parents and siblings in terms of relative social importance (Wrzus et al. 2013). The use of social media that is highly visible may heighten users’ awareness of peers’ friendships and experiences that do not include the user. As a result, the visibility of peers’ relationships and experiences may uniquely contribute to adolescents’ FoMO.

Finally, specific aspects of neurocognitive development may interact with features of mobile media to increase digital stress. Neuronal myelination and selective synaptic pruning within the prefrontal cortex and parietal cortex are generally not complete until the post-puberty years (see Blakemore and Choudhury 2006). As a result, some aspects of executive functioning (e.g., attention control, delayed reinforcement, perspective taking) may not be fully developed among adolescents, leaving this age-group relatively vulnerable to compromised emotion regulation in response to social stressors (e.g., Defoe et al. 2015). Highly synchronous, available, and quantifiable platforms may overload available regulatory systems, resulting in the experience of digital stress, particularly when users enable multiple platforms and applications simultaneously (viz., LaRose et al. 2014; Reinecke et al. 2017).

Digital Stress as a Mediator or Moderator

A fundamental issue in the development of digital stress as an explanatory variable is the question of whether it functions as a *mediator* of the relationship between digital media

use and potential negative outcomes, as a *moderator* of the (ostensibly direct) association between digital media use and potential outcomes, or both. Unfortunately, the literature provides a mixed and as of yet unresolved picture. We address both the empirical evidence and theoretical rationale for both a mediated association and a moderated association.

On one hand, digital stress may be conceptualized as a mediator of the association between social media use and psychosocial functioning. From this perspective, some aspect(s) of digital media use would be expected to “cause” or elicit digital stress, which would subsequently “cause” or elicit changes in psychosocial functioning (see Fig. 2a). Consistent with Valkenburg and Peter’s (2013) *Differential Susceptibility to Media Effects* model, one might presume that individual characteristics, prior history, and/or pre-existing psychological states would moderate the mediated association by influencing the degree to which social media use is associated with digital stress in any particular individual.

Indeed, two path analytic studies of availability stress (i.e., entrapment; e.g., Hall and Baym 2012; Hall 2017), supported the role of digital stress as a mediator in both cross-sectional and longitudinal analyses. Between friends, greater expectation of maintaining relationships through texting and voice calls was associated with overdependence in the friendship, and entrapment mediated the association between overdependence and relationship satisfaction (Hall and Baym 2012). Frequency of texting also was associated with greater entrapment, which mediated the association between texting frequency and subjective well-being (Hall 2017). Further, in a recent experimental study of availability stress, Halfmann and Rieger (2019) manipulated participants’ awareness of digital notifications and found that participants were more likely to experience availability stress when awareness was high but not when awareness of notification was low, suggesting that patterns of media use can elicit digital stress. Availability and accessibility stress, as conceptualized by Thomee et al. (2010), were positively associated with both mobile phone use and with depression, although frequency of use and depression were unassociated, suggesting a fully mediated relationship between the two.

On the other hand, digital stress may operate as a moderator of the association between digital media use and psychosocial outcomes. In this model, digital media use would be expected to have a direct association with psychosocial sequelae, but the magnitude and/or direction of that association would be affected by digital stress (see Fig. 2b); when digital stress is high, the model would predict more deleterious effects of social media use on psychosocial functioning than when digital stress is low. From this perspective, digital stress could be thought of as emerging from characteristics of the individual, the peer environment, or the amount of coping resources (viz., Valkenburg and Peter 2013), rather than as a consequence of digital media use itself. Fewer

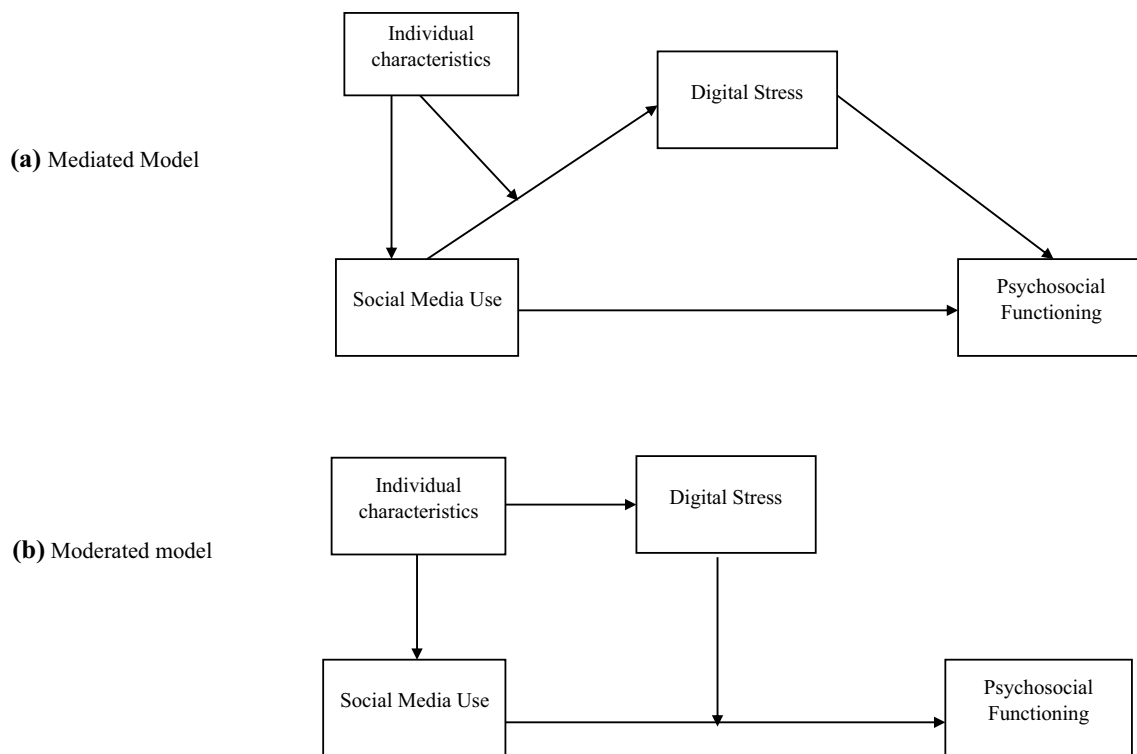


Fig. 2 Digital stress as a mediator or a moderator of the association between social media use and psychosocial functioning

studies have directly tested a moderated model of digital stress on the association between social media use and outcomes. Consistent with Valkenburg and Peter (2013), studies have identified other moderators, including sex/gender, specific use of social media (e.g., active vs. passive), and individual susceptibility (e.g., pre-existing loneliness or popularity; see Nesi and Prinstein 2015; Teppers et al. 2014).

Although there are currently more studies supporting the mediated model of digital stress than a moderated model (e.g., Halfmann and Rieger 2019; Hall 2017; Hall and Baym 2012; Thomee et al. 2010), we leave it to future studies to experimentally test the degree to which the two models explain the variance observed in the literature. For the present, we believe the literature provides strong support for the idea that digital stress, at the very least, explains substantial variance in the degree to which social media use is associated with current and subsequent psychosocial functioning, and that individual characteristics likely interact with both social media use and susceptibility to digital stress to influence psychosocial functioning.

Clinical Implications

Social media use among adolescents and young adults has been associated with a number of negative mental health outcomes, including depressive symptoms, anxiety,

loneliness, suicidal ideation, and compromised quality of life. Although overall effect sizes for the association between social media use and psychological outcomes are generally small (Hancock et al. 2019), the literature suggests that some individuals may be at greater risk for negative psychological effects resulting from some kinds of social media use (e.g., Nesi and Prinstein 2015; Teppers et al. 2014). Specifically, the literature suggests that pre-existing psychological conditions (e.g., depressive symptoms, loneliness) and the passive use of social media (e.g., “lurking” or “browsing”) may individually and interactively increase young people’s risk for negative psychological sequelae. However, complicating the clinical picture, other research points to *positive* effects of some aspects of social media use for some people (e.g., LaRose et al. 2014) and for some types of media use (Hancock et al. 2019).

At the present time, the literature limits the number and strength of the clinical recommendations that we can realistically provide. Few clinical trials or controlled experiments have examined causal associations among social media use (or abstinence) and clinical outcomes (see above review). Nevertheless, the current review suggests that associations between social media use and negative clinical outcomes can be considered through the lens of digital stress. That is, rather than supposing direct associations between digital media use and negative psychosocial outcomes, the literature suggests that clinicians should consider the various ways in

which social media use relates to specific sources of distress such as availability stress, approval anxiety, fear of missing out, and connection overload. This view provides directions for evidence-informed interventions that may effectively decrease negative psychological sequelae associated with digital media use.

For example, the literature indicates that efforts to gain approval from online peers and/or pressure to be available for online communications are consistently related to health and mental health outcomes (e.g., Nesi and Prinstein 2015; Twenge et al. 2018; Woods and Scott 2016), particularly among females and those presenting with lower offline popularity. Following from these empirical findings, foci of clinical attention for clients who report high approval anxiety or availability stress might include enhanced self-esteem and self-reliance, more realistically reframing input from social media platforms or expectations for online communications (perhaps through Cognitive Behavioral Therapy; CBT), or the further development of offline relationships and social skills. Further, Hefner, Knop, and Klimmt (2018) suggest that greater self-regulatory skills (e.g., self-monitoring, emotion regulation) vis-à-vis digital media use may mitigate potential digital stress and psychological outcomes.

Similarly, distress stemming from perceived isolation or lack of popularity, perhaps resulting from observations of others' social media content (i.e., FoMO), might be a focus of clinical attention. For example, a clinician might explore the degree to which interpretations of social media content (e.g., posts, tweets) reflect or contribute to unhelpful or unrealistic distortions/attributions about the client's social interactions or popularity (i.e., CBT). Such interventions might also include targeted behavioral interventions directed at using social media as a means of connecting (i.e., offline) with others. Since adolescents and young adults with social anxiety, depressive symptoms, and/or loneliness may be more likely to use social media to seek support or relieve symptoms (e.g., Lo 2019; Song et al. 2014), efforts to decrease the subjective experience of digital stress or to alleviate underlying symptoms may prove more effective than efforts to reduce psychological symptoms by curtailing social media use itself.

Consistent with this approach, the current review also reaffirms the notion that individuals' specific uses of social media may be more important than quantity of use, per se, in predicting or moderating negative outcomes. For example, passive social media use may have qualitatively different outcomes than active use of social media platforms to facilitate activities and direct social interactions (Hall 2018; Hancock et al. 2019). Indeed, Blum-Ross and Livingstone (2016) suggest that instead of focusing on decreasing the quantity of mobile media use, clinicians might consider promoting the quality of mobile media use as a time for learning and creating, connecting with others, and civic action and

engagement. Given the ubiquity and automaticity of digital media use, adolescents, in particular, may benefit from discussions with clinicians (and perhaps parents) about their motivations behind the use of various social media platforms (e.g., connecting with others vs. social comparison). Hefner et al. (2018) discuss this concept in terms of "being mindfully connected" (p. 176).

Blum-Ross and Livingstone's (2016) recommendations notwithstanding, quantity of social media use can be problematic to the extent that it interferes with other valued activities or engenders the perception of being overloaded (Chen and Lee 2013; Misra and Stokols 2011; Reinecke et al. 2017). Indeed, Hall (2107) found that individuals who were attempting to maintain too many acquaintances or casual friends through their mobile device were more likely to experience availability stress over the course of a week. Several apps provide quantitative summaries of media use and some allow restrictions on time spent in specified social media platforms. Clinical discussions of time spent engaging in social media use may be most productive in the context of assessing client values and fostering movement toward specific personal goals (Hefner et al. 2018). Such a view seems consistent with an Acceptance and Commitment Therapy (ACT) approach to treatment (Hayes et al. 2013), in which flexibly moving toward specific client values is used to foster improved functioning and decreased psychological distress.

Recommendations for Future Research

There is growing evidence that *digital stress* may be an important intervening factor that helps explain the association between mobile and social media use and psychosocial outcomes. However, this literature is complicated by numerous terminologies and multiple methods for assessing similar constructs. Given the similarities (and differences) in the qualitative descriptions of the various components of digital stress, we suspect that the various components represent unique but related factors that may contribute variance to a higher-order construct (see Table 1 and Fig. 1). Our review suggests that these various aspects of digital stress may be important to consider in clinical contexts, and may be more directly related to psychosocial outcomes than mobile and social media use, per se.

Moving forward, future research is needed to empirically examine the associations among the identified aspects of digital stress (i.e., approval anxiety, availability stress, fear of missing out, and connection overload). Given that three of the four aspects of digital stress are social in nature, we might anticipate higher correlations among these, with perhaps weaker associations among these social aspects and the fourth (connection overload). The degree of overlap between these constructs is an empirical question future

research could answer. Such work should also identify the presence (and number) of higher-order factors as well as the degree to which components of digital stress uniquely predict psychosocial outcomes. Nesi and colleagues' (2018) framework for understanding the impact of social media on peer interactions provides a potential guide for hypothesis testing. For example, the experimental manipulation of the features of digital media (e.g., immediacy, visualness, publicness) might be expected to differentially impact various aspects of digital stress.

Related to clinical applications, future research is needed for the development and validation of new measures to capture the ways in which social media are associated with social behavior and mental health outcomes. Morin-Major et al. (2016) suggested the need for new measures of media use, whereas Nesi et al. (2018) recommended new measures to assess the degree to which features/affordances of media impact social relationships. In addition to these important areas, validated measures of digital stress are needed that are grounded in the current literature, but flexible enough to assess new and emerging media platforms and features.

Finally, work is needed to examine the degree to which social media use and outcomes covary within and across cultural and developmental groups. Although an international community is clearly invested in this work, we identified no studies specifically examining digital stress and related constructs through a cultural lens. Further, we identified no studies that examined psychological outcomes associated with social or digital media in pre-adolescent children and only one focused on older adults (i.e., Reinecke et al. 2017). Given that the age at which children start using digital and mobile technologies appears to be steadily and rapidly decreasing, empirical investigations that take a developmental approach to understanding associations between digital media use, digital stress, and psychological outcomes will be increasingly important. Until that time, we suggest that clinicians and families rely on the general recommendations provided by the American Academy of Pediatrics (2016) regarding digital technologies.

Conclusion

The association between social media use and psychosocial outcomes in adolescents and young adults may be mediated or moderated by a number of individual and contextual variables. It is not sufficient to characterize social media use broadly as “good” or “bad,” nor is it sufficient to ignore the role of mobile and social media as a likely aspect of a client's social existence. Rather, a nuanced approach is required in which one develops clinical case conceptualizations in light of the ways in which clients use social media, and in the context of clients' unique strengths and challenges. Digital stress

is emerging as a potential intervening variable explaining the wide variability of outcomes observed in the literature. The practical, clinical, and empirical implications of this suggestion await confirmation in future research.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval This type of study contains no data from human participants collected by the authors.

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