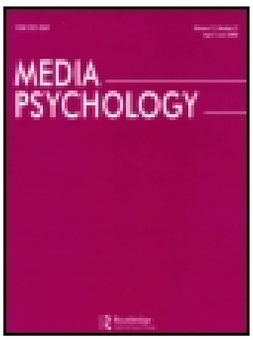

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Digital Stress over the Life Span: The Effects of Communication Load and Internet Multitasking on Perceived Stress and Psychological Health Impairments in a German Probability Sample

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The present study investigated the psychological health effects and motivational origins of digital stress based on a representative survey of 1,557 German Internet users between 14 and 85 years of age. Communication load resulting from private e-mails and social media messages as well as Internet multitasking were positively related to perceived stress and had significant indirect effects on burnout, depression, and anxiety. Perceived social pressure and the fear of missing out on information and social interaction were key drivers of communication load and Internet multitasking. Age

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significantly moderated the health effects of digital stress as well as the motivational drivers of communication load and Internet multitasking. The results, thus, underline the need to address digital stress from a life span perspective.

Information and communication technology (ICT) has become an integral part of everyday life for a growing number of Internet users throughout the world. More and more Internet users of all age groups seem to be constantly connected to a stream of online content and computer-mediated communication (CMC; Vorderer & Kohring, 2013). A large body of research demonstrates the indisputable benefits of private online communication and social media use for psychological health and well-being, such as the acquisition of online social capital (Ellison, Vitak, Gray, & Lampe, 2014), or the satisfaction of intrinsic needs (Reinecke, Vorderer, & Knop, 2014). However, the same communication opportunities that pave the way for these beneficial effects of online communication carry the inherent risk of imposing a permanent burden on Internet users: Just as pervasive ICT may provide ubiquitous opportunities to satisfy individual needs, the social expectations to respond to online communication, the sheer mass of communication content, as well as the growing trend of combining Internet use with other simultaneous activities may expose users to information overload and impair their psychological well-being (Misra & Stokols, 2012).

While the potential dangers of information overload and perceived stress originating from ICT use at the workplace and in corporate contexts are well documented (e.g., Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008; Reinke & Chamorro-Premuzic, 2014), the consequences of information overload arising from personal and private online communication remain largely unknown. Due to the lack of representative studies that would allow for a test of the effects of private communication load in the general population and over the life span, it also remains unclear whether adolescents and young adults, who are particularly enthusiastic users of social media and mobile Internet, are equally susceptible to the potential negative effects of communication overload as older users. Furthermore, the motivational forces that drive the engagement in frequent online interactions and Internet multitasking remain largely unexplored. It, thus, remains unclear, why so many ICT users willingly expose themselves to potentially burdensome and straining communication patterns.

The aim of the present study is to address these open questions. In the following sections, we shall first review existing theory and research on the effects of ICT use and media multitasking on stress and psychological symptoms. We shall then introduce perceived social pressure and the fear of missing out as potential motivational drivers promoting communication load and Internet multitasking. Subsequently, we discuss age as a potential moderator of the effects proposed in our theoretical model. This model is then tested based on a representative probability sample of German Internet users.

THE EFFECTS OF ICT STRAIN ON PERCEIVED STRESS AND PSYCHOLOGICAL HEALTH

The processes and variables that drive the experience of stress have received considerable attention in psychological research (for an overview, see Lazarus, 1993). According to the transactional theory of stress (Lazarus & Folkman, 1984, 1987), stress reactions are the result of the interaction of person variables and environmental variables. Stress can be defined as "an unfavorable person-environment relationship" (Lazarus, 1993, p. 8) and is perceived when the situational demands are taxing or exceeding the resources of the individual. Cognitive appraisal is a central mediator between environmental demands and stress reactions and refers to a process in which individuals "constantly evaluate the significance of what is happening for their personal wellbeing" (Lazarus, 1993, p. 7). Primary appraisal refers to the evaluation of situational environmental demands and their relevance to the individual's well-being whereas secondary appraisal processes evaluate the coping options and resources of the individual. In combination, primary and secondary appraisal determine the stress reaction, which is particularly pronounced and negatively valenced when the environmental demands are perceived as a threat to well-being and the confidence in successful coping is low (Lazarus & Folkman, 1984, 1987). In the present study, we propose that digital stress, that is stress reactions elicited by environmental demands originating from ICT use, varies as a function of at least two factors that challenge the users' coping resources: communication load (i.e., the number of sent and received private e-mails and social media messages) and Internet multitasking (i.e., concurrent use of ICT and other activities). In the following sections, we will review existing research on communication load and media multitasking and explicate the relationship between both factors and stress.

Early research on the effects of ICT use on stress and psychological health has been dominated by a focus on job-related online communication. A large number of studies have addressed the impact of ICT-based informational overload on professionals in various job contexts (for an overview, see Eppler & Mengis, 2004). Information overload can be defined as "the experience of feeling burdened by large amounts of information received at a rate too high to be processed efficiently" (Misra & Stokols, 2012, p. 739). Closely connected to the phenomenon of ICT-related information overload is the concept of technostress that can be defined as "stress caused by an inability to cope with the demands of organizational computer usage" (Tarafdar, Tu, & Ragu-Nathan, 2010, p. 304). Prior research has linked both technostress and information overload to a number of negative psychological outcomes in the working context, such as lower job satisfaction, decreased productivity, stress, and burnout (Ragu-Nathan et al., 2008; Reinke & Chamorro-Premuzic, 2014; Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007; Tarafdar et al., 2010). This research demonstrates that

information overload arising from ICT use in the work-context places employees under intense strain, resulting in stress and impaired psychological health and well-being.

The fact that the majority of existing research on the negative effects of ICT-related stress and strain is focused on work-related ICT use is not surprising, given the fact that access to online communication was mainly restricted to military, governmental, or corporate organizations during the early days of the Internet (Leiner et al., 2009). The dissemination of Internet access in the general population, however, has seen an exponential growth throughout the last two decades (Zickuhr, 2013). The constant connectedness to online content and communication is further intensified by the fast growing use of mobile Internet access (Smith & Page, 2015). Accordingly, a growing number of researchers have suggested that more and more people tend to be "permanently online" (Vorderer & Kohring, 2013, p. 188). In a 24-hour tracking study of the mobile phone use of 793 university students in four countries, Mihailidis (2014) found that 31% of the participants logged into social networking apps more than 13 times in a 24-hour period, clearly demonstrating the centrality of mobile Internet use for the "tethered generation" (p.58). In a similar vein, Crawford (2009) refers to the use of social media such as Twitter as "background listening," where a constant flow of bits of information and conversations "continue as a backdrop throughout the day" (p. 528). These findings suggest that private online communication is taking up a fast growing share of the time and cognitive capacity of Internet users who are facing a constant load of incoming messages and communication demands. Thus, the question whether the pervasive use of private e-mail and social media is associated with similar stress and strain reactions as work-related online communication is a pressing challenge to CMC-research: Whereas ICT overload in the work setting is restricted to a relatively small group of professionals, communication overload resulting from private online communication affects large parts of the general population irrespective of employment status or profession.

Only a few prior studies have explored the effects of information overload outside the job context. In a survey study with 600 student participants, LaRose, Connolly, Lee, Li, and Hales (2014) explored the effects of "connection overload" (p. 59) arising from the communication demands resulting from social media and e-mail use. Their results demonstrate that deficient self-regulation of Internet use and communication demands was significantly related to negative outcomes of Internet use in everyday life which, in turn, were significant predictors of perceived stress. In a prospective panel study with 1,127 students from Sweden, Thomée, Eklöf, Gustafsson, Nilsson, and Hagberg (2007) found that high levels of ICT use (computer and mobile phone) significantly predicted increased stress and depression at a 1-year follow up. Two additional survey studies with over 4,000 young adults in Sweden found significant detrimental effects of high accessibility demands caused by mobile phone use

(Thomée, Härenstam, & Hagberg, 2011) and of frequent computer use (Thomée, Härenstam, & Hagberg, 2012) in form of sleep disturbances, stress, and depression. Finally, a panel study among 484 undergraduate students from the United States found negative effects of perceived "cyber-based overload" (e.g., e-mail volume, pressure to respond, perceived pressure to post content on social media etc.) on perceived stress and overall health status (Misra & Stokols, 2012, p. 740). In summary, these studies clearly identify information overload and the communication demands arising from private ICT use as a significant predictor of perceived stress. In an attempt to replicate these findings of prior research in a probability sample of the general population, we predicted in the present study that communication load arising from private ICT use, more specifically the frequency of sent and received e-mails and social media messages as well as the frequency of checking behavior, is associated with increased perceived stress.

H1: Communication load is positively related to perceived stress.

The second potential source of ICT-related stress addressed in the present study is Internet multitasking. Prior research has addressed media multitasking both in terms of the simultaneous use of two or more different media stimuli (e.g., Ophir, Nass, & Wagner, 2009) as well as the combination of media use and other non-media activities (e.g., Jeong & Fishbein, 2007). In this study, we, thus, refer to Internet multitasking as any combination of Internet use with other media or non-media activities. In times of ubiquitous Internet access, Internet multitasking has become a common phenomenon. In a diary study with 1,783 Dutch participants aged 13–65 years, Voorveld and van der Goot (2013) investigated media multitasking with regard to 14 different media activities (e.g., watching television, listening to the radio, or using social media). Participants engaged in media multitasking during 21.9% of the total time spent on media use. E-mail and website use were the two media most frequently used in multitasking. In a survey among 547 adolescents in the United States by Jeong and Fishbein (2007), a substantial share of the participants reported that they frequently used the Internet during homework (24%) or interactions with friends (22%). Furthermore, in an experience sampling study with 189 undergraduate students, Moreno et al. (2012) found that their participants multitasked at 56.5% of the time they were online.

The effects of media multitasking have been addressed from a number of theoretical perspectives in prior research. Some studies (e.g., Z. Wang et al., 2012) have made reference to central bottleneck theories that propose that human information processing is limited and can only accommodate one stimulus at a time (for an overview, see Meyer et al., 1995). Consequently, when two tasks need to be processes simultaneously, they have to be queued, resulting in performance impairments during multitasking. Other research on media multitasking (e.g., David, Xu, Srivastava, & Kim, 2013; Jeong &

Fishbein, 2007; Pool, Koolstra, & Van der Voort, 2003) is grounded on limited capacity models of information processing (e.g., Lang, 2000). In contrast to bottleneck approaches, limited capacity theory does not propose that stimuli need to be processed serially, but suggests that cognitive overload occurs when the cognitive resources demanded by the concurrent tasks exceed the limited cognitive capacities of the individual (Lang, 2000), resulting in reduced performance (David et al., 2013; Pool et al., 2003; Z. Wang et al., 2012) and increased perceived task demand (David et al. 2013) during media multitasking. More recently, research on media multitasking (e.g., David, Kim, Brickman, Ran, & Curtis, 2015) has also adapted theories of information processing with a particular focus on concurrent multitasking, such as the threaded cognition model (Salvucci & Taatgen, 2008). The threaded cognition framework proposes that concurrent tasks can be conceptualized as separate threads of processing that are coordinated by a serial procedural resource. While different threads can be processed in parallel, resource conflicts can arise when two or more threads require attention from the central procedural resource or if multiple tasks demand the same resources (e.g., perceptual or motor resources; Salvucci & Taatgen, 2008).

Although the cognitive models applied in media multitasking research differ with regard to the specific mechanisms they identify as the source of the limited capacity for multitasking, all models suggest that media multitasking places the cognitive resources of media users under considerable strain. In accordance with transactional models of stress, these environmental demands originating from media multitasking in general and Internet multitasking in specific, are likely to result in stress reactions. Cognitive demand, however, may not be the only source of stress elicited by Internet multitasking. Multitasking is often highly habitual (Hwang, Kim, & Jeong, 2014; Zhang & Zhang, 2012) and can turn into a form of deficiently self-regulated media use interfering with other tasks and obligations (David et al., 2015). Recent experience sampling research demonstrates that media use frequently conflicts with other goals in everyday life (Hofmann, Vohs, & Baumeister, 2012). Such goals conflicts and the negative self-conscious emotions triggered by self-control failure due to media use (Reinecke, Hartmann, & Eden, 2014) could be a further mechanism linking Internet multitasking to increased stress.

In fact, previous research provides initial evidence of a relationship between media multitasking and perceived stress. Media multitasking has been linked to significant increases in perceived stress both in the working context (Mark, Gudith, & Klocke, 2008) as well as the private domain (Misra & Stokols, 2012). The link between multitasking and stress is further supported by an in situ observational study conducted by Mark, Wang, and Niiya (2014). The computer activities of 48 students as well as their psychophysiological condition were monitored for 7 days during all waking hours. Multitasking was significantly related to psychophysiological indicators of stress. Besides stress reactions, media multitasking has also been linked to other negative

psychological health outcomes, such as depression and anxiety (Becker, Alzahabi, & Hopwood, 2013). Based on the theoretical considerations outlined above and the findings of previous research establishing a significant connection between media multitasking and stress reactions, we expected to find a positive relationship between Internet multitasking and perceived stress in the general population.

H2: Internet multitasking is positively related to perceived stress.

A large body of research demonstrates that perceived stress is a crucial risk factor for a number of negative psychological health outcomes. In a meta-analysis by Lee and Ashforth (1996), stress was strongly and consistently associated with burnout. Furthermore, perceived stress has been linked to depression and anxiety in the working context (Rusli, Edimansyah, & Naing, 2008) as well as the general population (Bergdahl & Bergdahl, 2002). This suggests that the increased levels of perceived stress resulting from communication load (Hypothesis 1) and Internet multitasking (Hypothesis 2) increase the risk of negative psychological health outcomes.

H3: Perceived stress is positively related to a) burnout and b) depression and anxiety.

SOCIAL PRESSURE AND FEAR OF MISSING OUT AS DRIVERS OF COMMUNICATION LOAD AND INTERNET MULTITASKING

In addition to expanding our insights into the potential implications of strain resulting from ICT use, the present study also attempts to address the underlying motivational processes that increase the personal risk of engaging in potentially harmful ICT-usage practices. Prior research has demonstrated that CMC is characterized and guided by strong social norms and expectations, placing communication partners under considerable social pressure. Violations of social expectations in CMC interaction, such as not responding to e-mails in a socially acceptable timeframe, result in negative evaluations of the communication partner (Kalman & Rafaeli, 2011). Similar forms of availability demands and social pressure are also present in other forms of online communication, such as social media use (Quan-Haase & Young, 2010; E. S.-T. Wang & Chen, 2012). We, thus, propose that the perceived social pressure to be constantly available has a significant impact on communication patterns. Supporting this rationale, Misra and Stokols (2012) found that perceived pressure to respond to online communication was a significant predictor of information load. We, thus, suggest that availability expectations of their social

environment place Internet users under perceived pressure to check for new e-mails or social media messages frequently and to respond to online communication immediately (hence, increasing communication load) and irrespective of situational demands or conflicting activities (resulting in Internet multitasking).

H4: Perceived social pressure to be constantly available is positively related to a) communication load and b) Internet multitasking.

In addition to perceived social pressure, recent research has linked online communication and social media use to the fear of missing out (Przybylski, Murayama, DeHaan, & Gladwell, 2013). Fear of missing out is defined as "a pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski et al., 2013, p. 1841). Social media in particular provide easy access to social information and an easy way to stay socially involved (Quan-Haase & Young, 2010). As the fear of missing out is characterized "by the desire to stay continually connected with what others are doing" (Przybylski et al., 2013, p. 1841), social media use should be a particularly attractive option to stay informed about social activities for individuals with high levels of fear of missing out. In fact, prior research has found strong empirical connections between the fear of missing out and the intensity of social media use (Przybylski et al., 2013). These results suggest that the fear of missing out should be positively related to the frequency of online communication and checking behavior, resulting in higher levels of communication load. Prior research also provides evidence linking fear of missing out to Internet multitasking. In a study with undergraduate students, Pryzybylski et al. (2013) found that students showing higher levels of fear of missing out had a higher tendency to use social media during meals or lectures and used their mobile phones to check or send e-mails while driving their car more frequently than students low on fear of missing out. We, thus, expected the fear of missing out to be a significant motivational driver of both communication load as well as Internet multitasking.

H5: The fear of missing out is positively related to a) communication load and b) Internet multitasking.

DIGITAL STRESS OVER THE LIFE SPAN: AGE AS A MODERATOR OF THE PROPOSED EFFECTS

Our theoretical model predicts both the well-being implications as well as the underlying motivational drivers of communication overload and Internet

multitasking. What remains unclear, however, is the question whether the hypothesized effects equally apply to Internet users of all age ranges. Both the public as well as the scholarly discourse is frequently characterized by the assumption that younger users are more apt and knowledgeable ICT users, simply because they have been exposed to new media early on in their lives (Hargittai, 2010; Helsper & Eynon, 2010). Accordingly, younger generations of Internet users have been referred to as "digital natives," supposedly possessing better expertise and a deeper understanding of online media than "digital immigrants" who did not have access to ICT at an early age (Prensky, 2001). A number of researchers have provided empirical evidence against this simplistic idea of strong generational differences in ICT expertise, demonstrating that members of the group of digital natives vary considerably regarding their online use and Internet skills (Hargittai, 2010) and that age is only one among many other predictors of ICT expertise (Helsper & Eynon, 2010). At the same time, prior research clearly demonstrates that the prevalence of ICT use decreases over the life span and that younger users engage in media multitasking more frequently than older users (Carrier, Cheever, Rosen, Benitez, & Chang, 2009; Helsper & Eynon, 2010; Voorveld & van der Goot, 2013). This suggests that, on average, younger Internet users should be more intensively exposed to strain resulting from communication load and Internet multitasking. It remains unclear, however, whether these higher levels of ICT-related strain also result in higher levels of perceived stress or whether younger and older users differ systematically with regard to the inherent coping resources to deal with ICT-related stressors.

Communication load as well as Internet multitasking are cognitively demanding and deplete the limited cognitive capacity of ICT users. Stress arises when the demands of the environment exceed the resources available to the individual (Lazarus & Folkman, 1984). A higher cognitive capacity should, thus, act as a buffer against perceived stress, that may result from communication load and Internet multitasking. A broad body of research demonstrates that central executive functions such as speed of processing, memory, and reasoning (Verhaeghen & Salthouse, 1997) as well as dual-task performance (Verhaeghen & Cerella, 2002) deteriorate with age. Hence, older ICT users may be less well prepared to cope with ICT-related cognitive strain than younger users, suggesting a stronger effect of communication load and Internet multitasking on perceived stress. This notion is supported by the findings of Carrier et al. (2009), demonstrating that older participants found media multitasking more difficult than younger participants. Reduced cognitive resources may be compensated by other coping resources such as ICT expertise or Internet self-efficacy. Prior research, however, does not provide a unanimous picture of the effects of age on Internet skills. In a study by Helsper and Enyon (2010), perceived Internet skills were negatively related to age. In a study comparing different forms of Internet skills among younger and older ICT users, however, van Deursen, van Dijk, and Peters (2011) came to the conclusion that older users exhibited lower levels of medium-related Internet skills (i.e., formals skills such as operating the Internet browser and navigation skills) but

higher levels of content-related Internet skills (i.e., strategic skills such as selecting information or evaluating sources) than younger users. Furthermore, prior findings on age differences in perceived technostress also provide mixed results. While older participants in a study by Ragu-Nathan et al. (2008) experienced less technostress than younger participants, age was positively related to technostress in a study by K. Wang, Shu, and Tu (2008). Given these ambiguous results, the aim of the present study was to explore potential age-differences in the effects of ICT-related strain on perceived stress over the life span.

RQ1: Are the effects of communication load and Internet multitasking on perceived stress moderated by age?

Furthermore, we suggest that the underlying motivational mechanisms driving communication load and multitasking may also be moderated by age. Research in the field of developmental psychology suggests that the susceptibility to social pressure varies among different age groups. Identification with the peer group and growing autonomy from parents are particularly important developmental tasks in middle adolescence, resulting in an increased willingness to conform to the peer group and increased salience of social pressure (Brown & Larson, 2009). The influence of social pressure on behavior is, thus, particularly pronounced for adolescents and young adults and decreases in adult life (Steinberg & Monahan, 2007). Applied to the context of online communication, this may suggest that—compared to younger users—social pressure to be constantly available could have a smaller effect on the CMC practices of older individuals. The age-dependent effects of the fear of missing out on online communication, however, remain largely unclear. Findings by Pryzybylski et al. (2013) clearly demonstrate that the fear of missing out is negatively related to age. However, this does not imply that comparable levels of fear of missing out result in different behavioral outcomes for younger versus older individuals. The last goal of the present study was, thus, to explore potential variations of the effects of social pressure and fear of missing out on communication load and Internet multitasking over the life span:

RQ2: Are the effects of perceived social pressure to be constantly available and the fear of missing out on communication load and Internet multitasking moderated by age?

METHOD

Sample and Procedure

Our theoretical model was tested based on a representative probability sample of the German population aged 14 years and over. Data were collected by the

German market research institute USUMA. Participants were randomly sampled based on the sampling points of the ADM-sampling system (von der Heyde, 2009). The ADM-sampling system is a sampling frame for representative face-to-face interviews in Germany, provided by the Arbeitskreis Deutscher Markt-und Sozialforschungsinstitute [German Association of Market and Social Research Agencies], and represents a quasi-standard for probability sampling in Germany. The sampling system is based on a stratified net of 258 sampling points in combination with a random-route selection of private households (von der Heyde, 2009).

In the present study, 4,644 German households were sampled and contacted based on the ADM-sampling system, resulting in a sample of $N = 2{,}527$ completed interviews (response rate = 54.8%). Participants who reported they never used the Internet ($n = 830$) or who provided incomplete data ($n = 140$) were excluded from further analyses, resulting in a final sample of $N = 1{,}557$ participants (51.6% females, ages ranging from 14 to 85 years, $M_{age} = 42.37$ years, $SD = 14.84$ years). Participants reported to use the Internet on average at $M = 5.56$ days per week ($SD = 1.89$) and the majority of participants (63%) reported using the Internet for more than 1 hour on a typical weekday. Furthermore, more than half of the sample (54.4 %) reported using mobile Internet access via smartphones or tablet computers at least once per week.

Measures

Social Pressure. Perceived social pressure to be constantly available was assessed with four items adapted from the perceived norm scale by Fishbein and Ajzen (2010). Participants responded to the items (e.g., "My friends expect me to be constantly available") on a 5-point scale ranging from 1 (*does not apply at all*) to 5 (*fully applies*). The items formed a unidimensional scale and showed a high reliability (Cronbach's $\alpha = .92$, composite reliability (CR) = .92).

Fear of Missing Out. Three items were used to measure the fear of missing out on important events and information when not using the Internet. Participants responded to the items (e.g., "If I would use the Internet less frequently, I would fear missing out on important things") on a scale from 1 (*does not apply at all*) to 5 (*fully applies*). The items showed a unidimensional factor structure and a satisfactory reliability (Cronbach's $\alpha = .91$, CR = .91).

Communication Load. Six items were developed to measure communication load based on prior operationalizations of communication demands (e.g., LaRose et al., 2014). The average daily number of sent and received private e-mails and messages from social media, respectively, was assessed on 8-point scales ranging from *0* to *>100*. Additionally, the frequency of the perceived urge to check private e-mail and social media messages, respectively, was measured on a 5-point scale ranging from 0 (*never*) to 4 (*constantly*). Explorative principal components analysis with oblique

(Promax) rotation yielded two correlated factors with eigenvalues >1. The three items measuring communication load resulting from private e-mail loaded on the first factor (eigenvalue = 3.21, all factor loadings > .68, Cronbach's α = .76, CR = .76), while the three items measuring communication load through social media messages loaded on the second factor (eigenvalue = 1.35, all factor loadings >.88, Cronbach's α = .90, CR = .90). The two factors explained 76.34% of the variance. To account for the correlated two-factor structure of the measure, communication load was modeled as a second-order factor accounting for the two first order latent constructs in the subsequent analyses.

Internet Multitasking. Five items were used to assess Internet multitasking. Participants indicated on a 5-point scale from 0 (*never*) to 4 (*very frequently*) how often they use the Internet while they simultaneously a) use other media, b) are in a conversation with another person, c) are having a meal with another person, d) interact with their romantic partner, e) go out with their friends. These scenarios were chosen based on the findings of prior research demonstrating that media multitasking is particularly prevalent in combination with other media, during social activities, and during meals (Jeong & Fishbein, 2007; Shih, 2013). In the present study, the five items showed a unidimensional factor structure and a satisfactory internal consistency (Cronbach's α = .84, CR = .86).

Perceived Stress. The ten items of the Perceived Stress Scale (S. Cohen, Kamarack, & Mermelstein, 1983) were used to assess subjective stress levels. Participants responded to the items on a 5-point scale from 0 (*never*) to 4 (*very often*). The items showed a satisfactory internal consistency (Cronbach's α = .85, CR = .86). The results of an exploratory principal components analysis with oblique (Promax) rotation, however, suggested that instead of the expected unidimensional structure, the items loaded on two correlated factors with eigenvalues >1. The six items of the scale indicating higher levels of stress (e.g., "In the last month, how often have you felt nervous and 'stressed'?") loaded on the first factor (eigenvalue = 4.42, all factor loadings > .73, Cronbach's α = .85, CR = .86), while the four reverse-coded items of the scale (e.g., "In the last month, how often have you been able to control irritations in your life?") scored on the second factor (eigenvalue = 1.97, all factor loadings > .78, Cronbach's α = .86, CR = .86). To account for the correlated two-factor structure of the measure, perceived stress was modeled as a second-order factor accounting for the two first order latent constructs in the subsequent analyses.

Burnout. The six items of the personal burnout subscale of the Copenhagen Burnout Inventory (Kristensen, Borritz, Villadsen, & Christensen, 2005) were used to assess burnout in the present study. Participants responded to the items (e.g., "How often are you emotionally exhausted?") on a 5-point scale ranging from 1 (*never/almost never*) to 5 (*always*). The items showed a unidimensional structure and a high reliability (Cronbach's α = .92, CR = 92).

Depression and Anxiety. The 4-item Patient Health Questionnaire-4 (PHQ-4; Löwe et al., 2010) was used to measure depression and generalized

anxiety. The scale consists of an item stem ("Over the last 2 weeks, how often have you been bothered by the following problems?"), followed by two items measuring depression (e.g. "feeling down, depressed, or hopeless") and anxiety (e.g., "not being able to stop or control worrying"), respectively. Participants responded to the items on a 4-point scale from 0 (*not at all*) to 3 (*nearly every day*). The items showed a unidimensional structure in the present study (eigenvalue = 1.82, all factor loadings > .79, 71% explained variance) and a high reliability (Cronbach's α = .86, CR = .86). They were, thus, modeled as a combined depression and anxiety factor.

Data Analytic Procedure

A three-group structural equation model was computed using the AMOS 23 software packet and the maximum likelihood method. To reveal potential moderation effects of age, the sample was split in three subsamples. The subsamples were formed on the basis of theoretical as well as methodological considerations. Following the definition by Prenszky (2001; see also Helsper & Eynon, 2010), participants born in 1980 or later were categorized as members of the generation of digital immigrants. This first subsample of younger Internet users accordingly consisted of participants of the age range of 14 to 34 years (n = 512) and included 32.9% of the participants of the full sample. To ensure equal sample sizes and to allow for a comparison of middle-aged and older participants, the remaining group of digital immigrants was separated into two subsamples of participants in the age range of 35 to 49 years (n = 510) and 50 to 85 years (n = 535), respectively, by a split at the 66th age percentile. The statistical model (see Figure 1) tested all paths predicted in Hypotheses 1–5. Furthermore, due to their substantial zero-order correlations, social pressure and fear of missing out as well as the residuals of communication load and Internet multitasking were allowed to covary in the model. Model fit was tested based on the χ^2 and the CMIN/*df* statistics and a combination of three additional fit indices recommended by Hu and Bentler (1999): the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square of residuals (SRMR).

RESULTS

Means, standard deviations, and zero-order correlations among all studied variables are presented in Table 1. With $\chi^2(1953) = 5401.48$, $p < .001$, CMIN/*df* = 2.77, CFI = .910, RMSEA = .034, 90% CI = [.033, .035], and SRMR = .06, the model showed an acceptable fit to the data. The convergent and discriminant validity of all constructs was tested based on the average variance extracted (AVE), the maximum shared squared variance (MSV), and the average shared

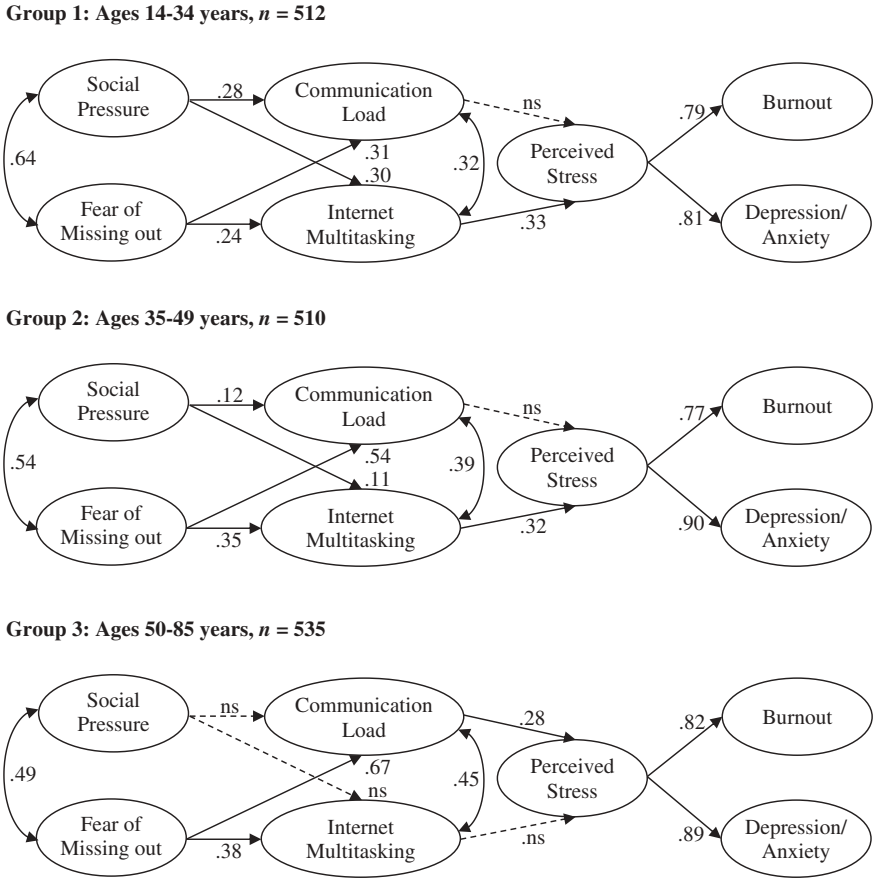

FIGURE 1 Observed three-group structural equation model, $\chi^2(1953) = 5401.48$, $p < .001$, CMIN/*df* = 2.77, CFI = .910, RMSEA = .034, 90% CI = [.033, .035], and SRMR = .06. Scores in the figure represent standardized path coefficients significant at $p < .05$.

squared variance (ASV). All constructs showed satisfactory convergent discriminant validity (all AVEs ≥ .50). Furthermore, all variables showed satisfactory discriminant validity (AVE > MSV and AVE > ASV), with the exception of perceived stress (AVE = .55, MSV = .67, and ASV = .26) and depression and anxiety (AVE = .61, MSV = .67, and ASV = .22). The suboptimal ratio between the AVE and MSV values of both constructs is caused by their strong mutual correlation (see Table 1). We decided to retain both variables in their current form, however, as both constructs were a) measured with prevalidated and commonly used measures and b) are strongly related both theoretically and in prior empirical research (Bergdahl & Bergdahl, 2002; Rusli et al., 2008).

As predicted in Hypothesis 1, communication load was positively related to perceived stress in the age range of 50 to 85 years (β = .28, $p < .001$), but not in the subsamples of participants aged 14 to 34 years (β = -.04, $p = .609$) and

TABLE 1 Means, Standard Deviations and Zero-Order Correlations

	M	*SD*	1	2	3	4	5	6	7	8	9	10
1. Age	42.37	14.84	–									
2. Messages sent	1.24	1.01	–.26**	–								
3. Messages received	1.50	1.11	–.30**	.77**	–							
4. Urge to check messages	1.14	.98	–.28**	.66**	.58**	–						
5. Internet multitasking	.73	.76	–.38**	.39**	.47**	.43**	–					
6. Perceived stress	1.24	.64	–.11**	.14**	.18**	.13**	.29**	–				
7. Burnout	2.12	.77	.05	.04	.12**	.04	.13**	.58**	–			
8. Depression/anxiety	.40	.53	–.01	.12**	.17**	.12**	.24**	.63**	.62**	–		
9. Perceived social pressure	2.76	1.18	–.30**	.30**	.34**	.38**	.38**	.15**	.05	.054*	–	
10. Fear of missing out	2.14	1.16	–.31**	.42**	.43**	.52**	.44**	.20**	.03	.16**	.56**	–

*$p < .05$; **$p < .01$.

35 to 49 years (β = .08, p =.248). With regard to Research Question 1, this pattern of results suggests a moderation effect of age on the effect of communication load on perceived stress. The categorization of a continuous moderator variable (i.e., age), as performed to establish the age groups for the three-group model in the present study, results in a loss of information and lowers the statistical power for the detection of moderation (J. Cohen, Cohen, West, & Aiken, 2003). To compensate for this and to treat age as a continuous moderator variable, the significance of all moderation effects addressed in Research Questions 1 and 2 was additionally tested with hierarchical regression analyses. The independent variable and the moderator were standardized and entered in the first step, followed by the interaction term in the second step. The results demonstrate a significant interaction effect of communication load and age (β = .07, $p < .05$) and a significant increase in the explained variance in stress (ΔR^2 =.004, $p < .05$). Accordingly, age significantly moderated the effect of communication load on stress, with older users suffering more strongly from ICT-related strain.

As predicted in Hypothesis 2, Internet multitasking was significantly related to perceived stress in the age range of 14 to 34 years (β = .33, $p < .001$) and 35 to 49 years (β = .32, $p < .001$), but not in the subsample of participants ages 50 years and above (β = .12, p = .079). However, the interaction effect between age and Internet multitasking did not reach significance (β = .02, p = .443; ΔR^2 <.001, p = .443).

Hypotheses 3a and 3b predicted a significant positive relationship between perceived stress and a) burnout as well as b) depression/anxiety. Both hypotheses were supported by the data and perceived stress was strongly positively related to both dependent variables in all three subsamples (see Figure 1). To further explore the implications of ICT-related strain on psychological health outcomes, the indirect effects of communication load and Internet multitasking via perceived stress on burnout and depression/

anxiety were bootstrapped with 5,000 bootstrap samples with replacement. The results are summarized in Table 2. Communication load had a significant indirect effect on burnout and depression/anxiety in the subsample of participants in the age range between 50 and 85 years, but not in the two younger subsamples. Furthermore, Internet multitasking had a significant influence on both psychological health outcomes in the age range of 14 to 34 years and 35 to 49 years but not in the subsample of participants in the age range of 50 to 85 years (see Table 2).

As predicted in Hypothesis 4a, perceived social pressure was significantly related to communication load for individuals in the age range of 14 to 34 years ($\beta = .28$, $p < .001$) and 35 to 49 years ($\beta = .12$, $p < .05$), but not in the subsample of participants in the age range of 50 to 85 years ($\beta = -.05$, $p = .465$). A similar pattern of results emerged with regard to Internet multitasking. As predicted in Hypothesis 4b, perceived social pressure was significantly related to Internet multitasking for individuals in the age range of 14 to 34 years ($\beta = .30$, $p < .001$) and 35 to 49 years ($\beta = .11$, $p < .05$), but not in the sub-sample of participants in the age range of 50 to 85 years ($\beta = .04$, $p = .482$). Hierarchical regression analysis revealed a significant moderation effect of age on the relationship between social pressure and communication load ($\beta = -.07$, $p < .01$; $\Delta R^2 = .01$, $p < .01$) as well as between social pressure and media multitasking ($\beta = -.12$, $p < .001$; $\Delta R^2 = .02$, $p < .001$). Accordingly, younger individuals were more susceptible to the effects of social pressure than older users.

H5 predicted a positive relationship between the fear of missing out and a) communication load as well as b) Internet multitasking. Hypotheses 5a and 5b were supported by the data in all three age groups (see Figure 1). Hierarchical regression analysis revealed a significant moderation effect of age on the relationship between fear of missing out and communication load ($\beta = .05$, $p < .05$; $\Delta R^2 = .002$, $p < .05$), suggesting that fear of missing out and communication load were more strongly related at higher age. The path between fear of missing out and Internet multitasking, however, was not significantly moderated by age ($\beta = -.03$, $p = .162$; $\Delta R^2 = .001$, $p = .162$).

TABLE 2 Indirect Effects of Communication Load and Internet Multitasking via Perceived Stress on Psychological Health Outcomes

	Ages 14–34 years		Ages 35–49 years		Ages 50–85 years	
	Burnout	Depression/ anxiety	Burnout	Depression/ anxiety	Burnout	Depression/ anxiety
Communication load	–.03	–.03	.06	.07	.23**	.24**
Internet multitasking	.26**	.26**	.25**	.29**	.10	.10

*$p < .05$; **$p < .01$. *Notes.* All scores represent standardized beta coefficients. The significance of the indirect effects (c') was tested using bootstrapping (maximum likelihood) with 5,000 bootstrap samples with replacement.

DISCUSSION

The goal of the present study was to extend prior research on ICT-related stress and strain by testing the health implications and motivational drivers of private communication load and Internet multitasking in a representative sample of the general population and over the life span. The results of our study strongly emphasize the relevance of addressing stress and strain evolving from the spreading "always on" communication practices. Our findings with regard to Hypotheses 1 and 2 clearly demonstrate that communication load resulting from sending, receiving, and checking private e-mails and social media messages, as well as Internet multitasking are significantly related to increased perceived stress. The indirect effects of communication load and Internet multitasking on burnout and depression/anxiety (see Hypotheses 3a and 3b in the results section) further demonstrate that the potential health impairments resulting from private ICT-strain extend to decreased levels of psychological well-being. To the best of our knowledge, our study is the first to demonstrate such negative effects of ICT strain in the general population and over the entire life span. The present study thus crucially extends prior research by demonstrating a) that the strain resulting from private CMC has similar effects on psychological health and well-being as ICT-induced information overload in the workplace and b) that these effects occur in the general population and do not only affect a small "net avant-garde" restricted to members of the generation of digital natives.

In addition to the effects of communication load and Internet multitasking on psychological health and well-being, the present study also sheds light on the motivational drivers of communication patterns that promote ICT-related stress. As predicted in Hypotheses 4 and 5, both social pressure as well as the fear of missing out make Internet users more susceptible to CMC behavior that, ultimately, increases their risk of stress and psychological health impairments. Prior research suggests, however, that social motivations and the need for information are not the sole predictors of Internet use and media multitasking. Other factors such as affective gratifications, media enjoyment, convenience, and efficiency, as well as habitual media use have been identified as additional drivers of social media use and Internet multitasking (Hwang et al., 2014; Quan-Haase & Young, 2010; Zhang & Zhang, 2012). Explicating the role of these variables as potential drivers of digital stress remains an important task for future research.

While the present study clearly underlines the universal relevance of ICT-related stress over the life span, our findings also demonstrate marked discrepancies between different age groups both with regard to the effects of communication load and Internet multitasking on psychological health (see Research Question 1) as well as the motivational drivers of ICT use (Research Question 2): While younger Internet users were less susceptible to the negative effects of communication load, higher numbers of sent and

received mails and social media messages and more frequent checking behavior was significantly related to stress and, in turn, to burnout, depression, and anxiety in the age group of users above 50 years. The opposite pattern of results was evident for Internet multitasking, which was more strongly related to stress and resulting psychological health impairments in young and middle-aged users than in older users. Furthermore, older and younger users in the present study engage in stress-inducing ICT usage patterns for different motivational reasons. Social pressure had a stronger effect on the communication patterns of younger individuals while older users were less likely to give in to social availability demands. The opposite pattern of results was observed for the fear of missing out. Whereas fear of missing out was a significant motivational driver of communication load in all age groups, its influence was particularly pronounced in the group of older Internet users. The present study, thus, expands prior research from Przybylski et al. (2013) by identifying age as a moderator of the effects of the fear of missing out on CMC.

Although our findings largely support our hypotheses and provide new insights into the potential origins and effects of ICT-related stress, a number of limitations have to be taken into consideration when interpreting our results. A first limitation refers to the cross-sectional nature of our data. Our findings are exclusively correlational and do not provide unequivocal evidence concerning causality or the direction of effects found in our data. This appears to be a particularly relevant issue with regard to the relationship between ICT use and stress. Whereas communication load and Internet multitasking are treated as sources of perceived stress in the present study, the direction of effects could also be reversed. In fact, research on Internet addiction suggests that problematic forms of Internet use can represent a dysfunctional strategy of coping with stress and frustration (e.g., Li, Zhang, Li, Zhen, & Wang, 2010). The same mechanisms could also apply to the nonpathological forms of ICT use assessed in the present study. We, thus, computed an alternative statistical model (i.e., social pressure and fear of missing out as predictors of perceived stress which, in turn, predicts communication load and Internet multitasking). This model, however, showed a lower model fit ($\chi^2(1959)= 5816.39$, $p <.001$, CMIN/df = 2.97, CFI = .898, RMSEA = .036, 90% CI = [.035, .037], and SRMR=.10) than our original model. We, thus, believe that it is justified to retain the model in its current form. Ultimately, however, the cross-sectional data collected in the present study do not provide a sufficient basis to determine the direction of effects between the observed variables. Future research should, thus, further explore the effects of communication load and Internet multitasking on stress and psychological well-being in experimental settings or with longitudinal designs. Longitudinal studies would also help to address the question whether the age-differences found in the present study originate from age effects (e.g., age-related declines in cognitive capacity) or from cohort effects (e.g., the different socialization of digital natives and digital immigrants).

A second methodological limitation concerns the use of self-report measures. All variables were assessed based on the subjective self-reports of our participants which may be biased or subject to systematic error. Psychological health impairments such as burnout, depression, and anxiety are socially stigmatized. Responses to the respective self-report measure may, thus, have been affected by social desirability considerations. Future research on the psychological health impact of ICT-strain would, thus, strongly benefit from the use of psychophysiological measures of stress and more elaborate clinical assessments of psychological symptoms. Such alternative measures of psychological health could also help to address issues of validity. As reported in the results section, the stress and the anxiety and depression measure used in the present study showed suboptimal discriminant validity due to their high mutual correlations. This may at least in part be explained by the brevity of the PHQ-4. A more differentiated assessment of different dimensions of psychological health could help to address validity issues in future research. Furthermore, the accuracy of self-report measures of media use is subject to ongoing debate. The estimation of behavior frequencies poses a significant cognitive challenge to survey participants that may result in distorted estimates of media use (Greenberg et al., 2005). Self-report data of CMC (e.g., sent and received text messages) typically show only moderate correlations with server log data (e.g., Boase & Ling, 2013). Such effects may affect the accuracy of the communication load measure used in the present study. Future studies addressing the sources of digital stress would thus benefit from more objective measures of CMC-behavior, such as tracking, experience sampling, or diaries.

A third limitation of the present study refers to the treatment of age as a moderator variable. Participants were separated into three age groups referring to the generation of digital natives (14–34 years) as well as middle-aged (35–49 years) and older (50–85) members of the generation of digital immigrants. We are aware that the differentiation of digital natives and digital immigrants has been criticized for its relative theoretical simplicity (Hargittai, 2010; Helsper & Eynon, 2010). We do believe, however, that this generational approach provides an informative structure for the explorative research questions concerning age as moderator (Research Questions 1 and 2) addressed in the present study. Given the fact that no prior research has systematically explored age differences in digital stress and taking into account the broad range of effects tested in our theoretical model, we believe that a more fine-grained differentiation of age groups that could theoretically account for age differences both in the motivational drivers of ICT use as well as the resulting effects on stress and psychological health is beyond the scope of the present study and an open challenge for future research. Furthermore, we believe that the additional moderator analyses based on age as a continuous variable reported above can compensate for potential shortcomings of our categorical age groups and thus complement the results of our three-group structural equation model in a meaningful way.

Besides these methodological limitations, the present study leaves a number of further questions for future research. While we have discussed potential reasons for the age differences in perceived stress resulting from ICT-use in our theoretical argumentation, none of these underlying processes and variables has been assessed in the present study. It, thus, remains unclear why older individuals were more vulnerable to the detrimental effects of communication load than younger Internet users. The decline of cognitive capacity at a higher age (Verhaeghen & Cerella, 2002; Verhaeghen & Salthouse, 1997) could be a plausible explanation for this age difference. A current review article by Salthouse (2012) comes to the conclusion that the existing empirical evidence clearly suggest a monotonic age-related decline in central cognitive variables such as reasoning and information processing abilities with correlations between age and cognitive performance ranging from –.30 to –.50. Within the context of transactional stress theory this suggests that due to decreased cognitive capacity, older users possess fewer resources to cope with the cognitive strain elicited by communication demands and should show a higher likelihood for stress reactions. This explanation should equally apply to the effects of Internet multitasking on perceived stress which, however, did not show the same pattern of interaction with age. The comparison of our three subsamples even suggests that older individuals are better at coping with Internet multitasking than younger users. This effect could be a result of accommodation: Prior research on aging and cognitive ability suggests that older individuals engage in various strategies to compensate for age-related decreases in cognitive capacity, such as the avoidance of deficit-revealing situations (Salthouse, 2012). With regard to Internet multitasking this could imply that older users more actively avoid situations in which multitasking exceeds their cognitive capacity, for example, by choosing relatively undemanding concurrent activities. Such accommodation strategies may be less easily available with regard to communication load as users have limited control over incoming messages and the necessity to respond.

Age-related differences in cognitive capacity may not be the sole origin of age differences in stress reactions to ICT-related strain. Older and younger users may also differ systematically in the perceived gratifications of CMC use, resulting in different stress appraisals. In a current study by Ellison et al. (2014), age was negatively related to social capital obtained on Facebook. This could suggest that the social gratifications received through CMC use are particularly rewarding for younger users, whereas for older users online communication plays a less substantial role for maintaining social relationships. This could have a crucial influence on the stress appraisal process as the social gratifications obtained through CMC might at least partly compensate for the strain resulting from communication load. This stress-buffering effect, however, may be less pronounced for older users who seem to benefit less from the social gratifications of CMC. Finally, age differences in self-control could be a further underlying mechanism providing a theoretical explanation for the pattern of results found in the present study. As

discussed above, media multitasking can evolve into a strongly habitual and deficiently self-regulated behavior that may interfere with other tasks and responsibilities in daily life (David et al., 2015). Internet multitasking could, thus, be a form of procrastination and represent instances of Internet use at the expense of other, less hedonically pleasant primary activities. Younger users might be more susceptible to deficiently self-regulated media multitasking because they engage in media multitasking more frequently (Carrier et al., 2009) and are, thus, more likely to develop a multitasking habit. Furthermore, according to a meta-analysis by Steel (2007), age is strongly negatively correlated with the tendency to procrastinate. In combination, these findings suggest that younger user may have a higher risk of experiencing conflict between habitual Internet multitasking and other goals and obligations. These goal conflicts are likely to result in negative self-related emotions (Reinecke, Hartmann, et al., 2014) and should, thus, increase the likelihood of stress reactions due to Internet multitasking.

On a more general level, the present study raises a number of further questions concerning the effects of CMC on psychological well-being. While the present study has focused on the risks and potential detrimental effects arising from CMC for psychological health, there can be no doubt that personal online communication and social media use provides a plethora of gratifications and positive experiences that strongly and positively contribute to well-being (e.g., Ellison et al., 2014; Reinecke, Vorderer, et al., 2014). The results of the present study in no way place the beneficial potential of CMC in question. Rather, they suggest that future research needs to integrate findings on the positive versus negative effects of CMC more systematically and coherently. The fact that the existing research has found mixed effects of online communication on psychological well-being underlines the need to learn more about the moderator and mediator processes that lead to beneficial versus detrimental effects of CMC and make some ICT-users more susceptible to the psychological risks of online communication than others. We believe that addressing the questions outlined above and gaining a better understanding of the processes that make CMC a rewarding and enriching experience versus a stressful and health impairing burden is of highest societal relevance and represents a pressing challenge and a worthwhile task for future CMC research and media psychology.

REFERENCES

Becker, M. W., Alzahabi, R., & Hopwood, C. J. (2013). Media multitasking is associated with symptoms of depression and social anxiety. *CyberPsychogy, Behavior, and Social Networking*, *16*, 132–135. doi:10.1089/cyber.2012.0291

Bergdahl, J., & Bergdahl, M. (2002). Perceived stress in adults: Prevalence and association of depression, anxiety and medication in a Swedish population. *Stress and Health*, *18*, 235–241. doi:10.1002/smi.946

Boase, J., & Ling, R. (2013). Measuring mobile phone use: Self-report versus log data. *Journal of Computer-Mediated Communication*, *18*, 508–519. doi:10.1111/jcc4.12021

Brown, B. B., & Larson, J. (2009). Peer relationships in adolescence. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (3rd ed., Vol. 2, pp. 74–103). Hoboken, NJ: Wiley.

Carrier, L. M., Cheever, N. A., Rosen, L. D., Benitez, S., & Chang, J. (2009). Multitasking across generations: Multitasking choices and difficulty ratings in three generations of Americans. *Computers in Human Behavior*, *25*, 483–489. doi:10.1016/j.chb.2008.10.012

Cohen, J., Cohen, P., West, S. G., & Aiken, L. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Erlbaum.

Cohen, S., Kamarack, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 385–396.

Crawford, K. (2009). Following you: Disciplines of listening in social media. *Continuum*, *23*, 525–535. doi:10.1080/10304310903003270

David, P., Kim, J.-H., Brickman, J. S., Ran, W., & Curtis, C. M. (2015). Mobile phone distraction while studying. *New Media & Society*, *17*, 1661–1679. doi:10.1177/1461444814531692

David, P., Xu, L., Srivastava, J., & Kim, J.-H. (2013). Media multitasking between two conversational tasks. *Computers in Human Behavior*, *29*, 1657–1663. doi:10.1016/j.chb.2013.01.052

Ellison, N. B., Vitak, J., Gray, R., & Lampe, C. (2014). Cultivating social resources on social network sites: Facebook relationship maintenance behaviors and their role in social capital processes. *Journal of Computer-Mediated Communication*, *19*, 855–870. doi:10.1111/jcc4.12078

Eppler, M. J., & Mengis, J. (2004). The concept of information overload—A review of literature from organization science, accounting, marketing, MIS, and related disciplines. *The Information Society*, *20*(5), 1–20.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior. The reasoned action approach*. New York, NY: Psychology Press.

Greenberg, B. S., Eastin, M. S., Skalski, P., Cooper, L., Levy, M., & Lachlan, K. (2005). Comparing survey and diary measures of Internet and traditional media use. *Communication Reports*, *18*, 1–8. doi:10.1080/08934210500084164

Hargittai, E. (2010). Digital na(t)ives? Variation in internet skills and uses among members of the "net generation." *Sociological Inquiry*, *80*, 92–113. doi:10.1111/j.1475-682X.2009.00317.x

Helsper, E. J., & Eynon, R. (2010). Digital natives: Where is the evidence? *British Educational Research Journal*, *36*, 503–520. doi:10.1080/01411920902989227

Hofmann, W., Vohs, K. D., & Baumeister, R. F. (2012). What people desire, feel conflicted about, and try to resist in everyday life. *Psychological Science*, *23*, 582–588. doi:10.1177/0956797612437426

Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55. doi:10.1080/10705519909540118

Hwang, Y., Kim, H., & Jeong, S.-H. (2014). Why do media users multitask?: Motives for general, medium-specific, and content-specific types of multitasking. *Computers in Human Behavior*, *36*, 542–548. doi:10.1016/j.chb.2014.04.040

Jeong, S.-H., & Fishbein, M. (2007). Predictors of multitasking with media: Media factors and audience factors. *Media Psychology*, *10*, 364–384. doi:10.1080/15213260701532948

Kalman, Y. M., & Rafaeli, S. (2011). Online pauses and silence: Chronemic expectancy violations in written computer-mediated communication. *Communication Research*, *38*, 54–69. doi:10.1177/0093650210378229

Kristensen, T. S., Borritz, M., Villadsen, E., & Christensen, K. B. (2005). The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress*, *19*, 192–207. doi:10.1080/02678370500297720

Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication*, *50*, 46–71. doi:10.1111/j.1460-2466.2000.tb02833.x

LaRose, R., Connolly, R., Lee, H., Li, K., & Hales, K. D. (2014). Connection overload? A cross cultural study of the consequences of social media connection. *Information Systems Management*, *31*, 59–73. doi:10.1080/10580530.2014.854097

Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*, *44*, 1–21.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York, NY: Springer.

Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, *1*, 141–169.

Lee, R. T., & Ashforth, B. E. (1996). A meta-analytic examination of the correlates of the three dimensions of job burnout. *Journal of Applied Psychology*, *81*, 123–133.

Leiner, B. M., Cerf, V. G., Clark, D. D., Kahn, R. E., Kleinrock, L., Lynch, D. C.,…Wolff, S. (2009). A brief history of the Internet. *Computer Communication Review*, *39* (5), 22–31. doi:10.1145/1629607.1629613

Li, D., Zhang, W., Li, X., Zhen, S., & Wang, Y. (2010). Stressful life events and problematic Internet use by adolescent females and males: A mediated moderation model. *Computers in Human Behavior*, *26*, 1199–1207. doi:10.1016/j.chb.2010.03.031

Löwe, B., Wahl, I., Rose, M., Spitzer, C., Glaesmer, H., Wingenfeld, K.,…Brähler, E. (2010). A 4-item measure of depression and anxiety: Validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *Journal of Affective Disorders*, *122*, 86–95. doi:10.1016/j.jad.2009.06.019

Mark, G., Gudith, D., & Klocke, U. (2008). The cost of interrupted work: More speed and stress. In *Proceedings of the 2008 SIGCHI Conference on Human Factors in Computing Systems, April 5-10, 2008, Florence, Italy* (pp. 107–110). New York, NY: ACM. doi:10.1145/1357054.1357072

Mark, G., Wang, Y., & Niiya, M. (2014). Stress and multitasking in everyday college life: An empirical study of online activity. In *Proceedings of the 2014 SIGCHI Conference on Human Factors in Computing Systems, April 26 – May 1, 2014, Toronto, Canada* (pp. 41–50). New York, NY: ACM.

Meyer, D. E., Kieras, D. E., Lauber, E., Schumacher, E. H., Glass, J., Zurbriggen, E.,… Apfelblat, D. (1995). Adaptive executive control: Flexible multiple-task performance without pervasive immutable response-selection bottlenecks. *Acta Psychologica*, *90*, 163–190.

Mihailidis, P. (2014). A tethered generation: Exploring the role of mobile phones in the daily life of young people. *Mobile Media & Communication*, *2*, 58–72. doi:10.1177/2050157913505558

Misra, S., & Stokols, D. (2012). Psychological and health outcomes of perceived information overload. *Environment and Behavior*, *44*, 737–759. doi:10.1177/0013916511404408

Moreno, M. A., Jelenchick, L., Koff, R., Eikoff, J., Diermyer, C., & Christakis, D. A. (2012). Internet use and multitasking among older adolescents: An experience sampling approach. *Computers in Human Behavior*, *28*, 1097–1102. doi:10.1016/j.chb.2012.01.016

Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in media multitaskers. *Proceedings of the National Academy of Sciences of the United States of America*, *106*, 15583–15587. doi:10.1073/pnas.0903620106

Pool, M. M., Koolstra, C. M., & Van der Voort, T. H. A. (2003). The impact of background radio and television on high school students homework performance. *Journal of Communication*, *53*, 74–87. doi:10.1111/j.1460-2466.2003.tb03006.x

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, *9*(5), 1–6. doi:10.1108/10748120110424816

Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in Human Behavior*, *29*, 1841–1848. doi:10.1016/j.chb.2013.02.014

Quan-Haase, A., & Young, A. L. (2010). Uses and gratifications of social media: A comparison of Facebook and instant messaging. *Bulletin of Science, Technology & Society*, *30*, 350–361. doi:10.1177/0270467610380009

Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information Systems Research*, *19*, 417–433. doi:10.1287/isre.l070.0165

Reinecke, L., Hartmann, T., & Eden, A. (2014). The guilty couch potato: The role of ego depletion in reducing recovery through media use. *Journal of Communication*, *64*, 569–589. doi:10.1111/jcom.12107

Reinecke, L., Vorderer, P., & Knop, K. (2014). Entertainment 2.0? The role of intrinsic and extrinsic need satisfaction for the enjoyment of Facebook use. *Journal of Communication*, *64*, 417–438. doi:10.1111/jcom.12099

Reinke, K., & Chamorro-Premuzic, T. (2014). When email use gets out of control: Understanding the relationship between personality and email overload and their impact on burnout and work engagement. *Computers in Human Behavior*, *36*, 502–509. doi:10.1016/j.chb.2014.03.075

Rusli, B. N., Edimansyah, B. A., & Naing, L. (2008). Working conditions, self-perceived stress, anxiety, depression and quality of life: A structural equation modelling approach. *BMC Public Health, 8*. Retrieved from http://www.biomedcentral.com/1471-2458/8/48 doi:10.1186/1471-2458-8-48

Salthouse, T. (2012). Consequences of age-related cognitive declines. *Annual Review of Psychology*, *63*, 201–226. doi:10.1146/annurev-psych-120710-100328

Salvucci, D. D., & Taatgen, N. A. (2008). Threaded cognition: An integrated theory of concurrent multitasking. *Psychological Review*, *115*, 101–130. doi:10.1037/0033-295X.115.1.101

Shih, S.-I. (2013). A null relationship between media multitasking and well-being. *PloS ONE*, *8*(5), e64508. doi:10.1371/journal.pone.0064508.t001

Smith, A., & Page, D. (2015). *U.S. smartphone use in 2015*. Washington, D.C.: Pew Research Center.

Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin*, *133*, 65–94. doi:10.1037/0033-2909.133.1.65

Steinberg, L., & Monahan, K. C. (2007). Age differences in resistance to peer influence. *Developmental Psychology*, *43*, 1531–1543. doi:10.1037/0012-1649.43.6.1531

Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007). The impact of technostress on role stress and productivity. *Journal of Management Information Systems*, *24*, 301–328. doi:10.2753/mis0742-1222240109

Tarafdar, M., Tu, Q., & Ragu-Nathan, T. S. (2010). Impact of technostress on end-user satisfaction and performance. *Journal of Management Information Systems*, *27*, 303–334. doi:10.2753/mis0742-1222270311

Thomée, S., Eklöf, M., Gustafsson, E., Nilsson, R., & Hagberg, M. (2007). Prevalence of perceived stress, symptoms of depression and sleep disturbances in relation to information and communication technology (ICT) use among young adults—An explorative prospective study. *Computers in Human Behavior*, *23*, 1300–1321. doi:10.1016/j.chb.2004.12.007

Thomée, S., Härenstam, A., & Hagberg, M. (2011). Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults—A prospective cohort study. *BMC Public Health*, *11*. Retrieved from http://www.biomedcentral.com/1471-2458/11/66 doi:10.1186/1471-2458-11-66

Thomée, S., Härenstam, A., & Hagberg, M. (2012). Computer use and stress, sleep disturbances, and symptoms of depression among young adults—A prospective cohort study. *BMC Public Health, 12*. Retrieved from http://www.biomedcentral.com/1471-244X/12/176 doi:10.1186/1471-244X-12-176

van Deursen, A. J. A. M., van Dijk, J. A. G. M., & Peters, O. (2011). Rethinking Internet skills: The contribution of gender, age, education, Internet experience, and hours online to medium- and content-related Internet skills. *Poetics*, *39*(2), 125–144. doi:10.1016/j.poetic.2011.02.001

Verhaeghen, P., & Cerella, J. (2002). Aging, executive control, and attention: A review of meta analyses. *Neuroscience and Biobehavioral Review*, *26*, 849–857. doi:10.1016/S0149-7634(02)00071-4

Verhaeghen, P., & Salthouse, T. A. (1997). Meta-analyses of age-cognition relations in adulthood: Estimates of linear and nonlinear age effects and structural models. *Psychological Bulletin*, *122*, 231–249.

von der Heyde, C. (2009). *The ADM-sampling-system for face-to-face surveys*. Retrieved from https://www.adm-ev.de/en/adm-sampling/

Voorveld, H. A. M., & van der Goot, M. (2013). Age differences in media multitasking: A diary study. *Journal of Broadcasting & Electronic Media*, *57*, 392–408. doi:10.1080/08838151.2013.816709

Vorderer, P., & Kohring, M. (2013). Permanently online: A challenge for media and communication research. *International Journal of Communication*, *7*, 188–196.

Wang, E. S.-T., & Chen, L. S.-L. (2012). Forming relationship commitments to online communities: The role of social motivations. *Computers in Human Behavior*, *28*, 570–575. doi:10.1016/j.chb.2011.11.002

Wang, K., Shu, Q., & Tu, Q. (2008). Technostress under different organizational environments: An empirical investigation. *Computers in Human Behavior*, *24*, 3002–3013. doi:10.1016/j.chb.2008.05.007

Wang, Z., David, P., Srivastava, J., Powers, S., Brady, C., D'Angelo, J., & Moreland, J. (2012). Behavioral performance and visual attention in communication multitasking: A comparison between instant messaging and online voice chat. *Computers in Human Behavior*, *28*, 968–975. doi:10.1016/j.chb.2011.12.018

Zhang, W., & Zhang, L. (2012). Explicating multitasking with computers: Gratifications and situations. *Computers in Human Behavior*, *28*, 1883–1891. doi:10.1016/j.chb.2012.05.006

Zickuhr, K. (2013). *Who's not online and why*. Washington D.C.: Pew Research Center.