**Technology can sting when reality bites:
Adolescents' frequent online coping is ineffective with momentary stress.**

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Abstract

The fact that youth widely engage with the online space in order to improve their emotional health has been lost amongst the debate surrounding adolescents' technology use and associated well-being. Two studies focused on adolescents' use of technology to cope with stressors in daily life. Focus groups (Study 1; $n = 16$) indicated that youth readily identify using technology to cope and perceive it as helpful for emotional relief. Experience sampling participants (Study 2; $n = 156$) completed a baseline assessment of online coping and mental health, and one week of reports, five times daily, on their technology use, stress, and emotions. Multilevel regression results indicated that across their daily lives, youth who widely endorsed using online strategies to cope responded more negatively to stressors and displayed difficulties in recovering from worry and jealousy. Results held even controlling for use of technology, typical number of stressors, and mental health. Findings highlight the potential shortcomings and comorbid vulnerabilities for youth who frequently turn to the online environment to seek support, information, or distraction.

Keywords: online coping, mixed method, adolescent, emotion reactivity, Experience

Sampling Method

Study is based on sensitive and confidential data from minors. Please contact corresponding author for requests for final codes for qualitative data, Mplus syntax, or outputs for final models.

Highlights.

- Adolescents widely endorse going online to cope
- No relation was found between momentary technology use and subsequent emotion.
- Youth who frequently use online coping had poorer recovery from worry and jealousy

Technology can sting when reality bites: adolescents' frequent online coping is ineffective with momentary stress.

1.0 Introduction

Mobile technologies are an essential part of adolescents' daily lives (Crone & Konijn, 2018; Odgers, 2018). Adolescents are constantly connected, affording them the opportunity to engage with the online world 24/7 (Lenhart, 2015). This constant connection means that adolescents can make use of the digital space to connect with peers, learn about their world, and to escape the everyday pressures adolescence entails (Seo, Houston, Knight, Kennedy, & English, 2014; Subrahmanyam & Smahel, 2010; Wartella, Rideout, Montague, Beaudoin-Ryan, & Lauricella, 2016). Yet, we know surprisingly little about these activities impact emotional well-being (Underwood & Ehrenreich, 2017).

The importance of emotional well-being is widely recognised across the life span, but during adolescence, it is especially significant. Adolescence is a developmental period characterized by increased stress and emotional lability (Silk, Steinberg, & Morris, 2003). Hence, adolescents are seeking to cope with daily challenges, and the affective upheavals they bring (Crone & Dahl, 2012; Uink, Modecki & Barber, 2017). Given the focal role of the online space in adolescent life, this is a key arena where teens seek to mitigate problems (Gould, Munfakh, Lubell, Kleinman, & Parker, 2002).

In the current study, we aim to characterize how youth are making use of the online space in the service of their well-being, namely in the face of day-to-day stressors. First, we explore focus group reports of why and how adolescents use technology to cope with negative experiences. Second, in a separate sample, we employ detailed experience sampling data to investigate the potential usefulness of online coping strategies for dampening the affective impact of moment-to-moment stress, after accounting for critical confounds.

1.1 The mixed role of technology in youth well-being

Historically, the combination of technology and adolescent well-being has been controversial, with some areas of research highlighting its potential dangers (e.g., Twenge, Joiner, Rogers, & Martin, 2018; Wartella & Robb, 2008), and fewer studies calling attention to its promises (e.g., George & Odgers, 2015; Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005; Mills, 2016). Indeed, evidence suggests that technology use may serve to fulfil certain developmental needs (Borca, Bina, Keller, Gilbert, & Begotti, 2015). For instance, youth employ technology in an effort to develop close and meaningful relationships (Reich, Subrahmanyam, & Espionza, 2012; Valkenburg & Peter, 2011), explore their identity (Subrahmanyam, Smahel, & Greenfield, 2006), and find information about developmentally sensitive issues (Valkenburg & Peter, 2011).

Alternatively, other studies report that adolescents' technology use can sometimes be linked to problems (Twenge, Cooper, Joiner, Duffy, & Binau, 2019). Specifically, in a study of older adolescents' retrospective daily estimates of time use, more technology use was associated with poorer academic performance (Jacobsen & Forste, 2011). Likewise, heavy internet use has been linked to poorer body image among adolescent girls (Tiggemann & Slater, 2013) and among teenagers more broadly, engagement with various types of technology has been associated with poorer physical and psychological health (Rosen et al., 2014). Indeed, Twenge and colleagues (2018) investigated social-media use and mental health among adolescents using two large-scale, nationally representative U.S. samples ($N = 506, 820$). Results indicated that social media use, depressive symptoms, and rates of suicide were positively linked, especially in adolescent females. The authors concluded that social media use may perhaps be driving increases in poorer mental health outcomes among youth. That said, although the relation between media use and mental health may indeed be negative, at least in relation to very high levels of use (Przybylski & Weinstein, 2017), the direction of effect is yet to be determined, and may even be bi-directional, or be due to a third

confounding factor that underlies both (Heffer, Good, Daly, Macdonnell & Willoughby, 2019; Orben & Przybylski, 2019). For instance, research has highlighted that the link between adolescents' technology use and overall maladaptation may be explained by other offline issues (e.g., poor sleep; Vernon, Modecki, & Barber, 2017), suggesting that the effects of technology use may be dependent, in part, on individual differences.

Moreover, to date, most quantitative research with adolescents has been based on either retrospective reporting (e.g., over the last six months), or focused explicitly on negative outcomes (e.g., cyberbullying, body image). A notable exception is recent research by George and colleagues (2018), who made use of daily reports of technology use and daily mental health symptoms in a noteworthy attempt to tease apart these relations. Findings were mixed, in that adolescents' self-estimated daily engagement with technology was positively linked with certain Attention Deficit Hyperactivity Disorder (ADHD) and Conduct Disorder symptoms. However, youth estimates of daily technology use were also linked to lower same-day anxiety symptoms. Importantly, when longitudinal (e.g., next-day) effects of technology were explored, only one of these relations held, greater estimated technology use predicted increased ADHD symptoms the following day. Thus, longitudinal findings have not yet clarified whether adolescents' technology use facilitates better or worse functioning.

Across studies, mixed findings regarding technology and youth well-being allude to several key considerations for the next phase of youth-technology research. First, given the complex interplay between technology use and mental health, questions regarding youths' technology use and their affective states are best explored longitudinally, such that concurrent technology use, on-going real-life experiences, and later emotional functioning are taken into account. Second, considering the fluid nature of youth emotions, contexts, and technology engagement, better understanding of these complex relations calls for a fine-tuned approach. That is, a moment-to-moment perspective (rather than daily reports) provides a more

informative picture of how and where youth are spending their time and how they are managing the challenges they face. Third, these mixed results suggest that these relations may depend, at least in part, on *why* youth are engaging with their technology. Youth likely experience different affective outcomes depending on their needs and motivations for technology use. Hence, exploring youth technology use in relation to certain purposes or needs, including how they utilize technology in the service of their- well-being, is a needed next step to progress the field.

1.2 Theoretical background: what motivates technology use?

Uses and Gratifications Theory (UGT) remains a cornerstone theory to help understand individual differences in what motivates technology use (Coyne, Padilla-Walker, & Howard, 2015; Elhai, Levine, Dvorak, & Hall, 2017). UGT highlights that individuals play an active role in their selection of media in an effort to fulfil specific needs or goals (Katz, Haas, & Gurevitch, 1973). For instance, Coyne and colleagues (2015) emphasize that young people are active and self-selecting agents and select technology for the purpose of building autonomy, intimacy, and developing their identity. Moreover, research has found that these needs can include entertainment and boredom relief (Rokito, Choi, Taylor, & Bazarova, 2019), to seek self-status (Park, Kee & Valenzuela, 2009), and critically in the context of adolescence, such needs sometimes pertain to management of stressors (Leung, 2007).

More recently, the UGT framework has been applied to identify different motivations for Internet use. Here, three main categories of gratification have been identified: 1) *Content gratification*, which includes the need for researching or finding specific information, 2) *Process gratification*, gaining gratification from the process of browsing the internet, either purposefully or randomly, and 3) *Social gratification*, which is based on forming or deepening social ties (Stafford, Stafford, & Schkade, 2004).

That said, while UGT underscores several purposes for which youth can engage with the online environment, these gratifications provide little clarification as to whether such technology use serves to help or hinder their affective well-being. Further, dealing with stressors is arguably a key need which drives adolescents to engage with technology. Thus, research is needed to clarify whether youth themselves identify with using technology in this way; and if so, does it help them feel better?

1.3 Adolescent stress and online coping

A critical need that adolescents seek to fulfill is effective management of their day-to-day stressors. During adolescence, youth are confronted by a range of challenges, including physical and cognitive changes, evolving family and peer relationships, new romantic ties, and increasing educational demands (Markova & Nikitskaya, 2013). Although minor in nature, the experience of these types of daily stressors, or ‘hassles’, is a salient source of emotional upheaval (Modecki, Zimmer-Gembeck, & Guerra, 2017; Silk, Steinberg & Morris, 2003). In fact, research shows that relative to major life events, these types of daily hassles can better explain human maladjustment (Compas et al., 1985), and more accurately predict psychological symptoms (Sim, 2000). That said, what has not yet been adequately explored is how youth engage with the online environment as they seek to manage (whether effectively or not) these day-to-day difficulties.

Online coping has been defined by van Ingen and Utz and Toepoel (2016) as “thoughts and behaviors that are *facilitated by the Internet* that people use to manage stressful situations” (p. 512). Indeed, scholars have established that adults report using the online space to cope with events, though this work is cross-sectional and based on retrospective reports. For instance, van Ingen and colleagues (2016) used an adapted online coping measure from Carver with more than 5,000 Dutch adults (*M*_{age} = 50 years) and showed that

online and offline coping strategies are significantly and positively correlated. However, online coping was associated with negative markers of well-being, including lower levels of optimism, life satisfaction, and self-esteem.

Specific to adolescents, a growing body of research attests to youths' use of technology in manners akin to coping (Eschenbeck, Schmid, Schröder, Wasserfall, & Kohlman, 2018; Leiner, Argus-Calvo, Peinado, Keller, & Blunk, 2014; Lohaus, Ball, Klein-Heßling, & Wild, 2005). Indeed, Leung (2007) found that adolescents reported motives for internet use that were significantly linked to major life stressors (e.g., parental separation, illness). Specifically, youth identified with using the internet to either manage negative emotions (e.g., seeking information for stress reduction), or for social compensation (e.g., relationship maintenance). More recently, Eschenbeck and colleagues (2018) found that media use as a coping strategy increases as youth enter adolescence.

1.4 Motivated by stress: linking UGT and online coping

Youth and their technology use have become so entwined (Subrahmanyam & Smahel, 2010) that in the course of managing the day-to-day bustle of adolescence, the online space is an ever-ready avenue for seeking emotional relief from daily challenges (Eschenbeck et al., 2018). More specifically, tentative empirical evidence indicates that youth access the online environment for three key reasons, for emotional support seeking (e.g., Valkenburg & Peter, 2011), self-distraction (e.g., Kuss & Griffiths, 2012; Snodgrass et al., 2014) and for information seeking (e.g., Skinner, Biscope, Poland, & Goldberg, 2003) in response to stress. These coping strategies can be usefully conceptualized in relation to UGT in that emotional support seeking falls within needs for social gratification, self-distraction within process gratification, and information seeking might be encapsulated within content gratification needs. That said, we know little about whether youth themselves identify with using these

strategies or whether employment of these strategies can buffer against the impact of day-to-day stress, at least in the short term.

Importantly, a body of research supports the value of coping for adolescents, at least in the offline context. Over the last few decades, adolescence research has sought to identify patterns of coping that are tied to well-being—in particular, emotional support seeking, informational support seeking, and self-distraction (Zimmer-Gembeck & Skinner, 2011). On the one hand, this work suggests that coping is a fundamental skill that youth attempt to master during adolescence (Modecki et al., 2017). On the other hand, not all offline coping strategies are considered equally healthy. For example, approach-oriented coping strategies such as support seeking and information seeking tend to be associated with more adaptive functioning. Whereas self-distraction, at least when considered over the long-term, tends to be tied to poorer well-being (e.g., Carver & Connor-Smith, 2010). That is, although it may feel good in the short term, the cumulative effects of problem-avoidance over time do not necessarily contribute to successful stress navigation.

1.5 Remaining questions

Thus far, research has largely focussed on characterizing technology's link with maladaptation (e.g., poor sleep). Yet, ties between adolescent technology use and its effects arguably depend upon individual differences (e.g., in well-being, in methods of access). Research has largely overlooked the impact of specific reasons for access on well-being, in this case, using technology to cope. By exploring motivations for technology use, scholars can better decipher the ways in which technology might be harmful (or indeed helpful). This question is especially relevant considering adolescents are highly vulnerable to stress and have unprecedented access to digital technologies. Thus, it stands to reason that youth are navigating this context intuitively (Subrahmanyam & Smahel, 2010). In fact, while scholars

have been quick to explore risks in relation to adolescents' use of technology (e.g., Wartella & Jennings, 2000), increasingly, calls have been made to highlight opportunities that naturally exist for youth in the online space (Odgers, 2018). Yet, relatively little research has explored avenues through which youth, in particular, might benefit.

1.6 The current studies

The current studies fill these critical gaps, leveraging detailed information from adolescents living in the context of stressful circumstances, specifically, socio-economic disadvantage. Importantly, economically disadvantaged adolescents report high rates of exposure to daily stressors (Evans, Vermeulen, Brassh, Lefkowitz, & Hutt, 2009), and many are subject to poor emotional functioning in response to moment-to-moment stressors (Uink, Modecki, Barber, & Correia, 2018). As a result, given our focus on youth coping, sampling within these circumstances not only provides adequate variability in stressors encountered and salient contexts for assessing efficacy of coping online, it also provides a much-needed picture of youth who could most benefit from services online. Moreover, using an ambulatory assessment design (Study 2) offers the advantage of each youth serving as his or her own control. Thus, this study marries a high likelihood of encountering stress with the ability to characterize emotion-change relative to each youths' own average (Modecki & Mazza, 2017).

Notably, there is a common misconception that a digital divide exists between low and high socioeconomic populations (Kreutzer, 2009). On the contrary, studies with youth have shown that when compared to high socio-economic status (SES) populations, youth from economically disadvantaged backgrounds are *more likely* to own a mobile phone (e.g., Byun et al., 2013), access their phones more frequently (Lenhart, 2015), and spend more time on their phones overall (Thomas, Heinrich, Kuhnlein, & Radon, 2010). Thus, the

combination of increased exposure to stressors and higher infiltration of mobile technologies in day-to-day life makes this sample especially pertinent.

In Study 1, we use qualitative (focus-group) data to describe adolescents' identified motivations and experiences engaging with their online environments to manage their emotions and stress. In Study 2, we employ an online coping measure to assess how different technology-based coping strategies (informational support, emotional support, self-distraction) relate to youths' effectiveness in mitigating negative emotional responses to stress. Together, these studies aim to validate adolescents' use of technology to cope with day-to-day problems and in turn, test the utility of technology-based coping.

H1: Adolescents will uniformly report using the online space in response to negative experiences (Study 1)

H2: Technology use will have short-term effects on negative emotion (but direction of effects is exploratory) (Study 2)

H3: Adolescents' online coping strategies will buffer against short-term negative affective responses to stress, and so will be experienced as temporarily useful (Study 2)

2.0 Study 1: Focus Groups

2.1 Method

2.1.1 Participants and procedure. Original ethics approval #2012/203 for the study "How do you feel? Adolescent Behaviour, Emotion, and Technology Use" was granted by the University Ethics Committee and Department of Education, to conduct pilot research at a low-SES metropolitan public high school. Participants/guardians granted consent following distribution of information about the study to sixty students. Sixteen participants (seven girls, nine boys) consented to participate in one of two single-gendered focus group discussions,

which aimed to explore experiences and phenomena relating to technology use and mood. Two facilitators used a discussion schedule to generate and facilitate discussion regarding experience of emotion in relation to technology use (e.g., How do you feel when you are talking with your friends on the phone? Texting? Posting on social networking sites? Privately through email?). Emotion probe cards were used to facilitate identification and selection of a range of different emotions.

Research team members explored qualitative themes in relation to adolescent technology use for managing moods and coping with problems. Given the exploratory nature of the data, thematic analysis using a six-stage process (Braun & Clarke, 2006) was conducted to generate themes from the content of the focus groups. This included becoming familiar with the data through repeated reading, generating initial codes and searching for themes, reviewing and refining themes, and defining themes to produce final analysis.

2.2 Focus Group Results

2.2.1 Using technology in response to offline experiences (internal and interpersonal). Adolescents reported engaging with technology in response to different types of offline experiences, as described in Table 1 under Theme 1. Specifically, youth described feelings such as boredom and anger, which they attempted to manage by engaging with technology, typically through social sites like Facebook, or Skype, or online games. Another key theme reported was that often, these emotional experiences and the desire to use technology were initiated in the context of interpersonal interactions, such as with friends or family. Key examples for this are also provided under Theme 1 in Table 1.

2.2.2 Using technology to manage mood and emotions. In response to queries about how technology was used to manage emotions, participants acknowledged a range of ways in which technology could alter or maintain a particular emotion, including through social

interaction and support as well as seeking experiences online that might produce positive emotional experiences. Several representative responses in relation to this theme are provided under Theme 2 (Table 1). What was apparent from youths' responses was that technology, most notably social networking sites such as Facebook, were often used as an emotion-focused strategy to reduce perceived negative emotions or to maintain positive emotions.

2.2.3 Technology as a source of negative emotional stimuli. Importantly, however, participants also discussed a range of situations that occurred online, which subsequently evoked negative emotional experiences. Here, participants recognized that although they often went online to feel better, being online could lead to further experiences of negative affect. Some of these experiences were relational, in that they perceived social networking sites as being used by others to provoke their emotions (e.g., engaging in actions to embarrass, provoke jealousy). In other cases, youth acknowledged that these experiences were simply a product of being online (e.g., social comparison). Illustrative examples are again provided in Table 1, under Theme 3.

2.3 Discussion

Results revealed that youth identified with using technology in response to negative experiences. Indeed, youth reported using the online space as an emotion-focussed coping strategy (e.g., steering away from anger or unpleasant offline experiences). That is, adolescents identified turning to the online space to alleviate negative experiences rather than coping with the trigger itself. This suggests that adolescents are cognizant of accessing the online space to deal with stressors, though they did not spontaneously volunteer preferred strategies. Youth also reported that the online environment can be a salient source of discomfort, either through a negative social interaction, or exposure to content that triggers negative reactions. All told, our first hypothesis positing that adolescents would widely

endorse using the online space to cope with negative experiences was generally supported.

Thus, study 2 empirically explored the utility of adolescents' online coping efforts in the face of day-to-day stressors.

3.0 Study 2: Experience Sampling Method Study

3.1 Method

3.1.1 Participants and procedure. Participants in the second study, using experience sampling study methods (ESM), were 213 adolescents from two additional low-SES public schools in a metropolitan area. Schools were recruited based on their designation as relatively low SES, as ranked on a national Index of Community Socio-Educational Advantage (Australian Curriculum, Assessment & Reporting Authority, 2013), which is determined based on a range of indicators, including parental education, household income, and single-parent status household. Five participants withdrew consent from the study, and two participants completed the pre-ESM survey but did not commence the ESM phase. Further, participants who were deemed non-compliant with the study protocol (see Results section) were excluded from study analyses. Thus, the final sample consisted of 156 adolescents ($M_{\text{age}} = 14.7$ years ($SD = 1.3$), 13-16 years; girls = 66%). The majority of study participants reported their ethnicity as Caucasian (74.4%). Other ethnicities were Maori (3.8%) African (2.6%) Asian (1.3%) Aboriginal or Torres Strait Islander (8.3%) and "other" (5.1%). 4.5% of participants did not report their ethnicity.

Ethics approval for "How do you feel? Adolescent behaviour, emotion, and technology use over time" project was obtained from the University Human Ethics Research Committee to extend the original project #2013/141, and continued approval was obtained

from the State Department of Education (Project # D13/0537672)¹. Participants and parents/guardians gave written consent prior to participation. Participants received no financial remuneration for participation but instead were given unlimited use of a recent model iPhone with phone and data credits to enhance engagement. Data were collected in groups of 20-25 youth per week between late 2013-mid 2016 in two school cohorts. Groups were staggered to allow sufficient resource allocation (e.g., smartphones and research team attention; Modecki et al., 2019). Prior to beginning the ESM phase, participants completed a computerized baseline survey (pre-ESM survey) which included items tapping demographics and a range of constructs, including adapted online coping questions, psychopathology, life-stressors, and well-being.

For the ESM study phase, participants were loaned a recent model iPhone for seven days, provided by the research team with a pre-paid plan. Five times throughout each study day participants were sent an SMS link to a web-based ESM survey at random intervals, within pre-specified time blocks. Surveys were sent each morning (07:30—08:00 (09:00 – 09:30 weekends)), Lunch (13:15 only, due to school lunch break), Afternoon (15:30 – 16:00), Dinner (18:30 – 19:00) and Night (21:00 – 22:00). Each survey was closed to responses within an hour of being sent. Survey times were successfully piloted in a separate sample of adolescents. The research team was also onsite at school each sampling day from early morning to after school to enhance compliance and were contactable by phone outside of school hours to troubleshoot any technical issues (see Figure S1 for a diagram of study design).

3.1.2 Momentary-level measures.

¹ These data were part of the larger project, “How do you feel? Adolescent behaviour, emotion, and technology use over time”, which focuses on day-to-day life among youth living in the context of low SES settings. This is the first project paper to report on youth technology use and is the second paper to publish from the final sample. See Modecki, Uink, & Barber, 2018; Uink, Modecki & Barber, 2017; Uink, Modecki, Barber, & Correia, 2018.

3.1.2.1 Momentary Emotion. Adolescents' emotions across the day were assessed by asking, "*Right now, how are you feeling?*" at each sampling moment. Because we were specifically interested in youths' problematic responding, in this study, we concentrated exclusively on negative affect (worry, anger, jealousy, loneliness, sadness). Participants rated how lonely, worried, angry, jealous, and sad they were feeling (1 = Not at all, 5 = Very much). Because we were interested in how youths' emotional states fluctuated with their technology use, the primary outcome variable in study analyses was emotional change, rather than level of each emotion. We tested for this emotion change by assessing a youth's emotion at the current sampling moment ($t=0$) while controlling for emotion at the previous time point ($t-1$). Thus, analyses characterize *changes* in emotion as a result of predictors.

3.1.2.2 Momentary Stressors. Adolescents' exposure to minor stressors throughout the day was assessed by asking, "*Since you were last messaged, has anything bad happened to you?*" (Schneiders et al., 2006; Uink, Modecki, & Barber, 2017). The question format ensured that participants reported on recent stressors, occurring within the last 2-5 hours. A dummy variable was created for momentary stressors (0 = no bad event since last messaged, 1 = bad event since last messaged).

3.1.2.3 Momentary Technology Use. Ninety-four percent of youth within the sample reported accessing a mobile phone on a more or less daily basis. Adolescents' momentary technology use was assessed by asking, "*Since the last message, have you*" followed by six variations of technology use (including: "*Used text messaging/Instant messaging*", "*Watched YouTube videos*" or "*Used social networking sites*" "*Done any gaming*" "*Made or received phone calls*" "*Watched TV or movies.*") A dummy variable was created (0 = no technology use, 1 = technology use).

3.1.2.4 Momentary Positive Events. Analyses also controlled for momentary positive events as a level-1 covariate. At each sampling moment, adolescents were asked: “*Since the last message, has anything good happened to you?*” A dummy variable was created for momentary positive events (0 = no good event since last messaged, 1 = good event since last messaged).

3.1.3 Person-level Measures.

3.1.3.1 Adapted Brief-COPE. To assess online coping, three subscales from the brief-COPE (Carver, 1997) scale were adapted to assess online coping behaviours. Previous research has shown a similar but slightly longer version of this scale to be valid among adults (van Ingen & Wright, 2016). Notably, Van Ingen and Wright’s (2016) work shows only moderate correlations between online and offline coping ($r = .36$) and reported generally positive correlations between well-being and offline coping, but negative correlations between online coping and self-esteem and connectedness. Supplementary Table 1 reports our parallel work with young adults (ages 17-25, $M_{\text{age}} = 20.03$) which provides a fairly similar pattern of findings. That is, offline strategies were generally negatively associated with problems, with the exception of self-distraction. Whereas online strategies were associated with more problems and maladaptive affect regulation.

Table 2 presents means and correlations between youths’ scores on the adapted Brief-COPE subscales and other study variables. Participants were asked: “*Please rate how much you do the following things when you experience stressful events.*” Responses were recorded on a 4-point Likert scale (1 = I haven’t been doing this at all, to 4 = I’ve been doing this a lot). Subscales included Emotional Support (2 items; e.g., To get emotional support from others, I use technology like Facebook, Instant Messaging and SMS, $\alpha = .78$; 17% reported not doing this at all, 6% reported doing this a lot); Seeking Information (e.g., To get advice

from other people I use technology like Facebook YouTube and Google (1 item; 22% had not done this at all, 11% reported doing this a lot); and Self-Distraction (2 items; e.g., To take my mind off things, I turn to technology like Facebook, YouTube and Streaming Music, $\alpha = .64$; 6% had not done this at all. 13% reported doing this a lot).

3.1.3.2 Person-Level Covariates. A number of person-level controls were included in the analyses, including gender (0 = male, 1 = female), depression symptoms, social anxiety symptoms, and externalizing behaviours (see Supplementary Section). Additional controls included average engagement with technology over the week, average stressors encountered over the week, and average level of each emotion experienced across the week (see Planned Analysis). Specifically, gender, psychopathology, and weekly averages were regressed onto the intercept at level-2 to control for between-person differences in these factors (Ebner-Priemer, Eid, Kleindienst, Stabenow, & Trull, 2009). Hence, analyses provide an estimate of emotion change separate from overall mean level of technology use, stressors experienced, and dispositional emotion (Bolger & Laurenceau, 2013).

3.1.4 Planned Analyses. Analyses used multilevel modelling (MLM) (Hox, 2010) to account for repeated measures of stressors, technology use, and emotion nested within-person. MLM accounts for non-independence in the variables that were measured at each sampling moment (e.g., technology use, stressors, emotions) and also allows within-person and between-person variance in outcomes to be estimated separately (Hox, 2010). Within-person (i.e., repeated measures) variables are modelled at level-1 of the models, and between-person variables are modelled at level-2 of the models. Notably, these are conservative tests in that we re-introduced the means of technology use, emotion, and stress at level 2 so that models report independent micro- (level 1) and macro-level (level 2) contributions of these predictors. Level-1 variables were group-mean centered (e.g., centered on each adolescents' average for the week) and level-2 variables were grand-mean centered (e.g., on the sample's

average) (Enders & Tofighi, 2007). Separate models were estimated for each emotion and each coping subscale.

Models first examined whether momentary stressors, technology use, and online coping strategy predicted emotion change (i.e., fixed effect models). Next, a cross-level interaction was added to the models to assess the focal hypothesis, in which online coping strategy conditioned the relation between experiencing a stressor and change in emotion. To test the cross-level interaction, the slope of emotion was regressed on stress and was allowed to vary across adolescents. The three online coping variables were (separately) then regressed onto the random slope. Adding this cross-level interaction allowed us to test whether coping strategy explained variance in slopes (between stressor and subsequent emotion) across adolescents.

MLM was run using Mplus version 8 (Hox, 2010; Muthén & Muthén, 2017). Missing data were estimated using Full Information Likelihood Method (FIML), which provides model estimates based on all observed data, in line with best practice (Enders, 2010)². Models were estimated using robust standard errors to account for variable non-normality. Notably, in all multilevel models (e.g., main effect and cross-level interaction models) Benjamini-Hochberg family wise corrections were applied across coping strategy ($n = 3$), thus accounting for increased type 1 error due to exploration of three different types of coping for each emotion.

3.2 ESM Results

3.2.1 Data preparation and participant compliance. The final sampling moment of the ESM study was excluded as it was not temporally linked to change in emotion, resulting

² To inform FIML estimation, and make use of all relevant information, construct variances at level 2 and level 1 were brought into each model. In instances where these failed to converge, level 1 variances were individually excluded.

in 34 assessable time points per participant. Further, less than 1% (.8%) of sampling moments were incomplete due to a technical error or a school scheduling conflict. Compliance rates were based upon the completed number of momentary reports of emotion. Consistent with past ESM studies focused on momentary emotion change (e.g., Brans, Koval, Verduyn, Lim & Kuppens, 2013) participants who completed less than 40% (i.e., less than 14 reports, $n = 50$) of emotion reports were deemed non-compliant and were excluded from current analyses. The median response among included participants in this study was 24, which translates to a median response rate of 71% (i.e., 24/34 possible reports per participant).

3.2.2 Correlations. As described in Table 2, average level of technology use was positively associated with all online coping strategies. Further, social anxiety symptoms and externalizing were also positively associated with all online coping strategies (trend for social anxiety and self-distraction). Additionally, depression symptoms were positively associated with online emotional support and information seeking. Emotional support seeking was positively related to average levels of all emotions (trend for worry). Finally, online information seeking was positively associated with average levels of loneliness and at trend, sadness and worry.

3.2.3 Does adolescents' online coping, stress, and technology use predict emotion change?

3.2.3.1 Main effects predicting emotions. In the two-level fixed effects models, there were significant main effects at level 1 and level 2 for each emotion. Across all three of the coping models, and as shown under the level 1 section of Supplementary Table 2, recent stressors were associated with significant increases in each emotion, except jealousy. Further, recent positive events were associated with significant decreases in each emotion (trend for jealousy). Likewise, previous emotion positively predicted subsequent emotion. Notably,

however, momentary technology use was not associated with emotion change in any of the models.

As shown under the level 2 section of Supplementary Table 2, average emotion across the week was positively associated with the corresponding emotion outcome in each model. Further, there was a trend-level association with gender and jealousy across all models; girls experienced more change in jealousy across the week than boys. Social anxiety symptoms were also related to less change in jealousy across all models. Further, externalizing symptoms were associated with less change in momentary loneliness (trend for emotional support and information seeking) and less change in momentary jealousy (trend). Adolescents with higher average technology use across the week experienced less change in anger and sadness. Regarding specific online coping strategies, going online to seek information was significantly associated with greater change in worry. It is worth noting that these models are predicting within-person change in emotion, as opposed to emotional well-being across the week (for between-level averages, see correlations in Table 2).

3.2.4 Do adolescents' emotional responses to stress depend on their online coping strategy?

Outlined in section 3.2.3.1, recent stressful events were associated with increases in negative emotion. The following cross-level interactions tested whether this relation between stressor and emotion was conditioned by participants' online coping style.

3.2.4.1 Online Emotional Support Seeking. As described in Table 3, for emotional support, there was a significant Stressor X Online Coping interaction predicting loneliness. Plotting and probing of simple slopes at high and low levels of support seeking ($SD+1$, $SD-1$), indicated that when youth were not experiencing a stressor, both groups of youth reported similar moment-to-moment change in loneliness (left side of Figure 1A). However, youth

reporting high levels of online emotional support seeking (light grey bar, right side of Figure 1A) reported significant increases in loneliness ($b = .32(.12)$; $p = .006$) after experiencing a stressor. Youth at low levels of online emotional support only reported slight increases in loneliness after a stressor, and this relation was non-significant ($b = .02(.08)$; $p = .776$).

Figure 1A. High online emotional support seeking is associated with surges in loneliness after a stressor. Change after a) no stressor and b) a stressor, for low and high online emotional support seekers. Error bars represent standard errors.

Additionally, there was a trend-level interaction for Stressor X Online Coping predicting worry. Given we were conservative in our application of a Benjamini-Hochberg correction to multi-level effects, we explored this interaction via probing and plotting of simple slopes. The pattern of results was similar to those for lonely. Results indicated that when youth were not experiencing a stressor, both groups of youth reported fairly similar moment-to-moment change in worry. However, after experiencing a stressor, youth endorsing high levels of emotional support seeking reported significant increases in worry ($b = .46 (.11)$; $p < .001$). Youth endorsing low levels of emotional support seeking also reported slight upticks in worry pre- to post-stressor, but this association was weaker ($b = .20(.12)$; $p = .093$).

Finally, there was a significant Stressor X Online Coping interaction predicting jealousy. Plotting and probing of simple slopes at high and low levels of emotional support seeking ($SD+1$, $SD-1$), indicated that when youth were not experiencing a stressor, both groups of youth reported relatively similar moment-to-moment change in jealousy. However, youth reporting high levels of online emotional support seeking reported increases in jealousy, ($b = .05(.04)$; $p = .201$) after experiencing a stressor, although this relation was non-significant. Youth at low levels of online emotional support reported slight decreases in jealousy after a stressor, although again this relation was non-significant ($b = -.06(.05)$; $p = .197$).

3.2.4.2 Online Self-Distraction. For self-distraction, there was a significant Stressor X Online Coping interaction predicting worry. This interaction is characterized in Figure 2A. Specifically, after experiencing a stressor, youth at high levels of self-distraction reported significant increases in worry ($b = .49(.09)$; $p < .001$), as did youth with low levels of self-distraction ($b = .19(.06)$; $p = .002$). Again, this association was weaker at low levels of self-distraction.

Figure 2A. High online self-distraction is associated with surges in worry after a stressor.

Worry change after a) no stressor and b) a stressor, for low and high online self-distractors.

Error bars represent standard errors.

Additionally, there was a significant Stressor X Online Coping interaction predicting jealousy. Youth high in self-distraction experienced significant increases in jealousy after a stressor ($b = .13(.03)$; $p < .001$) whereas youth low on self-distraction experienced significant decreases in jealousy after a stressor ($b = -.14(.04)$; $p = .001$). These relations are characterized in Figure 2B.

Figure 2B. High online self-distraction is associated with surges in jealousy after a stressor. Jealousy change after a) no stressor and b) a stressor for low and high online self-distractors. Error bars represent standard errors.

3.2.4.3 Online Information Seeking. For information seeking, there was a significant Stressor X Online Coping interaction predicting worry. Youth at high levels of information seeking reported significant increases in worry after a stressor ($b = .55(.09)$; $p < .001$). Youth at low levels of information seeking also reported increased worry after experiencing a stressor, but this relation was weaker, and the simple slope was non-significant ($b = .10(.06)$; $p = .125$). These relations are characterized in Figure 3A.

Figure 3A. High online information seeking is associated with surges in worry after a stressor. Worry change after a) a stressor and b) no stressor for low and high online information seekers. Error bars represent standard errors.

Finally, there was a significant Stressor X Online Coping interaction predicting jealousy. Plotting and probing of simple slopes at high and low levels of information seeking ($SD+1$, $SD-1$) indicated a pattern similar that found for self-distraction (Figure 2B). When not experiencing a stressor, both groups of youth reported relatively similar moment-to-moment change in jealousy. However, when experiencing a stressor, those at high levels of online information seeking experienced increases in jealousy, although this relation was non-significant ($b = .06(.04)$; $p = .156$). Further, those at low levels of online emotional support seeking reported slight decreases in jealousy after a stressor; however, this relation was again non-significant ($b = -.06(.05)$; $p = .257$).

3.3 Discussion

Study 2 sought to build on findings of Study 1 (suggesting that youth make use of online spaces to cope) and investigated whether adolescents' use of online coping strategies mitigated affective upheavals in the face of actual daily stress. Two hypotheses were tested. First, technology use across the day was a key covariate in the models and as an exploratory research aim, we sought to investigate whether moment-to-moment use of technology led to

short-term change in emotion. Surprisingly, we found no effects of recent technology use on subsequent emotion. Second, we hypothesized that the types of online coping style that adolescents endorsed would each dampen emotional reactivity to stress. However, this hypothesis was not supported for any of the investigated online coping styles. In fact, adolescents' frequent use of online coping in any form was tied to poorer "bounce back" from stress. Regardless of whether youth reported high levels of seeking emotional support, self-distraction, or looking for information when experiencing stressful events, their emotion change (relative to the previous time point, T-1) was more overtly negative—mainly in relation to worry and jealousy, with one effect for loneliness—relative to youth who endorsed lower levels. This suggests that using the online space as a general means of dealing with stress may not be helpful when employed frequently, as adolescents' habitual approach to feeling better.

4.0 General Discussion

Teens are almost always online; yet surprisingly, little research has sought to understand the ways in which youth are connecting with technology to benefit their emotional well-being (e.g., Wartella & Jennings, 2000). Here we have sought to validate and characterize adolescents' online coping in conjunction with their emotional health, drawing on Uses and Gratification Theory (UGT) (Katz et al., 1973). First, our focus group findings re-affirm that in the face of day-to-day challenges, adolescents are turning to technology in order to feel better. According to their own accounts, this strategy tends to be perceived as effective, though not without its challenges (e.g., other stressors encountered online). Second, we examined whether, in everyday life, youthful online coping is protective in response to stressors. Contrary to adolescents' beliefs and our original hypothesis, frequent online coping was associated with poorer bouncing back when problems arose, mainly in relation to worry

and jealousy. Hence, adolescents who regularly engage in online coping do not appear to benefit from short-term emotional relief.

4.1 Validity of adolescent online coping

This study is the first, to our knowledge, to explicitly assess online coping with adolescents within a theoretically informed framework. We triangulated methods, using focus groups followed by ESM to substantiate adolescents' use of technology as part of their coping repertoire. Within focus group discussions, youth spontaneously shared engaging with technology solely for the purpose of coping with their affective states and emotional upheavals. Motivated by these accounts, we worked to adapt a theoretically informed, widely-used measure of coping constructs to the online space. Similar to recent research with adults (e.g., van Ingen & Wright, 2016), our updated online coping constructs exhibited excellent validity with adolescents. When asked how often they engaged with online strategies in response to stress, 84% reported seeking emotional support online; 78% endorsed finding information online; and 94% reported engaging in self-distraction, at least in some way. Notably, endorsement of online coping was significantly associated with average technology engagement across the week, indicating that the more time spent online, the more likely youth were to engage in these strategies.

4.2 Does adolescents' online coping work?

Two considerations underpinned our selection of coping strategies thought to be especially pertinent for adolescents online. First, adolescent coping research points to three common forms of coping used among this age group—emotional support seeking, informational support seeking, and self-distraction (Zimmer-Gembeck & Skinner, 2011). Second, each of these strategies, in turn, is inherently linked to the application of UGT to motivations for internet use (Stafford et al., 2004). Adolescent emotional support seeking

parallels seeking *social gratification*, in that using the Internet may be a way to emotionally connect. Youths' information support seeking aligns with their *content gratification*, or searching for helpful information, and adolescent self-distraction mirrors *their process gratification* (enjoying the experience of browsing itself). As a result, theoretically, these strategies were an appropriate selection for investigation in youth.

Contrary to our hypothesis, however, high reliance on these online strategies was equally ineffective in providing adolescents with short-term emotional relief. Based on empirical analyses of moment-to-moment change in stress and emotions, we found that youth who endorsed engaging in online coping more frequently had worse outcomes following a stressful experience. Conversely, those who were less inclined to engage in technology in this way displayed more adaptive recovery from a stressor. Notably, these findings emerged in a conservative test that controlled for adolescents' experience of positive events, technology use, and psychopathology and deployed a family-wise error rate to diminish chances of false-discovery.

More specifically, when examined relative to each emotion, adolescents who recurrently engaged in online coping strategies were particularly ineffective in managing their worry. Adolescents who tended to rely heavily on any one of the online strategies (only trend for emotional support) exhibited greater surges in worry post-stress, relative to their previous emotional state. We posit that these strategies are especially ineffective in relation to worry because this emotion encompasses an intolerance of uncertainty (Laugesen, Dugas, & Bukowski, 2003), and so can be particularly difficult to address without credible reassurance or solutions. Illustratively, in a previous cross-sectional survey study of adolescents, roughly 20% of Internet help-seekers reported dissatisfaction with the help they received for emotional problems online (Gould et al., 2002).

Also discernible was a link between high use of online coping and lack of effectiveness in controlling jealousy. Across emotional support seeking, self-distraction, and information seeking, high engagement in online coping was associated with increased jealousy after a stressful experience. Potentially, adolescents may be going online to divert their attention, but subsequently expose themselves to unrealistic content tailored to impress or instil envy (Lennarz, Lichtwarck-Aschoff, Finkenauer, & Granic, 2017). Indeed, youth who reported only engaging in self-distracting behaviours less frequently or not at all recovered especially well after stress. We posit that these youth are showing particular adaptation and may be using more productive strategies offline, which are more problem-focused and actively support their sense of control (Compas, Conner-Smith, Saltzman, Thomsen, & Wadsworth, 2001).

Although findings were mainly in relation to worry and jealousy, frequent seeking of emotional support online was also problematic in relation to loneliness. In contrast, some previous research has found that adolescents' support-seeking online can be beneficial in relation to challenges such as mental health struggles (e.g., Gray et al., 2005), or by increasing general feelings of "belongingness" and self-esteem (e.g., Best, Manktelow, & Taylor, 2014). Thus, it may be that our findings of poorer outcomes tied to frequent support seeking online may reflect a general vulnerability within these youth. That is, those who struggle with regulating their loneliness also tend to commonly seek support online. Indeed, higher support seeking was positively correlated with youths' depression scores and reported overall loneliness across the week.

All told, it is quite possible that frequent online coping may be linked to poorer adaption because youth who actively endorse online strategies tend to be the most challenged. That is, youth who are especially at-risk also tend to seek to cope online more frequently. As a result, the difficulties recovering from stress seen here are more indicative of youths'

vulnerabilities, rather than due to the online environment itself. For instance, emotional support seeking, self-distraction, and online information seeking all showed associative patterns indicative of poorer well-being. Higher use of each was tied to increased levels of psychopathology, and with the exception of self-distraction, increased average negative affect.

Alternatively, a non-competing explanation is that adolescents' frequent online coping as they are currently inclined, is problematic, and may do more harm than good. Considering that analyses controlled for psychopathology, experience of stressors, and mean levels of affect, it is unlikely that our findings are wholly attributable to these factors. Thus, adolescents' recurrent online coping may be dicey at best. For instance, one possibility is that online coping may be useful up until a certain point, as seems to be the case in relation to adolescent media use more generally (Przybylski & Weinstein, 2017). However, when relied on habitually, these coping endeavours, in their current form, may reflect efforts in vain.

4.3 How does this relate to offline coping?

Although the current study focused solely on youth online coping behaviour, a natural extension of this question is whether this pattern is unique to the online context. That is, would a similar pattern of negative functioning be found in relation to adolescents' offline coping? One line of thinking in relation to UGT, suggests that those who are going online (especially those venturing online to cope) may do so in order to compensate for poor resources offline (e.g., Elhai, Levine, Dvorak, & Hall, 2017). Accordingly, we would expect that youth engaging in heavy online coping, in tandem with low levels of offline coping, might be especially vulnerable, and hence less resilient in the face of stress. In fact, in a previous between-person analysis of offline and online coping and well-being among adults, findings corroborated this idea, whereby offline coping was associated with decreased

depressive symptoms more broadly, and online coping was linked to higher loneliness, with moderate correlations between the two (van Ingen & Wright, 2016).

Notably, in our own supplementary data with young adults (Supplementary Table 1), in which we also employed online and offline coping measures in association with well-being, a similar pattern arose. Namely, online emotion support-seeking and online information seeking were linked to more stress and internalizing symptoms; whereas their offline counterparts showed a reverse relation to well-being (e.g., depression, emotion regulation strategies). Only self distraction strategies appeared to be unhealthy, regardless of context (online or offline). Again, within both van Ingen and Wright's (2016) and our data, correlations between online and offline coping were small to moderate, indicating modest overlap. Thus, these behaviours should indeed be considered separately.

4.4 Why do youth continue to cope online if it sometimes makes them feel worse?

With such negative outcomes associated with routine online coping, the question arises as to why youth continue to cope online? Indeed, in Study 1, youth widely reported coping online, and were under the impression that it made them feel better. In Study 2, youth again reported coping online. However, when online coping was endorsed at high levels, it was related to feeling worse (whether due to ineffective coping or simply individual differences in reactivity, remains to be seen). Here, we discuss three possible explanations for this discrepancy. First, youth who cope less frequently using the online space seem to reap benefits. Thus, it is arguably over-reliance on these strategies that is the culprit. Second, drawing from UGT, a key element of continuing use is the balance between the gratifications sought online versus actual gratifications obtained. In fact, recent research emphasizes the role of gratification discrepancies. Individuals who are either extremely under- or over-gratified, that is, their needs are under- or over- met online, tend to return to the online space more frequently than individuals who have a more balanced experience (Rokito, Choi,

Taylor, & Bazarova, 2019). In this case, gratification discrepancies may mean that youth are engaging online to cope in very high amounts due to under-gratification. Third and finally, it is well-established that adults and youth alike are poor affective forecasters (Wilson & Gilbert, 2005). We tend to expect that experiences such as Facebook will make us feel better, even though empirically, these efforts tend to make us feel worse (Sagioglou & Greitemeyer, 2014).

4.5 No effects of technology use on emotion

A novel secondary contribution of this study was our inclusion of youths' moment-to-moment reports of their technology involvement across the week. Thus, we were able to control for each adolescents' technology engagement on average, enabling us to parse-out effects of their online coping rather than simply their time online. Further, as part of our exploration of online coping, we controlled for any momentary effects of technology, in case this precipitated subsequent changes in affect.

Somewhat surprisingly, we found no such effect of adolescents' recent technology use on their emotion. Although our focus groups indicated that the online environment could sometimes leave them feeling embarrassed, left out, or not measuring up, we found no evidence of these problematic effects. Likewise, previous survey research has pointed to relations between youths' poor well-being and their technology use (Rosen et al., 2014; Twenge et al., 2019), and associations between technology use and within-person variation in low emotional and behavioral control (George et al., 2018). Our findings of no significant effects of technology use on emotion suggest that this relation may instead depend on the various ways in which youth choose to engage with the online environment. For instance, texting a friend versus exposure to upsetting content.

Another possible explanation specific to our study design is that youth reported almost always being engaged with technology. In our data, across momentary samples, 90% of youths' responses reported having engaged with at least some form of technology since their last report. As a result, there may have been a lack of predictive capacity due to low variation and thus imprecise estimates.

In tandem with within-person relations between momentary technology engagement and momentary emotion change, we also reported between-person relations among average weekly technology engagement and average levels of each emotion across the week. Our correlations indicated no significant person-level ties. This lack of association at the between-person level again highlights the importance of investigating reasons for engagement when assessing ties between youth technology use and well-being.

4.6 Study implications

In order to better understand the potential benefits and risks afforded by technology, scholars would do well to acknowledge why youth are choosing to go online in the first place (Coyne et al., 2015). Are youth seeking entertainment? Connection? Assistance with their problems? Each of these motivations should arguably result in different outcomes, and here we focused on the latter. That is, when triggered by a stressor, how is online coping related to emotional well-being? Our findings highlight several points. First, we provide strong evidence that youth are widely engaging with the online space to cope. Further, findings point to the need to direct youth towards more effective online spaces, which are appropriately tailored to meet their needs (e.g., evidenced-based support sites). Additionally, our data indicate a need for parents, teachers, and practitioners to encourage youth to broaden their coping repertoire more generally, thus allowing them to flexibly employ a range of strategies in response to stress, as opposed to over-reliance on one (Zimmer-Gembeck et al., 2019). Finally, youth who frequently seek out the online space to cope with stress are clearly in need

of better options than those they are typically encountering. Providing better resources which are attractive to youth and easily available to them is a practical next step.

4.7 Study limitations

Study findings also need to be considered in light of study limitations. Included among these is the drawback of a coping measure that was assessed at the person-level, as opposed to the momentary-level. While this is consistent with how coping and technology has been assessed thus far (also without the benefit of experience sampling), ideally, future research will include repeated assessments of adolescent coping, at a micro-level (Duvenage, Uink, Zimmer-Gembeck, Barber, Donovan, & Modecki, 2019). A second limitation is our use of a broadly defined technology use measure. Although effects of technology may, in theory, be determined by type of technology use, research has shown that youth often multitask (e.g., van Der Schuur, Baumgartner, Sumter, & Valkenburg, 2015), making it challenging to explore effects of specific types of technology in real-time. Similar research exploring technology use at a day-level has also relied on a global measure of time-spent online using digital technologies (George et al., 2018). Third, as typical within the wider coping literature, we focused exclusively on negative emotions, and examining dips in positive emotions as a function of stress and coping would be a useful next step (e.g., Duvenage et al. 2019). Fourth, although we report correlations between online and offline coping from a young adult sample to address whether these are distinct, future research should seek to clarify how these may differ among youth. Finally, our participants include youth already at-risk for problems, given our recruitment from low SES settings. Although our strategy means that participants were likely to experience stressors on a more frequent basis (Uink, Modecki, & Barber, 2017), results need to be replicated in broadly representative samples of youth.

4.8 Conclusion

The fact that youth widely engage with the online space in order to improve their emotional health has been lost amongst the debate surrounding how adolescents' technology use affects their well-being. Adolescent focus groups described engaging in technology in different ways, often in response to certain emotional and social experiences, in order to regulate their negative emotions. In a quantitative experience sampling study, youth likewise endorsed engaging in theoretically relevant coping strategies in the online space.

Unfortunately, those adolescents who most frequently engaged in such online coping also tended to exhibit poorer outcomes after a stressor. In particular, increases in worry and jealousy tended to be more extreme among youth endorsing high levels of information seeking, emotional support seeking, or self-distraction online. Enhanced opportunities for coping online are now needed for adolescents to access and better manage stressors.

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Table 1. *Focus Group Themes.*

<i>Participant (Gender)</i>	Theme
	1. Using technology in response to offline experience (internal and interpersonal)
	1A. Examples in relation to moods
<i>AM (F)</i>	<i>Aah probably when I'm feeling bored, probably in the middle of the day or something</i>
<i>SH (F)</i>	<i>Na I just hop on it cause it's fun and on the weekend got on it 'cause we were bored and we were playing Minecraft with my cousin and we wanted to play with some of his mates...</i>
<i>MA (M)</i>	<i>yeah, I play Minecraft to get my mind off everything</i>
<i>DA (M)</i>	<i>When I'm bored I go on it, and then get bored on it anyway [laughs]</i>
	1B. Examples in relation to interpersonal experiences
<i>SH (F)</i>	<i>If my mum, my dad or my brother are annoying me I just go on Facebook and talk to people and it makes me feel calm instead of listening to them</i>
<i>DA (M)</i>	<i>I just get annoyed from my brothers, and sit in my room, pinch mums laptop for a couple of hours</i>
<i>LE (M)</i>	<i>When I get in trouble for things I didn't do</i> <i>[Facilitator: From your parents? Ok, so what do you do then?]</i> <i>Ah, I go on the computer and play games and that</i> <i>[Facilitator: Aah and how does that help?]</i> <i>Umm, It just makes you feel calmer</i>
	2. Using technology to manage mood and emotions
<i>TA (F)</i>	<i>Yeah, cause instead of being home and bored or something, when I'm in like a sad mood or something I can talk to my friends, or family that lives somewhere else. It makes me feel happier.</i>
<i>TY (M)</i>	<i>I watch YouTube videos [to manage unpleasant mood]</i>
<i>JA (M)</i>	<i>I watch YouTube videos, or play on the x-box when I feel crap</i> <i>[Facilitator: Oh ok, so you feel crap and it pops into your head, or?]</i>

JA (M): Yeah, and then I just try and, get my mind off it

3. Technology as a source of potential negative emotional stimuli

<i>SH (F)</i>	<i>When..ahh.. at the start of the year and all of my friends were commenting on this photo from when we were at the youth centre and they kept doing dots just to annoy people and then they ended up having an argument 'cause they were getting so much notifications and they didn't really like it</i>
<i>CA (F)</i>	<i>Uuum. It was between two of my friends. They were fighting over umm, that one of my friends should share me, and then another girl said yes and then everyone else started butting in... Yeah I got annoyed</i>
<i>DA (M)</i>	<i>When something makes me really, really angry. When you're talking to someone and then they screen check your conversation and then they post it to everyone. That just makes me [frustrated face].</i>

Table 2. *Descriptives and Correlations*

	M (SD)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Mean Negative Events	.12(.14)														
2. Online Emotional Support Seeking	2.16(.88)	.14+													
3. Online Information Seeking	2.23(.95)	.07	.60***												
4. Online Self-Distracton	2.58(.87)	.05	.57***	.50***											
5. Gender	.68(.49)	.12	.01	-.05	-.14										
6. Depression	5.75(1.49)	.22**	.32***	.21*	.09	.26**									
7. Social Anxiety	4.76(1.72)	.13	.33***	.21*	.16+	.30***	.69***								
8. Externalizing	2.55(.29)	.16+	.31***	.26**	.18*	-.13	.23**	.23**							
9. Mean Lonely	1.61(.77)	.26**	.24**	.20*	.10	.04	.49***	.39***	.24**						
10. Mean Worry	1.60(.71)	.36***	.15+	.16+	-.04	.11	.58***	.41***	.23**	.65***					
11. Mean Anger	1.48(.57)	.36***	.19*	.09	-.01	.05	.50***	.33***	.21*	.68***	.71***				
12. Mean Jealous	1.36(.64)	.25**	.16*	.10	-.02	.08	.47***	.33***	.26**	.72***	.71***	.76***			
13. Mean Sad	1.60(.77)	.31***	.20*	.15+	-.03	.19*	.56***	.40***	.15	.77***	.87***	.72***	.68***		
14. Mean Tech Use	.91(.12)	.09	.21*	.17*	.30***	.10	.00	.11	.24**	.03	.03	-.03	-.01	.05	
15. Mean Positive Events	.30(.26)	.17*	.02	.00	.12	-.13	-.23**	-.09	-.05	-.15+	-.14+	-.17*	-.17*	-.14+	.12

Notes: + $p < .10$ * $p < .05$. ** $p < .01$. *** $p < .001$. $n = 156$. Gender male = 0.

Table 3. *Adjusted Cross-Level Interactions of Online Coping X Negative Event Predicting Emotion*

Online Coping - Emotional Support					
Random Intercept and Slope Model	Lonely <i>b</i> (SE) [95% CI]	Worry <i>b</i> (SE) [95% CI]	Anger <i>b</i> (SE) [95% CI]	Jealous <i>b</i> (SE) [95% CI]	Sad <i>b</i> (SE) [95% CI]
Level 1 Covariates					
Negative Event	.17(.06)** [.05 – .30]	.33(.07)** [.19 – .47]	.65(.08)** [.49 – .81]	.01(.05) [-.10 – .09]	.60(.08)** [.44 – .75]
Positive Event	-.20(.04)** [-.27 – -.12]	-.10(.04)** [-.19 – -.02]	-.19(.04)** [-.27 – -.11]	-.05(.03)+ [-.10 – .00]	-.22(.04)** [-.30 – -.15]
Technology Use	.07(.05) [-.01 – .16]	.00(.05) [-.10 – .11]	-.04(.04) [-.12 – .05]	.08(.04)+ [-.16 – .00]	-.05(.05) [-.15 – .06]
Previous Emotion	.07(.03)** [.02 – .13]	.27(.04)** [.20 – .34]	.11(.04)** [.04 – .17]	.30(.05)** [.19 – .40]	.19(.04)** [.13 – .26]
Level 2 Covariates					
Cross-Level Interaction	.17(.07)* [.04 – .30]	.15(.08)+ [-.01 – .30]	.15(.09) [-.04 – .33]	.06(.03)* [.00 – .12]	.07(.08) [-.09 – .22]
Gender	-.19(.07)* [-.32 – -.05]	-.10(.14) [-.38 – .18]	-.01(.12) [-.25 – .22]	-.34(.34) [-.10 – .32]	-.07(.04) [-.16 – .02]
Average Emotion	.82(.06)** [.70 – .94]	.85(.06)** [.73 – .97]	.91(.03)** [.85 – .98]	.76(.04)** [.68 – .84]	.87(.05)** [.77 – .96]
Depression	.01(.02) [-.02 – .05]	.01(.02) [-.03 – .05]	.00(.01) [-.03 – .03]	.01(.02) [-.04 – .05]	.02(.02) [-.02 – .06]
Social Anxiety	.03(.01)* [.01 – .04]	.01(.01) [-.01 – .03]	-.01(.01) [-.03 – .01]	.04(.03) [-.29 – .11]	-.01(.01) [-.02 – .01]
Externalizing	-.06(.06) [-.18 – .05]	-.02(.03) [-.08 – .05]	.08(.03)* [.02 – .13]	-.02(.15) [-.30 – .27]	-.04(.04) [-.02 – .04]
Average Technology Use	-.03(.11) [-.26 – .19]	-.08(.15) [-.38 – .22]	-.03(.15) [-.32 – .25]	-.03(.19) [-.42 – .35]	-.11(.08) [-.27 – .04]
Average Negative Events	.02(.10) [-.18 – .22]	.17(.18) [-.18 – .52]	.14(.21) [-.26 – .54]	.23(.20) [-.16 – .62]	.10(.09) [-.08 – .28]
Emotional Support	.01(.03) [-.05 – .06]	.02(.02) [-.02 – .05]	-.02(.01) [-.04 – .01]	-.01(.03) [-.08 – .05]	.05(.02) [.02 – .09]

Online Coping – Self-Distraction					
Random Intercept and Slope Model	Lonely <i>b</i> (SE) [95% CI]	Worry <i>b</i> (SE) [95% CI]	Anger <i>b</i> (SE) [95% CI]	Jealous <i>b</i> (SE) [95% CI]	Sad <i>b</i> (SE) [95% CI]
Level 1 Covariates					
Negative Event	.18(.06)** [.06 – .31]	.34(.06)** [.22 – .46]	.66(.08)** [.51 – .81]	.00(.04) [-.08 – .07]	.59(.08)** [.44 – .74]
Positive Event	-.20(.04)** [-.28 – -.13]	-.10(.04)* [-.18 – -.03]	-.19(.04)** [-.26 – -.11]	-.05(.03)+ [-.10 – .01]	-.22(.04)** [-.30 – .14]
Technology Use	.07(.05) [-.02 – .16]	.00(.05) [-.10 – .10]	-.04(.04) [-.12 – .05]	-.08(.04)+ [-.16 – .00]	-.05(.05) [-.15 – .06]
Previous Emotion	.07(.03)** [.02 – .12]	.27(.04)** [.20 – .34]	.11(.04)** [.04 – .17]	.30(.05)** [.19 – .40]	.20(.04)** [.13 – .26]
Level 2 Covariates					
Cross-Level Interaction	.10(.09) [-.07 – .27]	.17(.07)* [.03 – .31]	.12(.10) [-.08 – .31]	.16(.04)** [.08 – .24]	.21(.10) [.01 – .40]
Gender	-.15(.08)+ [-.29 – .00]	-.11(.05)+ [-.21 – -.01]	-.02(.21) [-.43 – .39]	-.35(.35) [-1.04 – .33]	-.07(.06) [-.19 – .05]
Average Emotion	.84(.06)** [.72 – .97]	.85(.03)** [.78 – .92]	.90(.03)** [.85 – .95]	.75(.04)** [.67 – .84]	.87(.06)** [.76 – .98]
Depression	.01(.01) [-.02 – .03]	.01(.01) [-.01 – .03]	.00(.01) [-.03 – .03]	.01(.02) [-.04 – .05]	.03(.02) [-.02 – .07]
Social Anxiety	.02(.01)+ [.00 – .04]	.01(.01) [.00 – .03]	-.01(.01) [-.02 – .01]	.04(.03) [-.03 – .11]	.00(.01) [-.03 – .02]
Externalizing	-.04(.05) [-.14 – .07]	-.01(.03) [-.07 – .05]	.07(.05) [-.03 – .18]	-.01(.14) [-.29 – .27]	-.02(.04) [-.09 – .06]
Average Technology Use	-.09(.10) [-.30 – .11]	-.09(.09) [-.25 – .09]	-.02(.30) [-.61 – .57]	.03(.22) [-.14 – .62]	-.09(.07) [-.23 – .05]
Average Negative Events	.04(.13) [-.22 – .31]	.18(.08)+ [.02 – .34]	.18(.07)* [-.04 – .32]	.24(.19) [-.14 – .62]	.12(.11) [-.09 – .33]
Self-Distraction	.02(.01) [-.01 – .05]	.01(.01) [-.02 – .03]	-.02(.01) [-.03 – .00]	-.05(.05) [-.14 – .05]	.01(.02) [-.02 – .05]

Online Coping –Information Seeking					
Random Intercept and Slope Model Level 1 Covariates	Lonely <i>b</i> (SE) [95% CI]	Worry <i>b</i> (SE) [95% CI]	Anger <i>b</i> (SE) [95% CI]	Jealous <i>b</i> (SE) [95% CI]	Sad <i>b</i> (SE) [95% CI]
Negative Event	.19(.07)** [.06 – .31]	.33(.06)** [.05 – .30]	.66(.08)** [.50 – .82]	.00(.05) [-.10 – .10]	.59(.08)** [.44 – .75]
Positive Event	-.20(.04)** [-.28 – -.13]	-.10(.04)* [-.18 – -.03]	-.19(.04)** [-.27 – -.11]	-.05(.03)+ [-.10 – .00]	-.22(.04)** [-.30 – -.15]
Technology Use	.07(.05) [.02 – .16]	.00(.05) [-.09 – .10]	-.04(.04) [-.12 – .05]	-.08(.04)+ [-.16 – .00]	-.04(.05) [-.15 – .06]
Previous Emotion	.07(.03)** [.02 – .12]	.27(.04)** [.20 – .34]	.11(.04)** [.04 – .17]	.30(.05)** [.19 – .40]	.19(.04)** [.13 – .26]
Level 2 Covariates					
Cross-Level Interaction	.09(.05) [-.01 – .20]	.24(.06)** [.12 – .37]	.09(.09) [-.07 – .26]	.06(.03)* [.00 – .12]	.13(.08) [-.03 – .29]
Gender	-.15(.08)+ [-.31 – .00]	-.11(.05)+ [-.21 – .00]	.01(.22) [-.45 – .43]	-.34(.36) [-1.05 – .36]	-.08(.06) [-.18 – .03]
Average Emotion	.85(.07)** [.72 – .98]	.85(.04)** [.78 – .92]	.91(.03)** [.85 – .97]	.76(.05)** [.67 – .85]	.87(.05)** [.77 – .97]
Depression	.01(.01) [-.01 – .03]	.01(.01) [-.01 – .03]	.00(.02) [-.05 – .05]	.01(.02) [-.04 – .05]	.03(.02) [-.02 – .07]
Social Anxiety	.02(.01)+ [.00 – .04]	.01(.01) [.01 – .03]	-.01(.01) [-.03 – .01]	.04(.04) [-.03 – .11]	.00(.01) [-.02 – .02]
Externalizing	.00(.05) [-.13 – .06]	-.01(.03) [-.07 – .05]	.08(.04)+ [.00 – .16]	-.01(.16) [-.31 – .30]	-.03(.04) [-.10 – .05]
Average Technology Use	-.05(.10) [-.24 – .14]	-.07(.08) [-.23 – .10]	-.03(.21) [-.44 – .39]	-.03(.20) [-.42 – .37]	-.08(.07) [-.22 – .06]
Average Negative Events	.05(.14) [-.22 – .32]	.18(.08)+ [.03 – .33]	.14(.17) [-.18 – .47]	.22(.20) [-.17 – .61]	.12(.10) [-.08 – .33]
Information Seeking	-.01(.01) [-.03 – .02]	.00(.01) [-.02 – .02]	-.02(.02) [-.05 – .01]	-.03(.02) [-.08 – .02]	.02(.01) [-.01 – .04]

Note. + $p \leq .10$, * $p < .05$, ** $p \leq .01$, gender male = 0. All p values adjusted using the Benjamini-Hochberg family wise correction.

Supplementary Section for:

Technology can sting when reality bites:

Adolescents' frequent online coping is ineffective with momentary stress.

Study 2. Psychopathology Measures

Reynold's Adolescent Depression Scale. We assessed depression using the Reynold's Adolescent Depression Scale 2nd edition (RADS-2; Reynold's 2002; $\alpha = .82$). The RADS-2 assesses risk of a diagnosis of clinical depression by measuring dysphoric mood, anhedonia, negative self-evaluation and somatic symptoms. Participants rated on a 4-point Likert scale (1 = Almost never to 4 = Most of the time), how often they feel certain emotions; for example, "I feel that no-one cares about me."

Social Anxiety. We assessed social anxiety using the Social Anxiety Scale for Adolescents (SAS-A; LaGreca, 1998; $\alpha = .96$). Youth responded to each item on a 5-point Likert scale (1 = Not at all to 5 = All the time) regarding how often certain feelings and experiences applied to them; for example "I'm afraid others will not like me."

Externalizing behaviour. Externalizing behaviour was assessed with 15 items that asked participants to rate how often they had engaged in delinquent, aggressive, deceitful and risky behaviours in the last 6 months ($\alpha = .85$) (Fredricks & Eccles, 2006). Participants responded on an 8-point Likert scale how often they engaged in a risky behaviour (0 = none, 7 = 31 or more times). Both the full scale and behavioral sub-scales have been shown to have good validity across a range of adolescent samples (McCabe, Modecki, & Barber, 2016; Modecki, Barber, & Vernon, 2013). An example item includes: "About how often in the last 6 months have you gotten in a physical fight with another person?"

Supplementary Table 1. *Correlations between online and offline coping and well-being in a separate, young adult sample.*

	Online			Offline		
	Emotional Support	Self Distraction	Information Seeking	Emotional Support	Self Distraction	Information Seeking
Stress (DASS-21)	.183**	.261**	.188**	-.077	.168*	-.090
Anxiety (DASS-21)	.150*	.262**	.204**	-.069	.155	-.033
Depression (DASS-21)	.059	.296**	.156*	-.210**	.177*	-.222**
Emotional Symptoms (SDQ)	.145*	.266**	.159*	-.081	.132	-.161*
Conduct Problems (SDQ)	.222**	.213**	.136	-.023	.129	-.038
Nonacceptance of Emotions (DERS)	.069	.325**	.204**	-.097	.265**	-.142**
Lack of Regulation Strategies (DERS)	.061	.325**	.159*	-.153*	.149*	-.231**
Lack of Goals (DERS)	.103	.374**	.188**	.056	.141*	-.039

Note. $N = 213$, ages 17-25, $M_{\text{age}} = 20.03$, 64% female. ** $p < .01$; * $p = .05$.

Offline and online coping correlations: Emotion Support Seeking $r = .41^{**}$; Self-Distraction $r = .29^{**}$; and Information Seeking, $r = .30^{**}$.

Red indicates significant associations with maladaptive functioning; blue indicates significant associations with adaptive functioning. As shown on the left-hand side of the table, online coping was positively associated with indicators of poor well-being. Further, offline emotional support seeking was negatively associated with depression, and negatively associated with a lack of access to a wide array of emotion regulation strategies. Moreover, offline information seeking was negatively associated with depression, internalizing symptoms, and non-acceptance of emotion, and negatively associated with a lack of access to regulation strategies.

Supplementary Figure 1. Study design.

Note. “How do you feel? Adolescent behaviour, emotion, and technology use over time;” study design, illustrating the three phases of the study: (1) a Baseline Assessment (2) an Experience Sampling Method (ESM) Study of the adolescents via mobile devices for 7 consecutive days, and (3) a second Baseline Assessment.

One key element of the study was our commitment to youth participation and engagement. Research team members were available on site at each school, every day the study ran. This approach ensured regular opportunities to gain rapport with students, to encourage consistent and honest reporting, and make clear the importance of accuracy of results. In addition, research team members were on hand to troubleshoot any technical issues, and this meant availability before the start of each school day and past school closing. Further, a researcher cell-phone was monitored each day (weekends) and night (all days) of the study, in the event of any technical issues, or if there was a need to connect to additional psychological support (a psychologist was on call in the event of any issues in relation to reporting stressors).

Supplementary Table 2. *Adjusted multi-level models predicting emotion.*

Online Coping - Emotional Support					
Random Intercept and Slope Model	Lonely <i>b</i> (SE) [95% CI]	Worry <i>b</i> (SE) [95% CI]	Anger <i>b</i> (SE) [95% CI]	Jealous <i>b</i> (SE) [95% CI]	Sad <i>b</i> (SE) [95% CI]
Level 1 Covariates					
Negative Event	.24(.08)** [.09 – .39]	.35(.07)** [.21 – .49]	.59(.08)** [.43 – .75]	.05(.04) [-.03 – .12]	.62(.08)** [.47 – .78]
Positive Event	-.22(.04)** [-.30 – .13]	-.15(.05)** [-.24 – -.06]	-.23(.05)** [-.32 – -.13]	-.05(.03)+ [-.10 – .00]	-.26(.04)** [-.34 – -.17]
Technology Use	.02(.06) [-.10 – .14]	.01(.07) [-.13 – .15]	.01(.06) [-.11 – .13]	-.07(.06) [-.19 – .04]	-.03(.08) [-.19 – .12]
Previous Emotion	.07(.03)** [.02 – .12]	.26(.04)** [.19 – .34]	.10(.04)** [.03 – .16]	-.25(.05)** [-.17 – .34]	.19(.04)** [.12 – .26]
Level 2 Covariates					
Gender	.01(.01) [-.02 – .04]	-.01(.02) [-.04 – .02]	.00(.02) [-.03 – .03]	.02(.01)+ [.00 – .04]	.01(.01) [-.02 – .03]
Average Emotion	1.05 (.00)** [1.05 – 1.05]	1.03(.07)** [.89 – 1.16]	1.03(.02)** [1.00 – 1.06]	1.02(.01)** [1.00 – 1.04]	1.03(.01)** [1.01 – 1.04]
Depression	-.01(.01) [-.03 – .00]	.00(.02) [-.04 – .04]	-.01(.01) [-.02 – .01]	.01(.00) [.00 – .01]	-.01(.01) [-.02 – .00]
Social Anxiety	.00(.01) [-.01 – .01]	.00(.01) [-.01 – .01]	.00(.01) [-.02 – .01]	-.01(.00)* [-.02 – .00]	.00(.01) [-.01 – .01]
Externalizing	-.06(.01)** [-.08 – -.05]	.01(.03) [-.05 – .07]	.03(.03) [-.03 – .08]	-.04(.02)+ [-.08 – .00]	.01(.03) [-.06 – .08]
Average Technology Use	.05(.05) [-.05 – .14]	-.02(.05) [-.12 – .07]	-.12(.05)* [-.21 – -.02]	.04(.04) [-.04 – .12]	-.09(.04)* [-.17 – -.01]
Average Negative Events	-.02(.05) [-.12 – .08]	.00(.10) [-.20 – .20]	.04(.07) [-.09 – .18]	-.01(.04) [-.08 – .07]	.03(.05) [-.08 – .13]
Emotional Support	.00(.01) [-.02 – .02]	.01(.01) [-.01 – .03]	.00(.01) [-.02 – .03]	-.01(.01) [-.02 – .00]	.00(.01) [-.02 – .02]

Online Coping – Self-Distraction					
Random Intercept and Slope Model Level 1 Covariates	Lonely <i>b</i> (SE) [95% CI]	Worry <i>b</i> (SE) [95% CI]	Anger <i>b</i> (SE) [95% CI]	Jealous <i>b</i> (SE) [95% CI]	Sad <i>b</i> (SE) [95% CI]
Negative Event	.24(.08)** [.09 – .39]	.35(.07)** [.21 – .49]	.59(.08)** [.43 – .75]	.05(.04) [-.03 – .12]	.62(.08)** [.47 – .78]
Positive Event	-.22(.04)** [-.30 – -.13]	-.15(.05)** [-.24 – -.06]	-.23(.05)** [-.32 – -.13]	-.05(.03)+ [-.10 – .00]	-.26(.04)** [-.34 – -.17]
Technology Use	.02(.06) [-.10 – .14]	.01(.07) [-.13 – .15]	.01(.06) [-.11 – .13]	-.07(.06) [-.19 – .04]	-.03(.08) [-.19 – .12]
Previous Emotion	.07(.03)** [.02 – .12]	.26(.04)** [.19 – .34]	.10(.04)** [.03 – .13]	.26(.05)** [.17 – .34]	.19(.04)** [.12 – .26]
Level 2 Covariates					
Gender	.01(.02) [-.02 – .04]	-.01(.01) [-.04 – .02]	-.01(.02) [-.04 – .02]	.02(.01)+ [.00 – .04]	.01(.01) [-.02 – .03]
Average Emotion	1.05(.02)** [1.02 – 1.08]	1.03(.01)** [1.01 – 1.05]	1.03(.02)** [.99 – 1.06]	1.02(.01)** [1.00 – 1.05]	1.03(.01)** [1.01 – 1.04]
Depression	-.01(.01) [-.02 – .00]	.00(.01) [-.01 – .01]	-.01(.01) [-.02 – .01]	.00(.00) [.00 – .01]	-.01(.01) [-.02 – .00]
Social Anxiety	.00(.01) [-.01 – .01]	.00(.01) [-.01 – .01]	.00(.01) [-.01 – .01]	-.01(.00)* [-.02 – .00]	.00(.01) [-.01 – .01]
Externalizing	-.06(.04)+ [-.13 – .01]	.02(.03) [-.04 – .07]	.03(.03) [-.03 – .08]	-.04(.02)+ [-.09 – .00]	.01(.03) [-.06 – .08]
Average Technology Use	.05(.05) [-.05 – .14]	-.02(.05) [-.11 – .06]	-.10(.05)* [-.19 – .01]	.03(.04) [-.04 – .10]	-.10(.04)* [-.18 – -.02]
Average Negative Events	-.02(.05) [-.12 – .08]	.00(.06) [-.12 – .12]	.05(.07) [-.08 – .18]	-.01(.04) [-.09 – .07]	.02(.05) [-.08 – .13]
Self-Distraction	.00(.01) [-.01 – .01]	.01(.01) [-.01 – .02]	-.01(.01) [-.03 – .01]	.00(.01) [-.01 – .01]	.00(.01) [-.01 – .02]

Random Intercept and Slope Model	Online Coping –Information Seeking				
	Lonely <i>b</i> (SE) [95% CI]	Worry <i>b</i> (SE) [95% CI]	Anger <i>b</i> (SE) [95% CI]	Jealous <i>b</i> (SE) [95% CI]	Sad <i>b</i> (SE) [95% CI]
Level 1 Covariates					
Negative Event	.24(.08)** [.09 – .39]	.35(.07)** [.21 – .49]	.59(.08)** [.43 – .75]	.05(.04) [-.03 – .12]	.62(.08)** [.47 – .78]
Positive Event	-.22(.04)** [-.30 – -.13]	-.15(.05)** [-.24 – -.06]	-.23(.05)** [-.32 – -.13]	-.05(.03)+ [-.10 – .00]	-.26(.04)** [-.34 – -.17]
Technology Use	.02(.06) [-.10 – .14]	.01(.07) [-.13 – .15]	.01(.06) [-.11 – .13]	-.07(.06) [-.19 – .04]	-.03(.08) [-.19 – .12]
Previous Emotion	.07(.03)** [.02 – .12]	.26(.04)** [.19 – .34]	.01(.04)** [.03 – .16]	.26(.05)** [.17 – .34]	.19(.04)** [.12 – .26]
Level 2 Covariates					
Gender	.01(.02) [-.02 – .04]	-.01(.01) [-.03 – .02]	.00(.02) [-.03 – .03]	.02(.01)+ [.00 – .04]	.01(.01) [-.02 – .03]
Average Emotion	1.05(.02)** [1.02 – 1.08]	1.02(.01)** [1.00 – 1.04]	1.03(.02)** [.99 – 1.06]	1.03(.01)** [1.00 – 1.05]	1.02(.01)** [1.01 – 1.04]
Depression	-.01(.01) [-.02 – .00]	.00(.01) [-.01 – .01]	-.01(.01) [-.02 – .01]	.00(.00) [.00 – .01]	-.01(.01) [-.02 – .00]
Social Anxiety	.00(.01) [-.01 – .01]	.00(.01) [-.01 – .01]	.00(.01) [-.01 – .01]	-.01(.00)* [-.02 – .00]	.00(.01) [-.01 – .01]
Externalizing	-.07(.04)+ [-.14 – .01]	.01(.03) [-.05 – .06]	.03(.03) [-.03 – .09]	-.05(.02)+ [-.09 – .00]	.01(.03) [-.06 – .07]
Average Technology Use	.04(.05) [-.05 – .14]	-.03(.05) [-.12 – .07]	-.11(.05)* [-.20 – -.02]	.03(.04) [-.04 – .09]	-.10(.04)* [-.18 – .02]
Average Negative Events	-.02(.05) [-.11 – .08]	.01(.06) [-.11 – .12]	.05(.07) [-.09 – .18]	-.01(.04) [-.09 – .06]	.03(.05) [-.08 – .13]
Information Seeking	-.01(.01) [-.01 – .02]	.02(.01)* [.01 – .04]	.00(.01) [-.02 – .01]	.01(.01) [-.01 – .02]	.01(.02) [-.01 – .02]

Note. + $p \leq .10$, * $p < .05$, ** $p \leq .01$, gender male = 0. All p values adjusted using the Benjamini-Hochberg family wise correction.

References for measures in Supplementary Table 1:

Depression, Anxiety and Stress Scale (DASS-21):

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335-343.

Difficulties in Emotion Regulation Scale (DERS):

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, 26(1), 41-54.

Strengths and Difficulties Questionnaire (SDQ):

Goodman, R. (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child & Adolescent Psychiatry*, 40(11), 1337-1345.

Coping (brief-COPE):

Offline:

Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the brief cope. *International Journal of Behavioral Medicine*, 4(1), 92.

Online: To assess online coping, three subscales from the brief-COPE scale were adapted to assess online coping behaviors. Previous research has shown a similar but slightly longer version of this scale to be valid among adults (van Ingen & Wright, 2016).

Additional References for Measures in Study 2

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