



## Full length article

# Culture moderates the effect of social support across communication contexts in young adult women in the United States



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## ABSTRACT

**Objective:** Digital media is becoming integral to social communication, yet few studies have explored how documented cultural differences in social relationships transfer into digital contexts. The current study examined how cultural values moderate psychological and physiological responses to social support across media contexts among young-adult women from ethnically-diverse backgrounds. **Method:** Young adult ( $N = 103$ ;  $M_{age} = 19.91$ ,  $SD = 1.91$ ) psychological and physiological stress response after face-to-face, computer-mediated, or no support conditions were examined among women from diverse cultural backgrounds (e.g., Asian American, African American, European American, Latino). **Results:** Participants who received computer-mediated (instant messenger) support before a stressful lab task reported less psychological stress afterward compared to those who did not receive support. Additionally, the effect of support context on physiological stress (change in cortisol, heart rate and systolic blood pressure) before and after the stress task was moderated by cultural differences. **Conclusions:** Independent, but not interdependent, self-construal moderates associations between support context and psychological or physiological measures. These results suggest that culture may influence how young adults benefit from social connection in new media contexts like on-line messaging.

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## 1. Introduction

Young adults in the 21st century are increasingly turning to new technologies to connect to close others and navigate new roles and responsibilities on a daily basis (Common Sense Media, 2012). Although social support has traditionally been conceptualized as a face-to-face (F2F) interaction, it is now increasingly accessible via social media and other forms of online communication. Despite the prevalence of computer-mediated interpersonal communication (Lenhart, Purcell, Smith, & Zickuhr, 2010), the effects of these new opportunities for social connection on both psychological and physiological well-being have remained relatively unexplored (Holt-Lunstad & Uchino, 2015), especially for young people immersed in digital media. Offline, research suggests that social

relationships have great implications for physical well-being, such that levels of social connection can predict mortality (Holt-Lunstad, Smith, & Layton, 2010; Steptoe, Shankar, & Demakakos, 2013). Positive interpersonal exchanges, such as social support, can influence health by affecting physiological systems (e.g., neuroendocrine, cardiovascular) implicated in the development of chronic diseases (e.g., Thorsteinsson & James, 1999; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). However, not all individuals may choose to take advantage of these growing opportunities. Recent studies suggest that Asian American and Latino young adults are less likely to seek out help from friends and family than their European American counterparts (Guan & Fuligni, 2015; Taylor et al., 2004). Cultural differences in beliefs about personal disclosure and support-seeking can shape the benefits of received support (Kim, Sherman, & Taylor, 2008; Taylor, Welch, Kim, & Sherman, 2007). These cultural differences in social interaction may be reproduced in online spaces, but few studies have examined cultural factors that shape media use among young adults (Coyne, Padilla-Walker, & Howard, 2013). Therefore, the objectives of the current study

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were to explore the relationship between cultural values and media use, differences between computer-mediated support and F2F support on psychological stress and physiological stress, and the role of cultural values in moderating media-associated effects.

## 2. Conceptual background

### 2.1. Developmental and digital context: young adulthood and social media

Young adulthood (age 18–29) is a developmental period marked by important transitions in the United States. After legal emancipation from their parents and graduating from high school, young adults explore identity, status/career, and intimacy goals (Arnett, 2000). Despite greater independence, there is still a strong need for social connection. A key component of psychosocial adjustment during young adulthood is the development of intimate bonds, with peers outside of the family unit (Erikson, 1950) as individuals make decisions in ideological, vocational, and sexual domains (Marcia, 1966). Young people are turning to new media to meet these needs—on a daily basis, young adults are connecting socially and gathering cultural information via text, social media, email, and instant messaging (Common Sense Media, 2012).

“New” media refers to both hardware like personal computers and mobile devices as well as software applications like the Internet and social networking sites. It is distinguished from “older” forms of media, like television and radio, in that communication through new media is more pervasive, interactive, individualized, asynchronous (not tied to real-time), and disembodied (in that they are not tied to a physical body) (Rogers, 1986; Subrahmanyam & Smahel, 2010). Broadly, any form of new media that provides opportunities for social interaction, communication, and user-generated content (to an audience) is considered social media (e.g., Ngai, Tao, & Moon, 2015). The affordances of this new media that distinguish it from older forms as well as traditional F2F communication provide new opportunities for socioemotional and physical development that will be explored in this study.

### 2.2. Social support contexts: in-person and computer-mediated social support

How young adults communicate across social contexts (in-person and computer-mediated) may differentially affect their psychological as well as physical health. Research suggests that social support offline is associated with better physical health outcomes (Uchino et al., 1996). The stress-buffering that leads to reduced reactivity in physiological response systems, such as cardiovascular and hypothalamic-pituitary-adrenal (HPA) axis, is thought to be a key mechanism through which support affects health (Uchino et al., 1996, 2011). On the one hand, social support garnered via the Internet may have similar health-ameliorating effects given that new media may provide greater opportunities for “virtual networks” for social support (Wills & Ainette, 2012; Manago, Taylor, & Greenfield, 2012; Shaw & Gant, 2002) and that the digital landscape can be conducive for social support provision (Kane, McCall, Collins, & Blascovich, 2012; Shaw & Gant, 2002; Thorsteinsson, James, & Gregg, 1998). Thorsteinsson et al. (1998), for example, found that video-relayed support attenuated salivary cortisol (the hormone output of the HPA axis) and heart rate, though not blood pressure (indicators of the cardiovascular functioning), in a demanding computer task compared to no support. On the other hand, new media can have an isolating effect (Kraut et al., 1998; Sherman, Michikyan, & Greenfeld, 2013; Turkle, 2011), and thus be less beneficial for health than in-person support. Consistent with this notion, among adolescent girls undergoing a speech and

mental math task, communicating F2F or over the phone with a parent after the stressor was related to lower salivary cortisol levels compared to communicating through instant messaging or no support (Seltzer, Prosofski, Ziegler, & Pollak, 2012). The mixed results suggest there may be individual or group differences in rates of media adoption and the benefits gained (e.g., Ngai et al., 2015; Reid & Reid, 2007). For example, gender role norms that emphasize nurturance and emotional expressiveness in women in comparison to emotional control in males can also affect perceptions of available support and a willingness to seek it out (Barbee et al., 1993), whether online or offline. Within the social support literature, how support across media affects physical well-being is still understudied (Holt-Lunstad & Uchino, 2015). This current exploratory study addresses this gap in the literature by examining how another individual difference (i.e., in culture) may moderate physiological reactivity to support among female young adults.

### 2.3. Cultural context: independent and interdependent moderators

The causal-chain framework of social media research (Ngai et al., 2015), the product of a review of empirical work and theories in the literature, suggests that cultural differences may moderate the effect of digital media. That is, interpersonal attitudes and behaviors can differ across social contexts at varying degrees by culture (Markus & Kitayama, 1998). One documented difference across cultures is in how individuals view the self relative to others (Markus & Kitayama, 1991, 1998). Individuals in collectivistic cultures, such as those in Asia and Latin America, often hold more interdependent self-concepts, in which they are connected with others in their social networks. In these cultures, group goals are often prioritized over personal goals. In individualistic cultures, such as those in the United States, individuals view the self as unique and independent of others and often prioritize personal goals over group goals.

These cultural differences manifest as differences in social relationships and support-seeking (Kim et al., 2008). In independent cultures, individuals are more likely to share a cultural belief that one should pursue personal well-being and that others can freely choose to help when requested. Within this perspective, there should be less apprehension about seeking support as there is an emphasis on choice rather than social obligation—close others can simply and directly deny the request. For individuals with interdependent self-construals, seeking close others for support when distressed carries greater potential for negative relational consequences (Guan & Fuligni, 2015; Kim et al., 2008; Moilanen & Raffaelli, 2010; Taylor et al., 2004). That is, the emphasis on interdependent self-construal and sensitivity to others’ perceptions may heighten fears of being a burden, negative social evaluation or criticism, and loss of “face” when seeking help for personal problems (Kim et al., 2008; Okazaki, 1997). These cultural differences in social support seeking can have physiological effects. For example, although explicitly asking for support lowered psychological stress levels after a laboratory challenge among European Americans, it induced greater cortisol output for Asian Americans (Taylor, Welch, Kim, & Sherman, 2007). Additionally, Asian Americans that explicitly requested support exhibited greater a cortisol stress response than those who simply thought about those in their social network without explicitly making a support request. This suggests that social connection is important for all, but that there may be costs for enacting social support in individuals who endorse higher interdependence and lower independence.

The dual-factor model (Nadkarni & Hofmann, 2012) suggests that individuals are motivated to use social media to meet the need to belong and the need for self-presentation. If the ways individuals view themselves relative to others differ, the ways they experience

a sense of bonding may also differ and manifest as different patterns of technology use. On the one hand, it may limit social connection and blunt the positive effects social support across all media contexts. On the other hand, given affordances in anonymity and asynchrony, text-based communication may be a more neutral support conduit and reduce the psychological and relational costs of support seeking. It can better facilitate impression management and has been shown to decrease feelings of loneliness, stress, depression and negative social evaluation, perhaps especially among shy and less-disclosing individuals (Reid & Reid, 2007; Shaw & Gant, 2002). Additionally, individuals who endorse higher levels of interdependence may also hold stronger beliefs about being reserved and controlling emotion expressivity, especially in F2F interactions (Leong, 1986; Markus & Kitayama, 1991), and may benefit from text-based, digital mediums given the lack of affect visibility.

### 3. The current study and hypotheses

Despite the potential benefits of computer-mediated communication, few studies have examined new media use in stress and coping among culturally-diverse populations and the effects on a psychological and physiological level. Therefore, the current study examined how computer-mediated support relative to F2F support differentially affects stress reactivity among young adults from diverse ethnic backgrounds. Specifically, we explored (a) the relationship between cultural values and media use, (b) differences between computer-mediated support and F2F support on psychological stress, (c) differences between computer-mediated support and F2F support on physiological stress, and (d) the role of cultural values in moderating media-associated effects. We hypothesized that among individuals who endorse higher levels of independence, F2F support would dampen psychological and physiological responses to stress compared to support via a digital, text-based medium and not receiving support. In contrast, among individuals who endorse higher levels of interdependence, due to lowered anxiety and inhibition in the text-based medium, support through a digital medium would dampen psychological and physiological stress responses compared to not receiving support and F2F support.

## 4. Method

### 4.1. Participants

Undergraduate women ( $N = 103$ ;  $M_{age} = 19.91$ ,  $SD = 1.91$ ) from diverse backgrounds (59 Asian American, 2 African Americans, 5 European Americans, 21 Latinos, 9 from mixed-heritage backgrounds, and 7 from “other” categories) were recruited through the Psychology Subject Pool or through flyers around campus. The majority of participants were second generation (58.3%, they were born in the U.S. but at least one parent was foreign born), 33% were first generation (they and their parents were foreign-born), and 7.8% were third generation or higher (they and their parents were born in the U.S.). Parent education was assessed on a scale from 1 = no formal education to 7 = graduate/law/medical school. Average mother’s and father’s education was 4.50 ( $SD = 1.74$ ) and 4.87 ( $SD = 1.80$ ), respectively. This translated to an average education level between technical or trade school and community or junior college.

Participation in the study was limited to female young adults in order to control for potential gender differences in physiological stress reactivity (Kudielka & Kirschbaum, 2005) and perceptions of support (Barbee et al., 1993). Prior studies have used similar samples (Sherman et al., 2013). For estimated power greater than or

equal to 0.85 to detect large effect size = 0.35 (Gaab et al., 2003; Thorsteinsson et al., 1998) with G\*Power at alpha 0.05 to examine both main effect and interaction, projected sample  $N = 96$ .

### 4.2. Design

Participants were randomly assigned to one of three experimental conditions. In the *face-to-face* (F2F) condition ( $n = 39$ ), participants received support in-person from a female friend. Friend pairs in this condition were in the same room but were not allowed to touch. In the *instant messaging* (IM) condition ( $n = 32$ ), participants were instructed to seek support from partners located in a separate room and through the instant messaging program Google Chat (Google, Mountain View, California). The last condition was a no support control condition ( $n = 32$ ). Table 1 shows demographics and variable means by condition.

### 4.3. Procedure

All participants were pre-screened either through phone or email to confirm they (1) could bring in a female friend of the same ethnicity they have known for at least 3 months, (2) were fluent in English, (3) were not pregnant, (4) did not have a cold in the last 24 h, and (5) did not have any cardiovascular, inflammatory, blood-related, autoimmune, gastrointestinal, periodontal conditions or cancer. For participants who qualified, lab sessions were scheduled between the hours of 12 p.m.–6 p.m. to control for the circadian rhythm of cortisol and maximize cortisol reactivity (Ditzen et al., 2008; Ellenbogen, Hodgins, Walker, Couture, & Adam, 2006; Gaab et al., 2003; Taylor et al., 2007). Participants randomly assigned to the F2F or IM conditions were instructed to bring their friend to the lab. All participants were instructed not to eat or drink anything 30 min before their appointment.

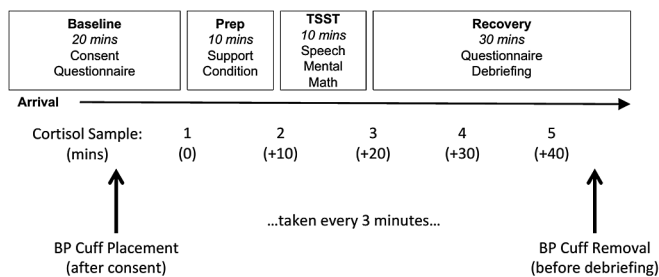
Figure 1 shows the timeline for cortisol, heart rate and blood pressure collection. Upon arrival, participants and their friends were led to separate rooms. After providing consent, both participants and their friends individually completed brief questionnaires about themselves and their friendship (length, quality). This consent and questionnaire period acted as a 20-min resting baseline period before the first biological measures were collected. Additionally, during this baseline resting period, friends ( $n = 72$ ) were trained on support provision with the protocol shown in Table 2 modified from prior research (Nagurney, 2001; Robles, 2007; Wills & Shinar, 2000). After the baseline period, participants completed the Trier Social Stress Test (TSST), which has been reliably shown to induce cardiovascular and cortisol responses. Kirschbaum, Pirke, & Hellhammer, 1993). The TSST involves performing a 5-min speech task and a 5-min mental math task in front of an evaluative panel of two confederates, one male and one female. Participants had 10 min to prepare comments before the speech task, during which participants’ friends in the F2F and IM conditions provided support to participants. After the TSST, participants completed self-report measures assessing the subjective impact of the stressor and social support. The entire session lasted a total of 1 h and 10 min. Participants were given either 2 Subject Pool credits or \$20.00 for their participation. Their friends were given 1 subject pool credit or \$10.00 for their participation.

### 4.4. Measures

**Psychological responses to support and the stressor.** To validate that participants indeed felt supported in the F2F and IM conditions, ratings of friend support were examined. In the post-task survey, participants reported the degree to which (1) they felt support by the presence of their friend during the support

**Table 1**  
Sample size and study variables across conditions.

	Condition			
	Control	F2F	IM	
<i>n</i>	32	39	32	
Study Variables	Control	F2F	IM	
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	
Parent Education	0.14 (0.89)	0.13 (0.90)	−0.07 (0.94)	$F(2,100) = 0.55, ns$
BMI	22.43 (2.04)	22.22 (4.11)	21.57 (3.50)	$F(2,99) = 0.55, ns$
Interdependent Value	4.86 (0.86)	5.09 (0.67)	4.99 (0.64)	$F(2,100) = 0.91, ns$
Independent Value	4.70 (0.67)	4.71 (0.77)	4.90 (0.98)	$F(2,100) = 0.65, ns$
Media Use	2.11 (0.62)	2.04 (0.63)	1.94 (0.49)	$F(2,100) = 0.69, ns$
Pre-task (Baseline)				
State Anxiety	1.77 (0.60)	1.76 (0.51)	1.67 (0.55)	$F(2,100) = 0.30, ns$
Cortisol	5.02 (3.44)	4.69 (3.00)	4.52 (2.07)	$F(2,100) = 0.24, ns$
HR	76.49 (10.67)	75.07 (9.84)	74.03 (12.01)	$F(2,100) = 0.42, ns$
SBP	104.37 (8.64)	100.95 (7.01)	100.17 (7.81)	$F(2,100) = 2.66, ns$
DBP	66.35 (6.18)	64.38 (5.80)	62.86 (6.24)	$F(2,100) = 2.67, ns$
Post-task (Peak)				
State Anxiety	2.70 (0.68)	2.53 (0.64)	2.27 (0.72)	$F(2,100) = 3.25, p = 0.043$ Control > IM
Cortisol	6.13 (6.74)	5.98 (6.37)	5.42 (3.96)	$F(2,100) = 0.13, ns$
HR	88.67 (13.87)	85.75 (12.35)	82.41 (13.47)	$F(2,100) = 1.73, ns$
SBP	121.03 (15.40)	120.86 (10.89)	119.90 (13.82)	$F(2,100) = 0.07, ns$
DBP	78.13 (8.29)	77.45 (6.83)	75.04 (6.67)	$F(2,100) = 1.59, ns$



**Fig. 1.** Timeline for cortisol, heart rate, and blood pressure collection.

manipulation, (2) the presence of their friend in the preparation room had a relaxing influence on them, and (3) the advice given to them by their friend was helpful to them on a scale from 1 = *completely disagree* to 6 = *completely agree*.

The short-form State-Trait Anxiety Inventory (STAI; Marteau & Bekker, 1992; Spielberger, 1983) was administered during the baseline period and after the TSST challenge. Six items (calm, tense, upset, relaxed [reverse-coded], content [reverse-coded], and worried) were rated on a scale from 1 = *not at all* to 4 = *very much*. A change score was created by subtracting baseline from post-challenge.

#### 4.4.1. Cultural values

Independent and interdependent self-construal were assessed separately using a 24-item scale (Singelis, 1994). For independent self-construal ( $\alpha = 0.76$ ), participants reported how much they endorsed (1 = *strongly disagree* to 7 = *strongly agree*) items such as “My personal identity independent of others is very important to me,” “I prefer to be direct and forthright when dealing with people I’ve just met” and “I am comfortable with being singled out for praise or rewards.” For interdependent self-construal ( $\alpha = 0.73$ ), participants reported how much they endorsed (1 = *strongly disagree* to 7 = *strongly agree*) items such as “It is

important for me to maintain harmony within my group,” “I will sacrifice my self-interest for the benefit of the group I am in” and “I respect people who are modest about themselves.”

#### 4.4.2. Salivary cortisol

As shown in Fig. 1, five saliva samples were collected with Salivettes (Sarstedt, Rommelsdorf, Germany) (1) at baseline 20 min after participants arrived in the lab, (2) after TSST instruction and the 10 min speech preparation period, (3) after the 10 min TSST speech and mental math task, (4) 10 min after TSST completion during recovery, and (5) 20 min after TSST completion during recovery. Collected samples were stored at  $-20\text{ }^{\circ}\text{C}$  until overnight delivery in dry ice to Biochemisches Laboratory, Universität Trier, Germany to be assayed for cortisol. After thawing, cortisol levels were determined using a solid phase time-resolved fluorescence immunoassay with fluoroimetric end point detection (DELFI; Dressendorfer, Kirschbaum, Rohde, Stahl, & Strasburger, 1992).

All participants provided at least one saliva sample and 97 (94.17%) participants provided a sufficient amount of saliva in all five samples. Every sample was analyzed in duplicate. The intra-assay coefficient of variation was between 4.0% and 6.7% and the corresponding inter-assay coefficients of variation were between 7.1% and 9.0%. Cortisol values were log-transformed before analyses to normalize the data. A change score was created by subtracting baseline cortisol from post-challenge levels (sample 3 – sample 1).

#### 4.4.3. Cardiovascular measures

During the session, heart rate (HR), systolic and diastolic blood pressure (SBP, DBP) were assessed automatically every 3 min by a Critikon (Tampa, Florida) sphygmomanometer (Dinamap Model 1846). All HR and blood pressure readings were averaged before each cortisol sample. On average, there were 4.40 readings per sample: 5.66 readings at baseline before cortisol sample 1; 4.69 readings before sample 2; 4.51 readings before sample 3; 2.72 readings before sample 4; and 3.51 readings before sample 5. A change score was created by subtracting baseline levels from post-challenge levels (averaged readings before sample 3 – averaged

**Table 2**  
Friends' supportive behaviors script.

Supportive Statements			
Functions	Definitions	Benefits	Specific Examples
Emotional support	Allowing discussion of feelings, expression of concerns or worries	Alters threat appraisals, enhances self-esteem, reduces anxiety/depression, motivates coping	<p>“Remember, it will all be over in a few minutes”</p> <p>“It's okay to feel anxious about this”</p> <p>“I definitely understand what you're going through”</p> <p>“You'll do fine.”</p> <p>“I know you'll be able to get through this”</p>
Instrumental support	Providing tangible assistance	Solves practical problems, allows increased time for coping efforts	<p>“You should structure your speech into 3 parts: Your background, what you bring to this position, and what you like about the position.”</p>
Informational support	Providing information about resources, advice about effective actions	Increases amount of useable information available to individual, leads to more effective coping	<p>“I've found that writing a brief outline of your main points is helpful”</p> <p>“One thing you can do is come up with 3 items for each main idea of your speech.”</p> <p>“It helps to speak at a slightly slower pace, because that makes you look comfortable”</p>
Validation	Providing information on normativeness of individual's behavior and/or feelings, relative status in population	Decreases perceived deviancy, allows acceptance of feelings, provides favorable comparisons	<p>“Other participants who have gone through this also feel pretty nervous, so what you're feeling is quite normal”</p> <p>“It's okay if you stumble a little bit in there; everybody gets nervous when giving a speech in front of people they don't know.”</p>
Supportive questions and responses			
Functions	Questions	Responses	
Emotional support	<p>“How are you feeling?”</p> <p>“Do you feel nervous?”</p>	<p>“You sound worried”</p> <p>“I understand”</p>	
Instrumental support	<p>“How are you organizing your speech?”</p> <p>“What did you write down in your notes?”</p>	<p>“That sounds like a good way to do it”</p> <p>“Good idea!”</p>	

Note. Script is from prior work (Robles, 2007). Functions, definition and benefits was taken from Wills and Shinar (2000) and examples are from Nagurney (2001).

readings before sample 1).

#### 4.4.4. Body mass index

Participants self-reported height and weight. Body mass index (BMI) was calculated based on the Center for Disease Control height and weight formula. BMI was included in all analyses as a covariate.

#### 4.4.5. Media use

Participants were be asked to report, on an average day, how long they (a) watch video content (TV, YouTube, movies, etc.); (b) play video games; (c) listen to music; (d) read or do homework; (e) e-mail or send messages/post on Facebook, MySpace, etc., (not

including Facebook chat); (f) text or instant message (including Facebook chat); (g) talk on the phone or video chat; and (h) participate in F2F conversations on a scale of 0 *never* to 5 *more than 4 h* (Pea et al., 2012; Rideout, Foehr, & Roberts, 2010).

An experimental compliance flag variable was created to account for participants who (1) were not able to provide sufficient saliva, (2) did not bring an ethnicity-matched friend or brought a relative (e.g., sister), (3) had a history of anemia, (4) had completed the TSST in a prior study, (5) reported eating and drinking 30 min before the session, (6) were recovering from a cold, and (7) had problems with blood pressure cuff placement. These participants were not removed to retain the sample size and power. However, a

dichotomous, compliance flag was included in analyses. The flag was removed from final models if not significant.

## 5. Results

### 5.1. Are the groups equivalent?

As noted in Table 1, participants across the three conditions did not differ in parent education level, BMI, interdependence, independence, social anxiety, media use, state anxiety or any of the physiological outcomes at baseline. On average, participants reported higher levels of interdependence ( $M = 4.99$ ,  $SD = 0.72$ ) compared to independence ( $M = 4.77$ ,  $SD = 0.81$ ),  $t(102) = 2.03$ ,  $p = 0.045$ .

Given the diversity in the sample, comparisons between our largest ethnic group (Asian American,  $n = 59$ ) and other ethnicities (2 African Americans, 5 European Americans, 21 Latinos, 9 from mixed-heritage backgrounds, and 7 from “other” categories,  $n = 44$ ) were examined. Of participants from Asian backgrounds, 43.1% were first generation and 56.9% were second generation. Of participants from non-Asian backgrounds, 20.46% were first generation, 61.36% were second generation, and 18.18% were third generation or higher. Asian American participants had lower BMI ( $M = 21.24$ ,  $SD = 2.91$ ) and higher interdependent self-construal ( $M = 5.11$ ,  $SD = 0.69$ ) compared to non-Asian participants (BMI:  $M = 23.21$ ,  $SD = 3.64$ ; interdependent self-construal:  $M = 4.82$ ,  $SD = 0.74$ ),  $ts(100-101) = 3.04$ ,  $-2.03$ ,  $ps = 0.003$ ,  $0.045$ , respectively. Asian American and non-Asian participants did not differ in parent education, independent self-construal, and media use,  $ts(101) = -1.83$ ,  $1.62$ , and  $0.01$ ,  $ps > 0.05$ . Asian Americans had lower baseline HR ( $M = 73.31$ ,  $SD = 10.30$ ) compared to non-Asian participants ( $M = 77.71$ ,  $SD = 10.93$ ),  $t(101) = 2.09$ ,  $p = 0.039$ . However, Asian American and non-Asian participants were equivalent in baseline and post-task SBP, DBP and cortisol,  $ts(98-101) = -1.06$  to  $1.59$ ,  $ps > 0.05$ .

On average, participants agreed that they felt supported by their friend ( $M = 4.80$ ,  $SD = 1.08$ ). Participants in the F2F condition ( $M = 4.74$ ,  $SD = 1.13$ ) did not report significant differences in feelings of friend support compared to participants in the IM condition ( $M = 4.97$ ,  $SD = 0.98$ ),  $t(74) = -0.91$ ,  $p = 0.368$ .

### 5.2. Are cultural values and other individual differences related to general media use?

Table 3 shows the bivariate correlations between main study variables. Higher levels of parent education were associated lower levels of general media use. Contrary to expectations, cultural values of interdependence and independence were not associated

with state anxiety changes or media use. Greater change in state anxiety was associated with greater change in HR and greater change in cortisol is associated with greater than in SBP. None of these psychological and physiological measures were associated with media use.

### 5.3. How does support across context affect psychological stress?

State anxiety increased from baseline ( $M = 1.73$ ,  $SD = 0.55$ ) to after the TSST ( $M = 2.50$ ,  $SD = 0.69$ ),  $t(102) = -10.94$ ,  $p < 0.001$ . ANOVAs with Bonferroni-corrected post hoc tests indicated that participants in the IM condition reported lower post-TSST state anxiety compared to participants in the control condition. There were no significant differences between these conditions and the F2F condition,  $ps = 0.343$  and  $0.876$  respectively.

### 5.4. How does support across context affect physiological stress?

While cardiovascular and cortisol measures increased from baseline to after the task,  $t's(99-102) = -2.41$  to  $-22.81$ ,  $p's < 0.05$ , there was no main effect of support condition on any physiological measures,  $r's = -0.01 - 0.13$ ,  $ps = 0.39 - 0.91$ .

### 5.5. Does culture moderate how social support across media affect stress?

Regressions were modeled to examine how the cultural values moderated the associations between support condition and psychological and physiological responses to stress. Table 4 shows that associations between independent self-construal and changes in cortisol, HR and SBP were moderated by support context. The same pattern of results appeared when the regressions were modeled without the covariates of BMI, parent education, and media use.

Next, follow-up regressions were modeled for those high and low on independent self-construal to examine simple effects. Fig. 2a shows that individuals with higher independent self-construal showed buffering of the cortisol response after receiving support, regardless of type of support (IM and F2F), compared to those who received no support. Fig. 2b shows that individuals with higher independent self-construal showed buffering of HR response when they received F2F support. Fig. 2c shows that individuals with higher independent self-construal showed greater buffering of SBP response after IM support compared to those who received no support. Interdependent self-construal did not predict or modify the effect of support type on change in anxiety ( $b's = -0.12 - 0.07$ ,  $SE's = 0.11 - 0.16$ ,  $p's = 0.51 - 0.68$ ), cortisol ( $b's = 0.01 - 0.05$ ,  $SE's = 0.07 - 0.12$ ,  $p's = 0.50 - 0.92$ ), HR ( $b's = -4.62 - 0.257$ ,  $SEs = 1.45-2.37$ ,  $p's = 0.06 - 0.51$ ), SBP

**Table 3**  
Descriptive data and correlations for study 2 variables.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
1. Parent Education	0.07	0.91	–	–0.25*	0.04	0.04	–0.24*	–0.06	–0.06	–0.10	–0.15	–0.15
2. Body mass index (BMI)	22.09	3.37		–	0.03	–0.01	0.07	0.20*	0.02	0.04	0.00	–0.07
3. Interdependence (1–7)	4.99	0.72			–	0.00	0.06	0.04	0.13	0.10	0.01	0.09
4. Independence (1–7)	4.77	0.81				–	–0.05	–0.17†	0.16	–0.07	0.06	0.02
5. Media Use (1–5)	2.03	0.58					–	0.02	0.14	0.09	0.03	–0.06
6. State Anxiety Change	0.77	0.71						–	0.14	0.22*	0.06	–0.02
7. Cortisol Change	0.09	0.47							–	0.19†	0.41**	–0.09
8. HR Change	9.93	9.47								–	0.47**	0.27**
9. SBP Change	18.66	9.94									–	0.31**
10. DBP Change	12.33	5.40										–

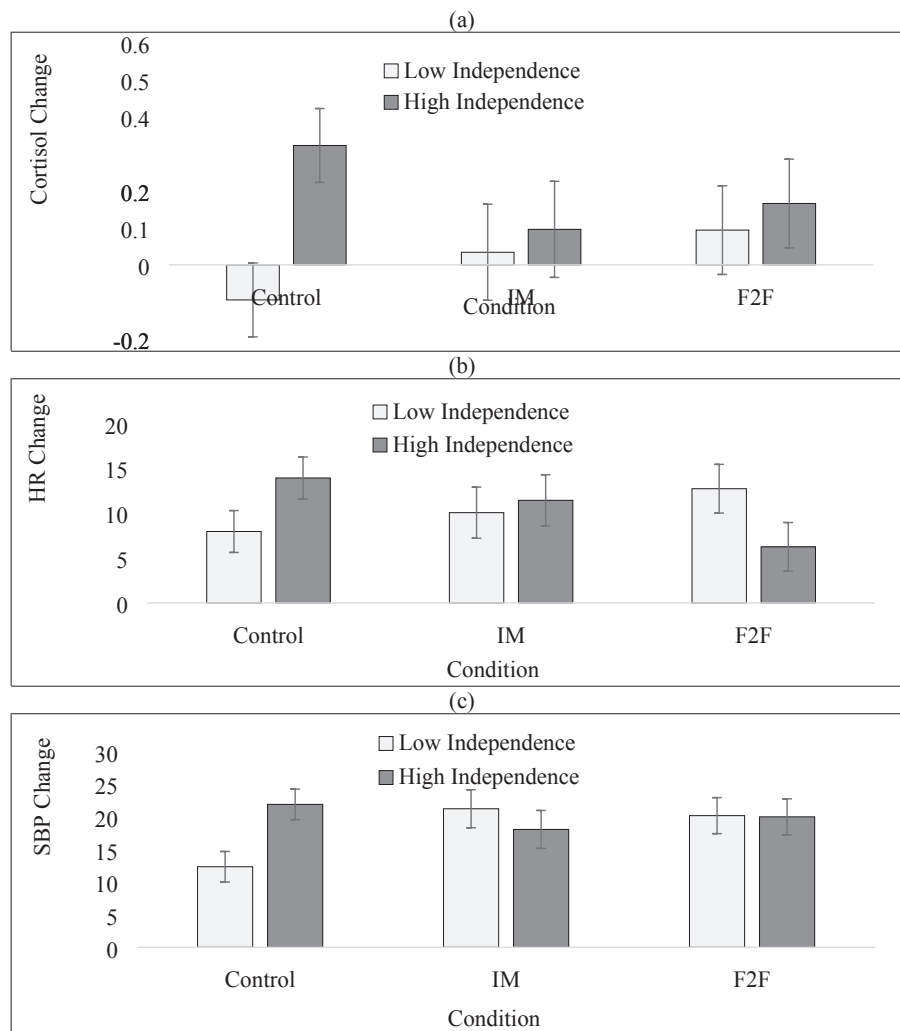
Note. Parent education is the mean of standardized (z-score) mother and father education. Cortisol values have been log-transformed before all analyses.  
† $p < .10$ , \* $p < .05$ , \*\* $p < .01$ .

**Table 4**  
Regression models predicting psychological and physiological outcomes from independence.

	State Anxiety Change	Cortisol Change	HR Change	Systolic BP Change	Diastolic BP Change
Intercept	0.92 (0.13)**	0.11 (0.08)**	10.91 (1.77)**	17.12 (1.84)**	11.85 (1.01)**
IM (vs. control)	-0.15 (0.17)	-0.05 (0.11)	-0.02 (2.32)	2.53 (2.43)	1.31 (1.33)
F2F (vs. control)	-0.28 (0.18)	0.02 (0.12)	-1.48 (2.50)	2.96 (2.60)	0.24 (1.43)
BMI	0.13 (0.08)†	0.00 (0.05)	-0.09 (1.01)	-0.22 (1.06)	-0.63 (0.58)
Parent Education	-0.03 (0.08)	-0.01 (0.05)	-0.90 (1.07)	-0.99 (1.13)	-1.14 (0.62)†
Media Use	-0.02 (0.07)	0.07 (0.05)	0.60 (0.97)	0.16 (1.03)	-0.76 (0.56)
Independence (ref: Control)	-0.15 (0.15)	0.21 (0.10)*	2.93 (2.33)	4.78 (2.34)*	-1.17 (1.28)
Independence x IM	0.07 (0.19)	-0.18 (0.13)	-1.88 (2.85)	-6.36 (2.91)*	1.06 (1.59)
Independence x F2F	0.03 (0.18)	-0.17 (0.12)	-6.23 (2.71)*	-4.87 (2.76)†	1.65 (1.65)

Note. IM = instant messenger support condition. F2F = face-to-face support condition. The no support, control condition was the reference group. Continuous variables were mean-centered z-scores.

† $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ .



**Fig. 2.** Interactions between condition and independent self-construal to change in (a) cortisol, (b) heart rate, and (c) systolic blood pressure pre- and post-task.

( $b$ 's =  $-0.72 - 0.99$ ,  $SE$ 's =  $1.54 - 2.52$ ,  $p$ 's =  $0.70 - 1.00$ ), and DBP ( $b$ 's =  $-0.95 - 1.32$ ,  $SE$ 's =  $0.81 - 1.33$ ,  $p$ 's =  $0.32 - 0.51$ ).

## 6. Discussion

The current study examined the effect of new communication contexts for social connection among female friends from ethnically-diverse backgrounds. The affordances of new media,

such as anonymity and asynchrony, make it a potentially beneficial context through which to receive social support. However, some individuals may benefit more than others. Cultural differences in how individuals view themselves relative to others can affect the way they negotiate their social resources. Cultural differences in reported support seeking (e.g., Kim et al., 2008; Taylor et al., 2004) led us to predict that individuals with higher levels of independent self-construal would show greater dampening in stress response to

F2F support compared to text-messaged support or no support. Additionally, we predicted that individuals with higher levels of interdependent self-construal may show greater dampening in stress response to IM support compared to F2F or no support.

In support of the hypothesis that online support can be beneficial, participants supported via IM reported less post-task state anxiety than those who did not receive support. There were no differences in those supported via IM compared to F2F, suggesting that support across either context may be sufficient to affect psychological well-being. In partial support of our hypotheses that individuals with higher levels of independent self-construal would exhibit greater physiological stress buffering after support F2F compared to IM or no support, individuals higher in independence showed greater increases in cortisol and SBP after the stressful task relative to before the task when they received no support. This was not the case when they received support of any kind, either F2F or via IM. Similarly, individuals higher in independent self-construal showed smaller HR change after in-person support compared to those who received no support. Contrary to our hypothesis that individuals with higher levels of interdependence would benefit more from IM support compared to in-person or no support, interdependence did not moderate the effect of support condition to changes in psychological or physiological outcomes. Altogether, the results highlight the fact that individuals across the board seem to benefit from social support on the psychological and physiological level, and that individuals with high levels of independent self-construal may benefit most from social support of any kind.

The results also suggest that receiving support online may be a beneficial alternative to receiving support in-person; and that for women from diverse backgrounds both options may be better than not receiving any support in reducing stress after a challenging task. These results are inconsistent with prior research that suggests that the sound of a loved one's voice in-person may be the key element in reducing HPA activity compared to text-only within a similar stress paradigm (Seltzer et al., 2012). However, cultural views about self and social relationships can affect how support across communication contexts affect physiological stress responses. Specifically, for individuals who reported greater endorsement of independent self-construal, for whom there is an implicit understanding that one should express personal opinions and pursue individual needs, support was often associated with greater dampening in physiological stress responses relative to no support. For these individuals, explicitly seeking out and receiving support from friends when in need may be viewed as a matter of personal choice made in pursuit of individual goals (Kim et al., 2008). Additionally, those who provide support are also believed to be under no social obligation and can provide it voluntarily. In this way, receiving support from others may not be viewed as a threat to social relationships and can be beneficial to reducing physiological experiences of stress.

Interdependent self-construal did not moderate the effect of support condition to changes in stress response. Contrary to prior research on individuals from Asian and American backgrounds suggesting that individuals who have higher levels of interdependence are likely to drive differences in support (Taylor et al., 2004, 2007), the results here suggest that independence and interdependence may operate differently. This may be suggestive of the discriminant validity of the value scales, and that independence and interdependence do not exist on opposite ends of a continuum (Singelis, 1994). On the other hand, characteristics of the sample may also account for these results. A large majority of the participants in the current study were from cultural backgrounds associated with higher levels of interdependence such as Asian and Latin American (Fuligni, Tseng, & Lam, 1999; Markus & Kitayama, 1991). Indeed, despite being recruited from a U.S. college campus,

participants reported higher interdependent self-construal scores compared to independent self-construal scores. Additionally, average independence and interdependence scores of participants in this study were more comparable to scores among Asian Americans in prior studies rather than Caucasian Americans (Singelis & Sharkey, 1995; Singelis, 1994; Singelis, Triandis, Bhawuk, & Gelfand, 1995). This may have reduced variation in interdependence and thus the ability of to detect differences along the interdependence continuum.

Other characteristics of the sample may limit generalizability. For example, this was an all-female sample. Research has documented gender differences in physiological stress response in face of the TSST (Kirschbaum, Klauer, Filipp, & Hellhammer, 1995; Robles, 2007). Robles (2007), for example, found that women exhibited lower levels of cortisol output compared to males, and women receiving support did not differ in cortisol response compared to those not receiving support. Participants in this study were also highly educated, which could mean greater socialization within independent contexts like U.S. institutions of higher education. Therefore, the variation in independence compared to interdependence might be capturing other factors such as gender norms or levels of U.S. acculturation.

We also did not find that cultural differences in self-construal moderated the effect of support condition to psychological outcomes or DBP. The discrepancy in self-reported state anxiety as compared to physiological stress responses may reflect social desirability in perceiving friends as effective support providers and thus reporting lower post-task anxiety. This phenomenon has been documented in prior research with the TSST (Kirschbaum et al., 1995). Alternatively, receiving in-person or digital help from a female peer may not have been sufficient in minimizing the psychological stress of the challenge in the current study. Therefore, the results found here only partially support prior research indicating that peer support can reduce diastolic, SBP and, to a lesser extent, HR during challenging lab tasks (for a review, see Thorsteinsson & James, 1999; Uchino et al., 1996).

In addition to the issues discussed, other limitations bear consideration. The current study focused on friend support. Given the importance of various support providers (Uchino et al., 2011), support providers outside of peers, such as kin, might be more effective in buffering stress responses (Seltzer et al., 2012). Family members may be especially important for minority groups (Burton, Bonanno, & Hatzenbuehler, 2014) and in interdependent cultures that prioritize family relationships (Fuligni et al., 1999; Kagitcibasi, 2005; Li & Cheng, 2015). Although romantic partners also grow in important during young adulthood, partner support may be more effective for males than women (Kirschbaum et al., 1995). Future research should examine how support from other sources outside of same-sex friend may affect stress response to acute stressors.

Additionally, characteristics of the confederates should also be considered. Although most of the participants and friend pairs were matched by ethnicity, the confederates in the current study were majority Asian American and not matched by ethnicity to participants. Characteristics of the audience in amplifying the social evaluation and social comparison elements of the TSST are key to eliciting a strong stress response (Dickerson & Kemeny, 2004). Participants across the groups in this study may have perceived the confederates differently. Specifically, non-Asian participants likely performed their speech in front of a cross-ethnic audience but were supported by a same-ethnicity friend in the F2F and IM conditions. In comparison, Asian participants saw Asian American faces whether they were in the F2F, IM or control condition. Overall, this could have reduced stress responses in Asian participants across all conditions and amplified stress in non-Asian participants. This, in turn, could have limited differences by culture.



## 7. Conclusions

Results from this study show that computer-mediated support from a friend via instant messenger was comparable to in-person support in reducing psychological and physiological stress compared to not receiving support. The study findings contribute to our understanding of how new and increasingly popular forms of social connection online may shape mental and physical well-being. These results highlight the importance of expanding current models of social support and theories on the stress-buffering effects of support to include digital contexts and online communication. In the current experiment, we controlled social support context to either in-person or via instant messenger from a friend, but young adults are increasingly finding ways to communicate intimacy, respect and affection online (e.g., “liking” pictures on social networking sites) to known and unknown individuals alike (Manago et al., 2012). Future research should examine the different forms of positive social interaction online. Additionally, individuals are increasingly receiving professional assistance via their digital devices (e.g., seeing a mental health profession in an online or web-conferencing program; Andersson, Topooco, Havik, & Nordgreen, 2016; Sijbrandij, Kunovski, & Cuijpers, 2016). The results here highlight the potential benefits and feasibility of telehealth programs intended to improve well-being by providing support services virtually (versus not receiving any form of help). However, given the characteristics of the healthy sample in the current study, the generalizability of results is limited. Future research should examine the effects of remotely-communicated assistance for clinical populations.

Additionally, the current study addresses how young-adult women from diverse cultural-backgrounds may differentially respond to received social support across different media contexts. The results suggest that cultural values moderate the effect of support across media context in objective, physiological measures of stress but less so in conscious, self-reported measures of stress. Specifically, the cultural value of independence, but not interdependence, moderated associations between support context and cortisol and heart rate but not changes in self-reported feelings of stress. This suggests that cultural values may differentially drive the way digital media affects individuals “under the skin” even if individuals are unaware of these effects. This separation of physiological and psychological effects has also been documented in the literature on social support (Uchino, Bowen, Carlisle, & Birmingham, 2012). For individuals from more independent cultures, like those in Western, industrialized nations, support received across both face-to-face and online contexts may be particularly important to well-being in the face of stress and challenge. This is perhaps not the case for young-adult women from cultures that are less independent and place less emphasis on explicit expression of individuality. Given the access to the Internet worldwide, the results here have implications for the ways social communication may be affecting an increasingly diverse and global population of Internet users.

## Author's note

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