



The Lonely States of America: Prevalence and Demographic Risk Factors for Affection Deprivation among U.S. Adults

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Affection deprivation indexes a deficit in the amount of affectionate communication one receives from others. According to affection exchange theory, affection deprivation is detrimental to physical and relational health, and empirical evidence supports that assertion. Little is known, however, about the prevalence of affection deprivation in the United States, a topic addressed here in two studies. The first study (N = 2,616) examined demographic and geographic variation in affection deprivation among a non-representative sample of U.S. adults. The latter study (N = 1,121) used a Census-matched representative sample of U.S. adults to replicate assessments of prevalence and examine how affection deprivation relates to loneliness and physical pain.

Keywords: Affectionate communication; affection deprivation; affection exchange theory; loneliness; pain

Humans are an intensely social species. Maslow's (1943) theory of human motivation, Schutz's (1958) fundamental interpersonal relations orientation theory, and Baumeister and Leary's (1995) need-to-belong perspective all identify quality social relationships as paramount for human well-being. As Floyd's (2006, 2019) affection exchange theory

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(AET) makes clear, humans create social connection largely through the exchange of affection, making affectionate communication a principal human need.

When individuals perceive a discrepancy between desired and experienced levels of affectionate communication—a condition known as *affection deprivation*—they are susceptible to detriments in their health (Floyd, 2014, 2016a; Hesse & Mikkelsen, 2017; see also Cacioppo & Patrick, 2008; House, 2001). Affection deprivation shares conceptual space with loneliness, the perception that one's needs for social engagement are unmet, yet affection deprivation indexes a lack of affectionate communication, specifically, making it more communicatively oriented than loneliness (Floyd & Hesse, 2017). As with loneliness, however, it is the *perception* of deficient affection, rather than any objective measure, that is problematic (Cacioppo & Cacioppo, 2014).

Although research (described below) has documented the prevalence of loneliness among adult samples in the United States and other countries, no research has done so for affection deprivation. Documenting prevalence and identifying risk factors is essential to guide intervention efforts aimed at reducing affection deprivation, so that such efforts can be targeted to those most in need. This paper delineates two exploratory studies of U.S. adults—one non-representative sample ($N = 2,616$) and one representative sample ($N = 1,121$)—that documented the prevalence and demographic risk factors of affection deprivation. The second study also documents its associations with loneliness and chronic pain. We begin this review by describing affectionate communication and affection exchange theory. We then describe affection deprivation and discuss its associations with loneliness and pain.

Affectionate Communication

Floyd and Morman (1998) defined affectionate communication as “an individual's intentional and overt enactment or expression of feelings of closeness, care, and fondness for another” a definition that has undergirded research for more than two decades (p. 145; see Floyd, 2019). This definition situates affectionate communication as a *behavior*, and Floyd and Morman's (1998) tripartite model offered that individuals can enact such a behavior in at least three ways. Some affectionate expressions are verbal, composed of words that are spoken or written. Other expressions are enacted nonverbally, via behaviors such as kissing and handholding. Still other expressions are made via supportive behaviors, including acknowledging important events and offering assistance.

Affection Exchange Theory

Floyd's (2006, 2019) AET explains why humans share affection and with what consequences. AET is described as “neo-Darwinian,” in that it assumes survival and reproduction are superordinate human goals and claims that affectionate communication is adaptive for those goals. Consistent with that assertion, multiple

studies have shown that affectionate behavior is beneficial for health and wellness (Floyd, 2019).

Although it situates affectionate communication as fundamental to the human experience, AET recognizes individual variation in how much affectionate behavior is desired. When received affection exceeds desired affection, the result is *excessive affection*, a condition associated with impaired self-esteem and life satisfaction (Hesse et al., 2018). When desired affection exceeds received affection, however, the result is *affection deprivation*, described subsequently.

Affection Deprivation

As originally articulated by Prescott (1976), affection deprivation was conceptualized as the lack of sufficient touch, or as Floyd (2014) later described, “the condition of wanting more tactile affectionate communication than one receives” (p. 383). Current conceptualizations broaden the definition to include deficits in any form of affectionate behavior (Floyd, 2016a). Such deprivation is consequential; research on touch deprivation has found associations with deficits in physical and mental health, relational wellness, and particularly for children, violence and drug abuse later in life (see Prescott, 1976, 1979, 1980). As AET argues, humans require a sufficient amount of affection to facilitate health, a claim now documented by several studies showing affection deprivation’s association with individual and relational problems (Floyd, 2019).

Correlates of Affection Deprivation

In multiple studies, Floyd (2014) found that affectionate touch deprivation correlates positively with depression, stress, loneliness, insecure attachment, alexithymia, and the number of diagnosed mood or anxiety disorders. It correlates negatively with general health, life happiness, received social support, relationship satisfaction, and attachment security. Floyd (2016a) later reported affection deprivation predicted chronic physical pain and disturbances in sleep quality, latency, duration, and daytime dysfunction.

Other research has linked affection deprivation to relationship quality. Affection deprivation is inversely associated with closeness and satisfaction in romantic couples (Hesse & Mikkelson, 2017), inversely related to family satisfaction and directly associated with loneliness, depression, and attachment anxiety (Hesse, 2015), and even associated with the frequency of pornography use (Hesse & Floyd, 2019). These results suggest that being deprived of affection is detrimental across a range of mental, physical, and social experiences.

Loneliness

Loneliness is the distressing state caused when the quantity and quality of one’s relationships are inadequate (Cacioppo et al., 2006). Chronic loneliness afflicts

millions of Americans, particularly adolescents and older adults. As many as 40% of adults over the age of 65, and as many as 80% of those under age 18, report feeling lonely (Hawkley & Cacioppo, 2010). Victor and Yang (2012) documented a curvilinear relationship between loneliness and age such that the highest rates of loneliness were found in adults over 65 years of age and under 25 years of age.

An array of physical and mental health detriments are associated with loneliness, including coronary heart disease (Thurston & Kubzansky, 2009), sleep dysfunction (Hawkley et al., 2010), elevated pain and fatigue (Jaremka et al., 2013), hypertension (Momtaz et al., 2012), clinical and subclinical depression (Aylaz et al., 2012; Cacioppo et al., 2006), eating disorders (Levine, 2012), and cognitive decline and dementia (Gow et al., 2007). Additionally, lonely adults report greater dissatisfaction with their relationships (Frye-Cox & Hesse, 2013). Most distressing is the significant association between loneliness and self-harm. Particularly among adolescents and young adults, loneliness is a strong predictor of suicide ideation (Goldsmith et al., 2002), parasuicidal behavior (Lasgaard et al., 2011; Stravynski & Boyer, 2001) and suicide attempts (Stickley & Koyanagi, 2016). This research clearly supports former U.S. surgeon general Murthy's (2017) conceptualization of loneliness as a public health crisis.

Although related, loneliness is distinct from affection deprivation in two ways. First, Floyd and Hesse (2017) note that whereas loneliness describes a general deficit in social connectedness, affection deprivation focuses specifically on a lack of received affectionate behavior. Second, although both constructs are perceptual, loneliness is more affective, whereas affection deprivation is more behavioral. Across three studies, Floyd and Hesse found clear empirical distinctions between markers of affection deprivation and loneliness.

Chronic Pain

In scholarly use (e.g., Masten et al., 2011) the term "social pain" describes the pain resulting from interpersonal conflict, rejection, or loss of a loved one. Neuroimaging studies show that social pain is induced when individuals feel excluded from interpersonal interaction (MacDonald & Jensen-Campbell, 2011), or when an individual's attempts to maintain close, satisfying personal relationships are thwarted. That failing to maintain social bonds causes distress supports the proposition of both AET and the need-to-belong hypothesis that meaningful social relationships are vital for well-being.

Affection deprivation is also an aversive state. AET hypothesizes that adequate affection is necessary for well-being, and research confirms the physical, psychological, and relational benefits of affectionate communication (Floyd, 2016b; Floyd et al., 2018). Therefore, it is logical to assume that being deprived of affection is related to social pain (Floyd, 2014).

Despite a tendency to think of social pain as a psychological experience distinct from that of physical pain, however, research indicates substantial sensory overlap

between them. As noted above, neuroscientists have discovered that social pain activates the same brain regions as physical pain. Therefore, although social pain is undesirable on its own, it may also manifest in the form of physical pain sensations, making physical pain a potential correlate of affection deprivation.

Indeed, neuroimaging studies show the brain processes physical and social pain similarly, lending support to Panksepp and colleagues' proposition that social and physical pain are similar sensory experiences and activate similar neural structures (Herman & Panksepp, 1978); Panksepp, Herman, et al., 1978; Panksepp, Vilberg, et al., 1978). Eisenberger and colleagues found the anterior cingulate cortex (known as the location of a common neural alarm system) was more active in participants who were socially excluded than included. Additionally (Kross et al., 2011) found that social rejection activated the secondary somatosensory cortex and dorsal posterior insula, both of which predict the sensory experience of physical pain.

This line of neurological research shows that social deprivation correlates strongly with physical pain. Indeed, physical pain is positively associated with loneliness (Cacioppo & Patrick, 2008; Jaremka et al., 2013), social exclusion (MacDonald & Leary, 2005), ostracism (Williams, 2007), and relationship loss (Panksepp, 2003). Common to these conditions is the inability to sustain meaningful social connections. Affection deprivation also represents a challenge to the maintenance of social needs; therefore, we hypothesize that it is directly associated with physical pain.

The Present Studies

As other studies have done with conditions such as communication apprehension (Degnar, 2010), communication disorders (Pinborough-Zimmerman et al., 2007), and loneliness (Kuwert et al., 2014), we document the prevalence of affection deprivation among U.S. adults in two studies. Our first research questions ask about general prevalence and geographic distribution:

RQ1: What is the general prevalence of affection deprivation among U.S. adults?

RQ2: How, if at all, does affection deprivation vary geographically within the United States?

Relatedly, we explore which demographic characteristics act as risk factors, making an individual more likely to experience affection deprivation:

RQ3: Which demographic characteristics, if any, are associated with a higher prevalence of affection deprivation?

We address the first three questions in both studies. Study 2 also examines how affection deprivation correlates with loneliness and chronic pain. As Floyd and Hesse (2017) observed, affection deprivation predicts many of the same detriments as loneliness. For example, loneliness predicts pain and fatigue (Jaremka et al., 2013), sleep disturbances (Kurina et al., 2011), depression (Aylaz et al., 2012), alexithymia (Qualter et al., 2009), and relationship dissatisfaction (Frye-Cox & Hesse, 2013), all of which are associated with affection deprivation (see Floyd, 2019). These findings make sense from the perspective of AET, which claims that affectionate

communication is a principal behavioral means through which individuals meet their need to belong. When affectionate communication is lacking, it is therefore logical to predict that the perception of social connection is similarly deficient. On these bases, we predict affection deprivation to covary significantly with the experience of loneliness:

H1: Affection deprivation is linearly related to loneliness.

On the basis of AET, Floyd (2016a) hypothesized a direct association between affection deprivation and chronic physical pain. AET proposes that the lack of adequate affection is detrimental psychologically, producing an experience of social pain that is empirically linked with the experience of physical pain (Eisenberger & Lieberman, 2004; Eisenberger et al., 2003):

H2: Affection deprivation is linearly related to chronic pain.

Study 1: prevalence of Affection Deprivation

Participants

Participants ($N = 2,616$) were 1,525 men and 1,091 women ranging in age from 18 to 74 years ($M = 32.41$ years, $SD = 10.80$). Most (91.9%) identified as white/Caucasian, whereas 29.6% were Asian/Pacific Islander, 21.4% were Hispanic and/or Latino/a, 20.8% were Black/African American, 7.8% were native American, and 3.0% identified other ethnic or racial origins.¹ At the time of the study, most participants (59.4%) were single/never married, whereas 34.2% were married, 6.1% were divorced, and 0.3% were widowed. Participants represented all 50 U.S. states, plus Puerto Rico and the District of Columbia.

Procedure and Measure

Participants were recruited via the Amazon.com crowdsourcing marketplace Mechanical Turk (MTurk). Prospective participants had to be at least 18 years old; be able to read and write English; have achieved “master worker” status (a designation indicating consistently high quality in submitted work); and have an average approval rate equaling or exceeding 90%. Eligible participants completed and submitted an online questionnaire in exchange for \$2.00US. Although samples recruited on MTurk for academic research are not truly representative of the U.S. adult population, they are typically *more* representative than are in-person convenience samples (Berinsky et al., 2012; Paolacci et al., 2010; Shapiro et al., 2013).

Affection deprivation was measured with Floyd’s (2014) Affection Deprivation Scale. The 9-point Likert scale asks participants to indicate their level of agreement with items such as “I don’t get enough affection from others” and “I often wish I got more affection in my life.” Higher scores index greater affection deprivation ($\alpha = .89$).

Results

RQ1: Prevalence of Affection Deprivation

Affection deprivation was measured on a scale of 1 (low deprivation) to 9 (high deprivation), with a theoretic median of 5. The observed mean score was 4.66 ($SD = 1.06$) and the observed median was 4.83, yet the modal score was 1.00. The distribution appears in [Figure 1](#). The distribution had minimal skewness (.014) and slight negative kurtosis (-.875).

RQ2: Geographic Distribution of Affection Deprivation

Participants' home states were recoded into the U.S. Census Bureau's four statistical regions (U.S. Census Bureau, 2019) of the Northeast, Midwest, South, and West. Affection deprivation was highest in the Midwest ($M = 4.81$, $SD = 2.02$), followed by the South ($M = 4.68$, $SD = 2.09$), the Northeast ($M = 4.58$, $SD = 2.18$), and the West ($M = 4.54$, $SD = 1.95$), yet these differences were nonsignificant, $F(3, 2619) = 1.95$, $p = .12$, $\eta^2 = .002$.

RQ3: Demographic Risk Factors for Affection Deprivation

Scores were nearly identical for women ($M = 4.66$, $SD = 2.15$) and for men ($M = 4.65$, $SD = 2.00$), Welch's $t(2244.67) = .087$, p (two-tailed) = .93, $d = .005$. To examine associations with age while accounting for the possibility of a nonlinear relationship, we used a hierarchical regression in which the linear effect of age was entered in the first step and the quadratic effect was entered in the second step. Affection deprivation showed a negative linear relationship with age, $\beta = -.10$, $p < .001$, but the quadratic relationship was nonsignificant.

Neither relationship status nor racial/ethnic background had a significant effect on affection deprivation scores.

Discussion

Although research has documented detriments associated with affection deprivation, little has been known about which populations are most vulnerable. The purpose of this initial study was to explore the prevalence and demographic risk factors for affection deprivation. Using a non-representative sample of U.S. adults, the study found that although average and median scores were close to the theoretic middle of the distribution (5, in this case), the modal score of 1 on a nine-point scale indicated that most participants felt little affection deprivation. There was no significant effect of geographic distribution, nor of biological sex, yet there was a small but significant association with age, such that younger participants were more likely than older participants to report feeling affection deprived, a finding inconsistent with Victor and Yang's (2012) research documenting a curvilinear association between age and loneliness but consistent with the report of a large-scale global study of more than 46,000 participants from 237 countries, finding that loneliness levels are greatest

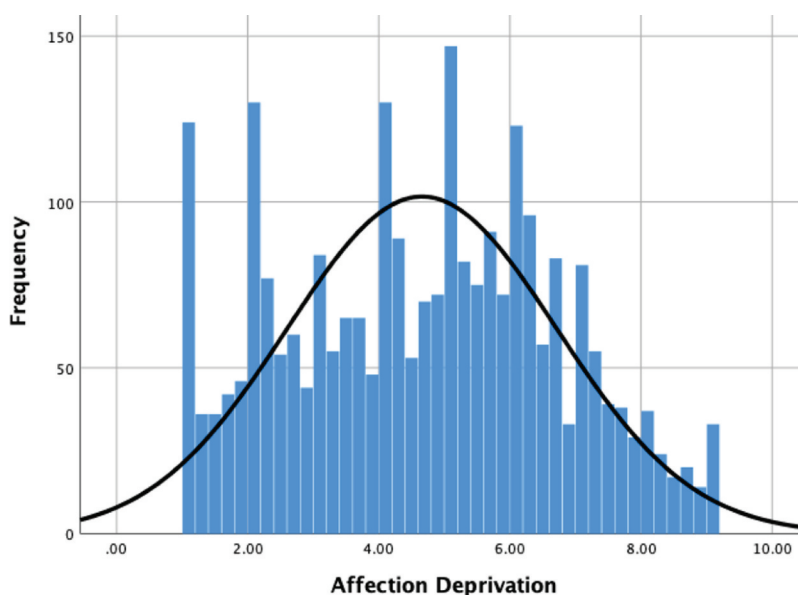


Figure 1 Histogram of Affection Deprivation Scores, Study 1 ($N = 2,616$).

among adolescents and young adults, compared to other age groups (Barreto et al., 2020).

Although informative, the first study is limited by its use of a non-representative sample of adults and its limited demographic information for examining risk factors associated with affection deprivation. Thus, we followed up the first study with a second investigation designed to remedy these limitations.

Study 2: prevalence of Affection Deprivation and Associations with Loneliness and Pain

This study both replicated and extended Study 1 by using a representative sample of U.S. adults to explore the prevalence of affection deprivation, as well as its associations with loneliness and chronic pain.

Participants

Participants ($N = 1,121$) were 498 men, 599 women, 4 transgender individuals, and 9 who reported another gender identity (e.g., nonbinary), ranging in age from 18 to 96 years ($M = 45.05$ years, $SD = 16.86$). With respect to ethnicity, 15.3% of participants were of Hispanic, Latino, and/or Spanish origin; with respect to racial identity; 69.8% were white/Caucasian; 12.7% were Black/African American; 4.8% were Asian/Pacific Islander; 3.7% were Native American or Aleut; 0.2% were Arab; and 1.4% claimed other racial identities.² At the time of the study, 30.0%

of participants were single/never married; 36.3% were married; 12.9% were not married but in a significant romantic relationship, 14.3% were divorced, and 5.4% were widowed. Most participants (86.4%) identified as exclusively or mostly heterosexual, whereas 4.4% identified as exclusively or mostly homosexual, 6.2% as exclusively or mostly bisexual, and 2.0% claimed other sexualities or elected not to answer. Thirty-nine percent of the sample had completed a high school education or less, whereas 29.0% had an associate's degree or technical school certificate, 21.4% had a bachelor's degree, and 10.6% had a graduate degree. The sample represented all 50 U.S. states and the District of Columbia.

Procedure

Participants were recruited using a U.S. Census-matched MTurk Prime Panel. The panel identifies Census-driven percentages of participants by age group, gender, ethnicity, and race and recruits until each group is sufficiently represented. Each prospective participant received a link to an online questionnaire, and those who elected to take part filled out the questionnaire and submitted it electronically. In exchange for their participation, respondents were able to direct a payment to a charity of their choice.³

A total of 1,234 participants were originally recruited. We subsequently removed 113 (8.9%) for failing an embedded attention check in the questionnaire, resulting in the current sample size of 1,121. Completion times for the questionnaire—which we expected to vary widely based on how many affectionate expressions, if any, a given participant reported—ranged from 1 minute, 30 seconds to 59 minutes, 54 seconds ($M = 10$ minutes, 28.8 seconds, $SD = 7$ minutes, 15.87 seconds).⁴

The methods and analytical strategy were preregistered with Open Science Framework on September 19, 2019, and the study was IRB-approved.

Measures

Affection deprivation was again measured with Floyd's (2014) Affection Deprivation Scale. *Loneliness* was measured using the UCLA Loneliness Scale (version 3; Russell, 1996). The widely used 20-item scale assesses agreement with items such as "I have nobody to talk to," "I feel completely alone," and "People are around me but not with me." *Pain* was measured using the pain subscale of the RAND Corporation Short Form Health Survey 36 (SF-36; Hays et al., 1995). The items on the pain subscale were "How much bodily pain have you had during the past 4 weeks?" and "During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?" Answers were assessed on an 11-point scale wherein higher scores indicate greater pain. Table 1 reports means, standard deviations, internal reliability estimates, and intercorrelations for study variables.

*Results**RQ1: Prevalence of Affection Deprivation*

Affection deprivation was measured on a scale of 1 (low deprivation) to 9 (high deprivation), with a theoretic median of 5. The observed mean score was 4.90 ($SD = 1.89$), and the observed median and modal score were both 5.00. The distribution appears in [Figure 2](#). As in Study 1, the distribution had minimal skewness (.012) and slight negative kurtosis (-.531).

RQ2: Geographic Distribution of Affection Deprivation

Participants' home states were recoded into the U.S. Census Bureau's four statistical regions (U.S. Census Bureau, 2019). Affection deprivation was highest in the South ($M = 4.95$, $SD = 1.97$), followed by the Midwest ($M = 4.92$, $SD = 1.87$), the West ($M = 4.89$, $SD = 1.82$), and the Northeast ($M = 4.75$, $SD = 1.90$), yet these differences were nonsignificant, $F(3, 1096) = 0.47$, $p = .70$, $\eta^2 = .001$.

For illustrative purposes, we calculated affection deprivation scores by U.S. state using the combined data of the two studies ($N = 3,737$). A graphic representation of the scores appears in [Figure 3](#).

RQ3: demographic Risk Factors for Affection Deprivation

There was no effect of gender on affection deprivation, $F(3, 1106) = 1.71$, $p = .162$, $\eta^2 = .004$. As in Study 1, affection deprivation showed a negative linear relationship with age, $\beta = -.10$, p (2-tailed) = .001, but no quadratic (curvilinear) relationship.

There were no effects of race or ethnicity. Relationship status had a significant effect on affection deprivation, $F(4, 1103) = 4.63$, $p = .001$, $\eta^2 = .02$. A post-hoc Bonferroni test revealed that single adults ($M = 5.26$, $SD = 1.84$) were more affection deprived than those who were married ($M = 4.70$, $SD = 1.80$) or in a significant nonmarital relationship ($M = 4.73$, $SD = 1.94$); other comparisons were nonsignificant.

Table 1 Means, Standard Deviations, Internal Reliability Estimates, and Intercorrelations, Study 2 ($N = 1,121$)

	M	SD	α	1	2
1. Affection deprivation	4.90	1.89	.89	–	
2. Loneliness	4.02	1.85	.86	.65*	–
3. Pain	3.39	2.66	.93	.13*	.14*

Notes. Variables were measured on 9-point scales wherein higher numbers indicated higher levels of the variable.
* p (two-tailed) < .01.

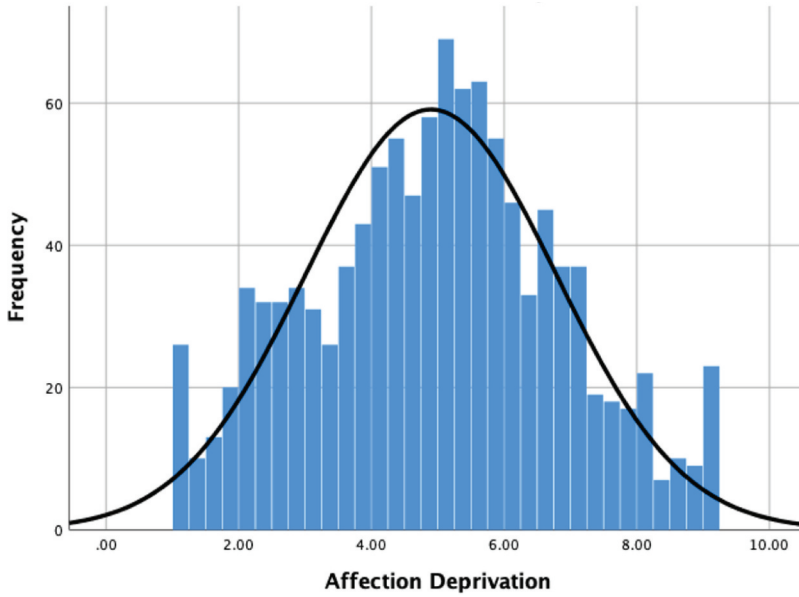


Figure 2 Histogram of Affection Deprivation Scores, Study 2 (N = 1,121).

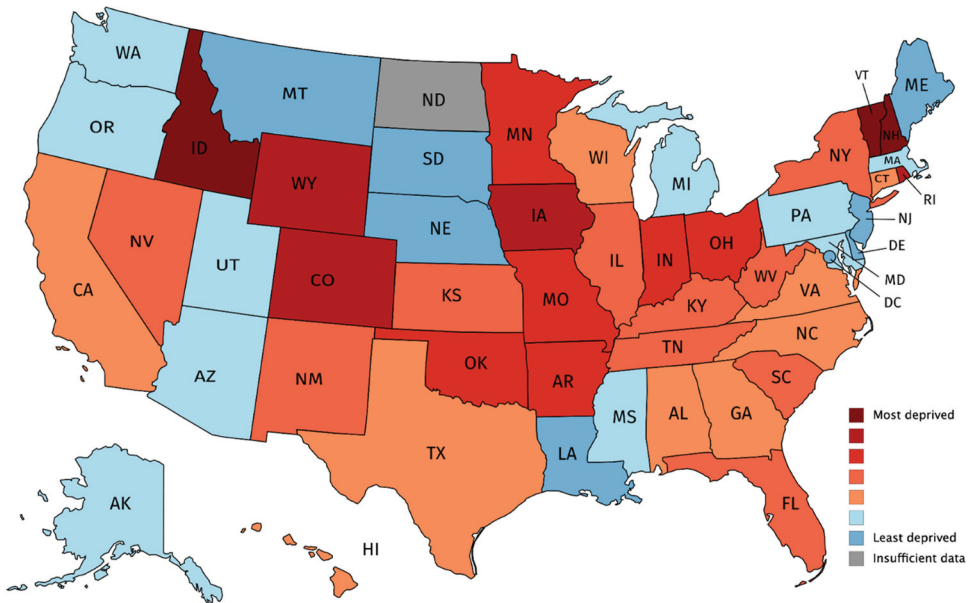


Figure 3 Affection Deprivation by U.S. State, Using Combined Data from Studies 1 and 2 (N = 3,737).

Sexual orientation had a significant effect on affection deprivation, $F(4, 1104) = 7.74, p < .001, \eta^2 = .03$. A Bonferroni test showed that heterosexual adults ($M = 4.79, SD = 1.85$) were less affection deprived than bisexual adults ($M = 5.90, SD = 1.93$); both comparisons with homosexual adults ($M = 5.41, SD = 2.04$) were nonsignificant.

Education level had no effect on affection deprivation.

H1: Association with Loneliness

For illustrative purposes, we examined the prevalence and demographic characteristics of loneliness before testing its predicted association with affection deprivation. Loneliness was measured on a scale of 1 (low deprivation) to 9 (high deprivation), with a theoretic median of 5. The observed mean score was 4.02 ($SD = 1.85$), with an observed median of 3.88 and modal score of 1.00. The distribution appears in [Figure 4](#). The distribution had a moderate positive skew (.302) and slight negative kurtosis (-.531).

Gender had a significant effect on loneliness, $F(3, 1106) = 5.39, p = .001, \eta^2 = .015$. A post-hoc Bonferroni test revealed that transgender individuals ($M = 6.53, SD = 1.92$) reported significantly higher loneliness than both women ($M = 3.89, SD = 1.94$) and men ($M = 4.13, SD = 1.71$) but did not differ from those identifying an “other” gender ($M = 5.21, SD = 1.44$); the latter three groups did not differ from each other. Loneliness showed a negative linear relationship with age, $\beta = -.53, p = .002$, as well as a significant quadratic relationship, $\beta = .35, p = .04$. The quadratic relationship, depicted in [Figure 5](#), indicates that the highest reported level of loneliness was from those 25 years of age and younger, consistent with some extant research in other Western cultures (e.g., Victor & Yang, 2012; but see Barreto et al., 2020).

There were no effects of race or ethnicity. Relationship status exerted a significant effect on loneliness, $F(4, 1103) = 27.28, p < .001, \eta^2 = .10$. A post-hoc Bonferroni test revealed that single adults ($M = 4.76, SD = 1.78$) were lonelier than those who were married ($M = 3.43, SD = 1.65$), in a significant nonmarital relationship ($M = 3.75, SD = 1.77$), or divorced ($M = 4.14, SD = 1.93$). Married individuals were also less lonely than divorced and widowed individuals ($M = 4.17, SD = 1.97$); other comparisons were nonsignificant.

Sexual orientation had a significant effect on loneliness, $F(4, 1104) = 9.01, p < .001, \eta^2 = .03$. A Bonferroni test showed that heterosexual adults ($M = 3.89, SD = 1.80$) were less lonely than homosexual ($M = 4.73, SD = 1.97$) and bisexual adults ($M = 4.92, SD = 1.93$); the latter comparison was nonsignificant. Education level had no effect on loneliness.

Loneliness was highest in the Midwest ($M = 4.06, SD = 1.87$), followed by the West ($M = 4.04, SD = 1.77$), the South ($M = 4.03, SD = 1.92$), and the Northeast ($M = 3.87, SD = 1.74$), yet these differences were nonsignificant, $F(3, 1096) = 1.39, p = .41, \eta^2 = .001$.

To test the association between affection deprivation and loneliness, a hierarchical linear regression was used, with age, gender, relationship status, and sexuality

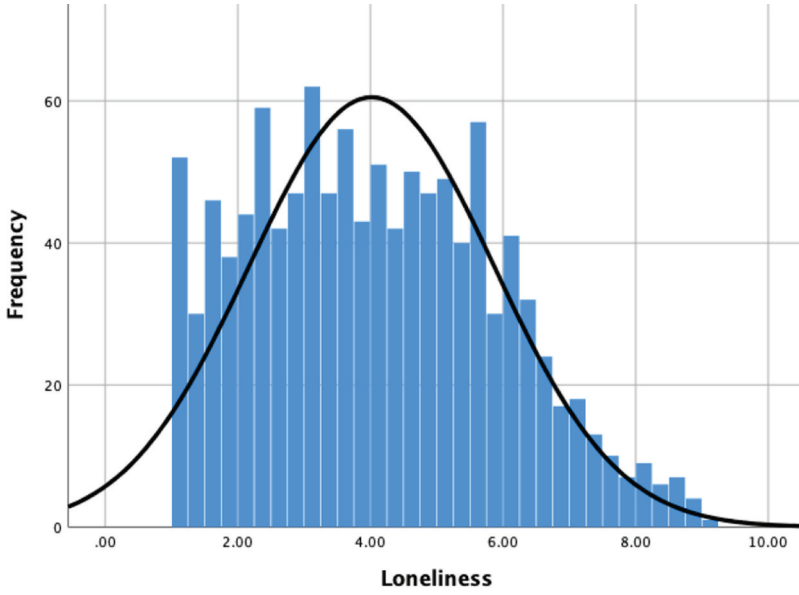


Figure 4 Histogram of Loneliness Scores, Study 2 (N = 1,121).

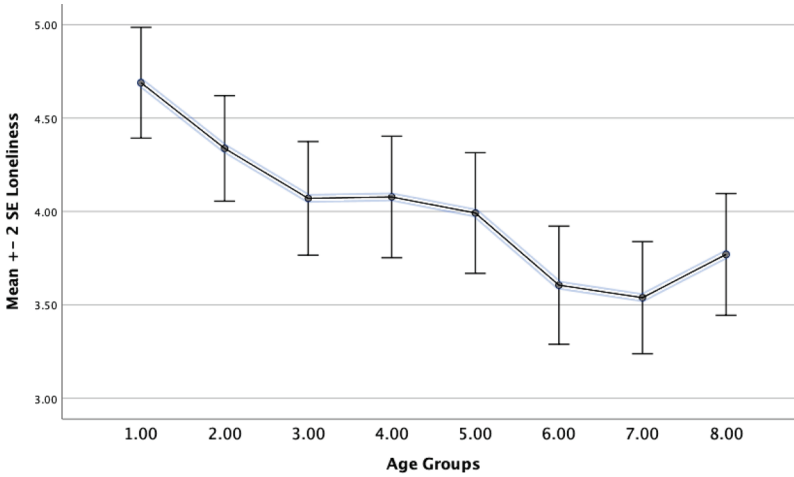


Figure 5 Quadratic Relationship of Loneliness with Age, Study 2 (N = 1,121).

Note. Age groups were 1 = 18–25; 2 = >25–30; 3 = >30–36; 4 = >36–43; 5 = >43–51; 6 = >51–58; 7 = >58–67; 8 = >67.

entered in the first step and affection deprivation entered in the second step. In the regression, only age, gender, and sexuality were significant predictors of loneliness, however, so relationship status was removed in the service of parsimony and the regression was re-calculated. Collinearity diagnostics were unremarkable.⁵ As Table 2 shows, with the effect of age, gender, and sexuality controlled, affection deprivation demonstrated a significant association with loneliness, $\beta = .63$, $p < .001$. The first hypothesis is supported.

H2: Association with Chronic Pain

For illustrative purposes, we examined the prevalence and demographic characteristics of chronic pain before testing its predicted association with affection deprivation. Chronic pain was measured on a scale of 0 (no pain) to 10 (high pain), with a theoretic median of 5. The observed mean score was 3.39 ($SD = 2.66$), with an observed median of 2.67 and modal score of 0.67. The distribution appears in Figure 6. The distribution had a moderate positive skew (.637) and slight negative kurtosis (-.857).

Gender had a significant effect on chronic pain, $F(3, 1106) = 5.00$, $p = .004$, $\eta^2 = .012$. A post-hoc Bonferroni test revealed that women ($M = 3.65$, $SD = 2.77$) reported significantly higher chronic pain than men ($M = 3.06$, $SD = 2.50$), but neither differed significantly from transgender individuals ($M = 3.16$, $SD = 2.78$) or those identifying as “other” genders ($M = 3.37$, $SD = 2.52$). Chronic pain showed a positive linear relationship with age, $\beta = .68$, $p < .000$, as well as a significant quadratic relationship, $\beta = -.63$, $p < .000$. The quadratic relationship, depicted in Figure 7, indicates that the highest reported level of chronic pain was from those 51 to 58 years of age. Asians reported less pain ($M = 2.50$, $SD = 2.42$) than did non-Asians ($M = 3.44$, $SD = 2.67$), Welch’s $t(59.72) = 2.77$, p (two-tailed) = .008, $d = .37$. Finally, relationship status had a significant effect on pain, $F(4, 1103) = 3.34$, $p = .01$, $\eta^2 = .01$. A Bonferroni test showed that single adults reported less chronic pain ($M =$

Table 2 Hierarchical Regression Predicting Loneliness from Affection Deprivation, Study 2 ($N = 1,121$)

Step	Variables	Zero-order r	B	SE B	β	ΔR^2
1	Age	-.18	-.02	.01	.15*	.06*
	Gender	.10	.27	.09	.09*	
	Sexuality	.17	.34	.08	.13*	
2	Age	-.18	-.02	.01	.10*	.38*
	Gender	.10	.27	.09	.05*	
	Sexuality	.17	.34	.08	.06*	
	Affection deprivation	.64	.61	.02	.62*	

Notes. $R^2 = .43$, adjusted $R^2 = .43$. $F(4, 1095) = 210.06$, $p < .001$. * $p < .05$.

2.95, $SD = 2.45$) than those who were married ($M = 3.52$, $SD = 2.78$) or in a significant nonmarital relationship ($M = 3.71$, $SD = 2.64$); other comparisons were nonsignificant. Neither sexuality nor education level had an effect on chronic pain.

To test the association between affection deprivation and chronic pain, a hierarchical linear regression was used, with age, sex, Asian ethnicity, and relationship status entered in the first step and affection deprivation entered in the second step. In the regression, only age and Asian ethnicity were significant predictors of chronic pain, however, so the other control variables were removed in the service of parsimony and the regression was re-calculated. Collinearity diagnostics were unremarkable.⁶ As Table 3 shows, with the effect of age and Asian ethnicity controlled, affection deprivation demonstrated a significant association with chronic pain, $\beta = .14$, $p < .001$. The second hypothesis is supported.

Discussion

This study remedied limitations of Study 1 by recruiting a representative national sample of U.S. adults to document the prevalence and risk factors for affection deprivation and to explore its associations with well-being, in the form of loneliness and chronic pain. Replicating the first study, affection deprivation was again found

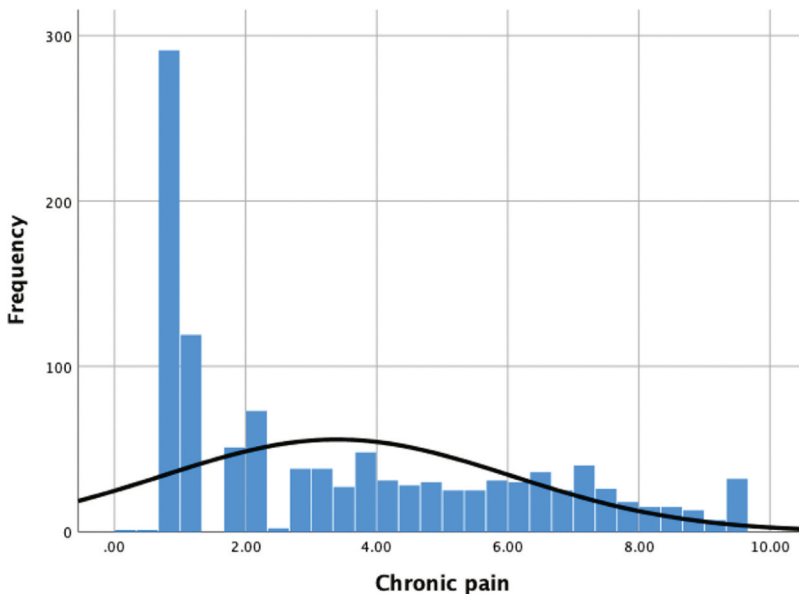


Figure 6 Histogram of Chronic Pain Scores, Study 2 ($N = 1,121$).

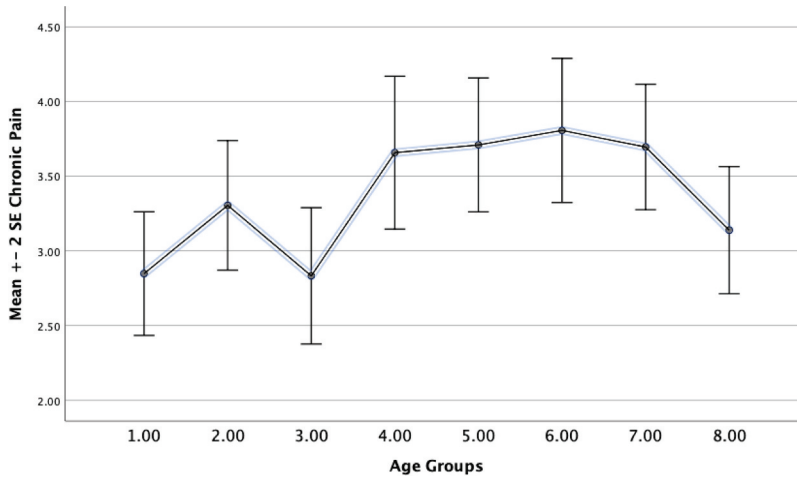


Figure 7 Quadratic Relationship of Chronic Pain with Age, Study 2 ($N = 1,121$).

Note. Age groups were 1 = 18–25; 2 = >25–30; 3 = >30–36; 4 = >36–43; 5 = >43–51; 6 = >51–58; 7 = >58–67; 8 = >67.

to be similar for women and men, inversely associated with age, and unaffected by racial or ethnic background. Study 2 measured a wider range of demographic variables, however, and found that single adults are more affection deprived than adults who are married or romantically partnered. That being unmarried is a risk factor for affection deprivation is understandable insofar as unmarried adults may be less likely than married or partnered adults to cohabit (see, e.g., Nugent & Daugherty, 2018), reducing their opportunities for receiving regular affection. Similarly, Study 2 found that bisexual adults are more affection deprived than heterosexual adults. This difference may reflect social stigma—and resulting minority stress—faced by bisexual adults, relative to their heterosexual counterparts. Whereas one might predict that such a stigma would affect homosexual adults to an even greater degree, some research shows that bisexual adults are at elevated risk of minority stress and associated health problems even compared to gay and lesbian individuals (see Feinstein & Dyer, 2017). It may therefore be understandable that bisexuality emerged as a risk factor for affection deprivation, whereas homosexuality did not.

Study 2 also expanded on the findings from Study 1 by replicating previously identified patterns of covariation with loneliness (Floyd, 2014) and chronic pain (Floyd, 2016a). Although earlier studies reported that affection deprivation is positively related to both conditions, no previous study had used a representative sample, so the current replication provides greater confidence in the results. Instructive is the comparison between effect sizes. Floyd (2014) reported a beta weight of .45 between affection deprivation and loneliness, yet the present study documented an even stronger association, with a beta weight of .63. Although Floyd and Hesse (2017) demonstrated that affection deprivation and loneliness are both conceptually and

Table 3 Hierarchical Regression Predicting Chronic Pain from Affection Deprivation, Study 2 ($N = 1,121$)

Step	Variables	Zero-order r	B	SE B	β	ΔR^2
1	Age	-.10	.01	.01	.06*	.01*
	Asian race	.02	-.97	.37	.08*	
2	Age	-.10	.01	.01	.07*	.02*
	Asian race	.02	-1.01	.37	.08*	
	Affection deprivation	.13	.19	.04	.14*	

Notes. $R^2 = .03$, adjusted $R^2 = .03$. $F(3, 1101) = 10.56$, $p < .001$. * $p < .05$.

empirically distinct constructs, the current study's Census-matched sample confirms a strong pattern of covariation, with 39.9% of variance in affection deprivation accounted for by loneliness. With respect to affection deprivation and chronic pain, Floyd (2016a) found an average beta weight of .14 across three studies, which precisely matches the beta weight identified in the current study. This replication with a representative sample adds credibility to the result, although the pattern of covariation is substantially smaller ($r^2 = .02$) than for loneliness.

General Discussion

Two exploratory studies, with a combined sample size of 3,737 U.S. American adults, investigated potential geographic and demographic risk factors for affection deprivation, and (in Study 2 only) its associations with loneliness and chronic pain. Table 4 summarizes the findings of the two studies.

Studies 1 and 2 differed in two principal ways. First, Study 1 recruited a convenience sample of MTurk workers, and although samples of MTurk workers tend to be *more* representative of the U.S. adult population than other convenience samples—including those recruited from other social media platforms (Casler et al., 2013)—they do not comprise a representative sample. Research indicates that, on average, MTurk workers are younger, underemployed, overeducated, more liberal, and less religious than the general population (Paolacci et al., 2010; Shapiro et al., 2013), and MTurk samples tend to overrepresent Asians and underrepresent African Americans and Hispanic adults, relative to the U.S. adult population (Berinsky et al., 2012). In contrast, Study 2 recruited a Census-matched sample that was representative of the U.S. adult population with respect to age, sex, race, and ethnicity, bolstering the study's external validity. The second principal difference is that Study 2 collected data on several more potential risk factors than did Study 1, as well as on associations with loneliness and chronic pain.

Despite their differences, however, the second study fully replicated the first with respect to geography, sex, age, race, and ethnicity. In both studies, affection

Table 4 *Summary of Findings across Two Studies (N = 3,737)*

Affection Deprivation Is

- Similar for women and men
- Inversely associated with age
- Unaffected by racial/ethnic background
- Higher for single adults than for married/partnered adults*
- Lower for heterosexual adults than bisexual adults*
- Unaffected by education level*
- Positively related to loneliness*
- Positively related to chronic pain*

Loneliness Is*

- Higher for transgender adults than for women and men
- Inversely and curvilinearly associated with age
- Higher for single adults than for married, partnered, and divorced adults
- Higher for divorced and widowed adults than for married adults
- Lower for heterosexual adults than for homosexual and bisexual adults

Chronic Pain Is*

- Higher for women than for men
- Inversely and curvilinearly associated with age
- Lower for Asian adults than non-Asian adults
- Lower for single adults than for married and partnered adults

*Study 2 only

deprivation showed no significant association with geographic location and did not differ as a function of sex or racial or ethnic group. Both studies also demonstrated a small but significant inverse association with age (and a lack of a nonlinear relationship). We can conclude, therefore, that *youth is a weak but reliable risk factor for affection deprivation*, with younger adults feeling more affection deprived than older adults, but we found no evidence that geography, sex, race, and ethnicity are risk factors.

The only conflicting result between the two studies related to the influence of relationship status; whereas Study 1 showed no effect, Study 2 found that single adults are more affection deprived than married or partnered adults. Although Study 1 had a larger sample size, the representative nature of the Study 2 sample warrants greater confidence in that study's finding that *being unmarried is a demographic risk factor for affection deprivation*. This finding is perhaps intuitive, insofar as being married or partnered may provide more opportunity for frequent affection exchange than being single. Given the discrepancy in findings, however, this result warrants replication.

Bisexual orientation is also a risk factor for affection deprivation, according to Study 2, although homosexual orientation is not, at least to a statistically significant degree. One might speculate that the social stigma associated with non-heterosexuality accounts for a perceived lack of adequate affection, a supposition supported by the finding that bi- and homosexual adults were also more lonely than heterosexual adults. AET would argue that individual characteristics that reduce the probability of reproduction—which would include a non-heterosexual orientation—are associated with lesser investment of affection, a hypothesis previously confirmed with gay and bisexual men in the context of their father-son relationships (Floyd, 2001; Floyd et al., 2004). AET, and the evolutionary psychology perspective in general, does not assume that individuals evaluate an individual's reproductive probability consciously when offering affection; nonetheless, characteristics that impinge on reproductive success do lead people to discriminate in their affectionate communication (see, e.g., Floyd & Morman, 2001), which accounts for the finding that heterosexual individuals experience the least affection deprivation and loneliness.

The finding that affection deprivation is linearly related to both loneliness and chronic pain replicates earlier research with a representative national sample, increasing confidence in both associations. Neither correlation suggests a causal relationship, of course. Feeling deprived of affection may lead to somatic complaints such as chronic pain; conversely, experiencing chronic pain may impair one's opportunities or motivation for social interaction, contributing to affection deprivation. Similarly, affection deprivation and loneliness likely have a symbiotic relationship, even though they are conceptually and empirically distinct (Floyd & Hesse, 2017).

Strengths, Limitations, and Implications

Like all research projects, this project benefited from particular strengths and was subject to certain limitations. One strength was a large combined sample of over

3,700 participants representing all 50 U.S. states, Puerto Rico, and the District of Columbia. Samples of this size and geographic diversity are relatively rare in the interpersonal communication field, which has tended to rely on much smaller samples of students drawn from a single college or university (often from a single course). In contrast, the present sample warrants greater confidence in the external validity of findings and in the avoidance of beta errors.

A related strength of the second study was its use of a Census-matched sample. Representative samples are exceedingly rare in interpersonal communication research, yet they warrant far greater confidence in the generalizability of findings, which was an important goal of the studies reported herein. Because the sample was Census-matched, it also represented far greater diversity with respect to age, gender, ethnicity, and race than is typically observed in interpersonal communication studies.

A principal limitation is that, because the studies were descriptive, they were purely cross-sectional, thus supporting no causal inferences. This was not problematic for the identification of risk factors. We would have no reason to claim, for instance, that being young or being bisexual *cause* affection deprivation, only that deprivation is more common among those populations than among others. The cross-sectional nature of the design does limit the inferences we can draw from affection deprivation's significant associations with loneliness and pain, however. It may be that feeling affection deprived leads to pain, for example, or that feeling pain leads people to avoid social interaction and therefore to feel deprived of affection. Either inference is warranted by a correlation, and the causal nature of the association between deprivation and these other outcomes requires further exploration.

Although it was by design, the exclusive focus on U.S. American adults might also be considered a limitation, insofar as affection deprivation, loneliness, and pain may present and/or interact differently in other countries or cultures. The construct of affection deprivation is new enough—having been introduced only in 2014—that much remains to learn about it, and potential cultural effects on the frequency or manifestation of affection deprivation are among those questions that await empirical attention.

The current studies have both applied and theoretic implications. The collective finding that young, unmarried, and/or bisexual adults are at elevated risk for affection deprivation informs prospective efforts to intervene on that condition. Given the wide range of its mental and physical comorbidities (e.g., Floyd, 2014, 2016a), affection deprivation is a good candidate for intervention strategies, which might model those used to intervene on loneliness (Masi, Chen, Hawkey, & Cacioppo, 2011), ostracism (Molet et al., 2013), and social isolation (Dickens et al., 2011). Experimental research may make use of social support provision (Collins & Benedict, 2006), social cognitive training (Marshall et al., 1996), social skills training (Christian & D'Auria, 2006), or expressive writing (Smyth & Pennebaker, 2008) as potential interventions for reducing perceived affection deprivation and

improving its comorbidities. The identification of demographic risk factors would allow such interventions to be targeted to the populations most in need.

Theoretically, the findings from Study 2 are also consistent with the contention, derived from AET and supported by Prescott's (1980) somatosensory affectional deprivation theory, that being deprived of affection needs is deleterious to wellness. The correlations identified in Study 2 do not confirm a causal association, but they are consistent with the proposition that individuals suffer when their needs for affection are unmet. AET proposes what is essentially a "Goldilocks zone" for affectionate behavior, arguing that physical and mental health are bolstered when people give and receive their desired amounts of affection and are stymied when people exchange too little or even too much (see, e.g., Floyd & Burgoon, 1999; Hesse et al., 2018). This work provides important verification of associations with loneliness and pain from a representative sample, increasing confidence in the generalizability of those findings and (by extension) in the theoretic arguments that gave rise to them.

Notes

1. These percentages sum to >100 because some participants selected more than one ethnic/racial identity.
2. These percentages sum to >100 because some participants selected more than one ethnic/racial identity.
3. When using Prime Panels, our survey platform, SurveyMonkey, offers participants the opportunity to make a donation to a charity of their choice in lieu of receiving a direct payment. SurveyMonkey sets the rate of remuneration and Prime Panels is not able to specify the exact amount.
4. We would normally delete cases in which the time to completion was more than 2 standard deviations below the mean. Doing so was impossible in this case, however, because the standard deviation was less than half the mean for completion time, so no cases were removed due to completion time.
5. Tolerance (TOL) and variance inflation factor (VIF) test values were both $1 \pm .072$.
6. TOL and VIF test values were both $1 \pm .013$.

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References

- Aylaz, R., Aktürk, Ü., Erci, B., Öztürk, H., & Aslan, H. (2012). Relationship between depression and loneliness in elderly and examination of influential factors. *Archives of Gerontology and Geriatrics*, 55(3), 548–554. doi:10.1016/j.archger.2012.03.006
- Barreto, M., Victor, C., Hammond, C., Eccles, A., Richins, M. T., & Qualter, P. (2020). Loneliness around the world: Age, gender, and cultural differences in loneliness. *Personality and Individual Differences* Advance online publication. doi: 10.1016/j.paid/2020.110066.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529. doi:10.1037/0033-2909.117.3.497
- Berinsky, A. J., Huber, G. A., & Lenz, G. S. (2012). Evaluating online labor markets for experimental research: Amazon.com's Mechanical Turk. *Political Analysis*, 20(3), 351–368. doi:10.1093/pan/mpr057
- Cacioppo, J. T., Hughes, M. E., Waite, L. J., Hawkey, L. C., & Thisted, R. A. (2006). Loneliness as a specific risk factor for depressive symptoms: Cross-sectional and longitudinal analyses. *Psychology and Aging*, 21(1), 140–151. doi:10.1037/0882-7974.21.1.140
- Cacioppo, J. T., & Patrick, W. (2008). *Loneliness: Human nature and the need for social connection*. W. W. Norton. New York, NY.
- Cacioppo, J. T., & Cacioppo, S. (2014). Social relationships and health: The toxic effects of perceived social isolation. *Social and Personality Psychology Compass*, 8(2), 58–72. doi:10.1111/spc3.12087
- Casler, K., Bickel, L., & Hackett, E. (2013). Separate but equal? A comparison of participants and data gathered via Amazon's MTurk, social media, and face-to-face behavioral testing. *Computers in Human Behavior*, 29(6), 2156–2160. doi:10.1016/j.chb.2013.05.009
- Christian, B. J., & D'Auria, J. P. (2006). Building life skills for children with cystic fibrosis: Effectiveness of an intervention. *Nursing Research*, 55(5), 300–307. doi:10.1097/00006199-200609000-00002
- Collins, C. C., & Benedict, J. (2006). Evaluation of a community-based health promotion program for the elderly: Lessons from Seniors CAN. *American Journal of Health Promotions*, 21(1), 45–48. doi:10.1177/089011710602100108
- Degnar, R. K. (2010). Prevalence of communication apprehension at a community college. *International Journal of Interdisciplinary Social Sciences*, 5(6), 183–191. doi:10.18848/1833-1882/CGP/v05i06/51742
- Dickens, A. P., Richards, S. H., Greaves, C. J., & Campbell, J. L. (2011). Interventions targeting social isolation in older people: A systematic review. *BMC Public Health*, 11(1), Article 647. doi:10.1186/1471-2458-11-647
- Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003, October 10). Does rejection hurt? An fMRI study of social exclusion. *Science*, 302(5643), 290–292. doi:10.1126/science.1089134
- Eisenberger, N. I., & Lieberman, M. D. (2004). Why rejection hurts: A common neural alarm system for physical and social pain. *Trends in Cognitive Sciences*, 8(7), 294–300. doi:10.1016/j.tics.2004.05.010
- Feinstein, B. A., & Dyer, C. (2017). Bisexuality, minority stress, and health. *Current Sexual Health Reports*, 9(1), 42–49. doi:10.1007/s11930-017-0096-3
- Floyd, K., & Morman, M. T. (1998). The measurement of affectionate communication. *Communication Quarterly*, 46(2), 144–162. doi:10.1080/01463379809370092
- Floyd, K., & Burgoon, J. K. (1999). Reacting to nonverbal expressions of liking: A test of interaction adaptation theory. *Communication Monographs*, 66(3), 219–239. doi:10.1080/03637759909376475
- Floyd, K. (2001). Human affection exchange: I. Reproductive probability as a predictor of men's affection with their sons. *The Journal of Men's Studies*, 10(1), 39–50. doi:10.3149/jms.1001.39

- Floyd, K., & Morman, M. T. (2001). Human affection exchange: III. Discriminative parental solicitude in men's affectionate communication with their biological and nonbiological sons. *Communication Quarterly*, 49(3), 310–327. doi:10.1080/01463370109385631
- Floyd, K., Sargent, J. E., & Di Corcia, M. (2004). Human affection exchange: VI. Further tests of reproductive probability as a predictor of men's affection with their fathers and their sons. *The Journal of Social Psychology*, 144(2), 191–206. doi:10.3200/SOCP.144.2.191-206
- Floyd, K. (2006). *Communicating affection: Interpersonal behavior and social context*. Cambridge, England: Cambridge University Press. doi:10.1017/CBO9780511606649
- Floyd, K. (2014). Relational and health correlates of affection deprivation. *Western Journal of Communication*, 78(4), 383–403. doi:10.1080/10570314.2014.927071
- Floyd, K. (2016a). Affection deprivation is associated with physical pain and poor sleep quality. *Communication Studies*, 67(4), 379–398. doi:10.1080/10510974.2016.1205641
- Floyd, K. (2016b). Affection exchange theory. In C. R. Berger & M. E. Roloff (Eds.), *International encyclopedia of interpersonal communication*. Hoboken, NJ: Wiley. doi:10.1002/9781118540190
- Floyd, K., & Hesse, C. (2017). Affection deprivation is conceptually and empirically distinct from loneliness. *Western Journal of Communication*, 81(4), 446–465. doi:10.1080/10570314.2016.1263757
- Floyd, K., Hesse, C., & Generous, M. A. (2018). Affection exchange theory: A bio-evolutionary look at affectionate communication. In D. O. Braithwaite & P. Schrodt (Eds.), *Engaging theories in interpersonal communication* (2nd ed., pp. 17–29). Thousand Oaks, CA: Sage. doi:10.4324/9781315204321
- Floyd, K. (2019). *Affectionate communication in close relationships*. Cambridge, England: Cambridge University Press. doi:10.1017/97811008653510
- Frye-Cox, N. E., & Hesse, C. (2013). Alexithymia and marital quality: The mediating roles of loneliness and intimate communication. *Journal of Family Psychology*, 27(2), 203–211. doi:10.1037/a0031961
- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., & Bunney, W. E., (Eds.) (2002). *Reducing suicide: A national imperative*. Washington, DC: National Academies Press. doi:10.17226/10398
- Gow, A. J., Pattie, A., Whiteman, M. C., Whalley, L. J., & Deary, I. J. (2007). Social support and successful aging: Investigating the relationships between lifetime cognitive change and life satisfaction. *Journal of Individual Differences*, 28(3), 103–115. doi:10.1027/1614-0001.28.3.103
- Hawley, L. C., Preacher, K. J., & Cacioppo, J. T. (2010). Loneliness impairs daytime functioning but not sleep duration. *Health Psychology*, 29(2), 124–129. doi:10.1037/a0018646
- Hawley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, 40(2), 218–227. doi:10.1007/s12160-010-9210-8
- Hays, R. D., Sherbourne, C. D., & Mazel, R. (1995). *User's manual for the medical outcomes study (MOS) core measures of health-related quality of life*. Santa Monica, CA: RAND Corporation.
- Herman, B. H., & Panksepp, J. (1978). Effects of morphine and naloxone on separation distress and approach attachment: Evidence for opiate mediation of social affect. *Pharmacology, Biochemistry, and Behavior*, 9(2), 213–220. doi:10.1016/0091-3057(78)90167-3
- Hesse, C. (2015). *Porn and health: The mediating role of affection deprivation* [Unpublished manuscript]. Department of Speech Communication, Oregon State University. <https://liberalarts.oregonstate.edu/sac/speech-communication>. Accessed October 3, 2018.
- Hesse, C., & Mikkelsen, A. C. (2017). Affection deprivation in romantic relationships. *Communication Quarterly*, 65(1), 20–38. doi:10.1080/01463373.2016.1176942

- Hesse, C., Mikkelsen, A. C., & Saracco, S. (2018). Parent-child affection and helicopter parenting: Exploring the concept of excessive affection. *Western Journal of Communication*, 82(4), 457–474. doi:10.1080/1050314.2017.1362705
- Hesse, C., & Floyd, K. (2019). Affection substitution: The effect of pornography consumption on close relationships. *Journal of Social and Personal Relationships*, 36(11–12), 3887–3907. doi:10.1177/0265407519841719
- House, J. (2001). Social isolation kills, but how and why? *Psychosomatic Medicine*, 63(2), 273–274. doi:10.1097/00006842-200103000-00011
- Jaremka, L. M., Fagundes, C. P., Glaser, R., Bennett, J. M., Malarkey, W. B., & Kiecolt-Glaser, J. K. (2013). Loneliness predicts pain, depression, and fatigue: Understanding the role of immune dysregulation. *Psychoneuroendocrinology*, 38(8), 1310–1317. doi:10.1016/j.psyneuen.2012.11.016
- Jaremka, L. M., Fagundes, C. P., Peng, J., Bennett, J. M., Glaser, R., Malarkey, W. B., & Kiecolt-Glaser, J. K. (2013). Loneliness promotes inflammation during acute stress. *Psychological Science*, 24(7), 1089–1097. doi:10.1177/0956797612464059
- Kross, E., Berman, M. G., Mischel, W., Smith, E. E., & Wager, T. D. (2011). Social rejection shares somatosensory representations with physical pain. *Proceedings of the National Academy of Sciences*, 108(15), 6270–6275. doi:10.1073/pnas.1102693108
- Kurina, L. M., Knutson, K. L., Hawkey, L. C., Cacioppo, J. T., Lauderdale, D. S., & Ober, C. (2011). Loneliness is associated with sleep fragmentation in a communal society. *Sleep*, 34(11), 1519–1526. doi:10.5665/sleep.1390
- Kuwert, P., Knaevelsrud, C., & Pietrzak, R. H. (2014). Loneliness among older veterans in the United States: Results from the National Health and Resilience in Veterans Study. *The American Journal of Geriatric Psychiatry*, 22(6), 564–569. doi:10.1016/j.jagp.2013.02.013
- Lasgaard, M., Goossens, L., & Elklit, A. (2011). Loneliness, depressive symptomatology, and suicide ideation in adolescence: Cross-sectional and longitudinal analysis. *Journal of Abnormal Child Psychology*, 39(1), 137–150. doi:10.1007/s10802-010-9442-x
- Levine, M. P. (2012). Loneliness and eating disorders. *Journal of Psychology*, 146(1–2), 243–257. doi:10.1080/00223980.2011.606435
- MacDonald, G., & Leary, M. R. (2005). Why does social exclusion hurt? The relationship between social and physical pain. *Psychological Bulletin*, 131(2), 202–223. doi:10.1037/0033-2909.131.2.202
- MacDonald, G., & Jensen-Campbell, L. A., Eds. (2011). *Social pain: Neuropsychological and health implications of loss and exclusion*. Washington, DC: American Psychological Association. doi:10.1037/12351-000
- Marshall, W. L., Bryce, P., Hudson, S. M., Ward, T., & Moth, B. (1996). The enhancement of intimacy and the reduction of loneliness among child molesters. *Journal of Family Violence*, 11(3), 219–235. doi:10.1007/BF02336942
- Masi, C. M., Chen, H.-Y., Hawkey, L. C., & Cacioppo, J. T. (2011). A meta-analysis of interventions to reduce loneliness. *Personality and Social Psychology Review*, 15(3), 219–266. doi:10.1177/1088868310377394
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370–396. doi:10.1037/h0054346
- Masten, C. L., Morelli, S. A., & Eisenberger, N. I. (2011). An fMRI investigation of empathy for 'social pain' and subsequent prosocial behavior. *NeuroImage*, 55(1), 381–388. doi:10.1016/j.neuroimage.2010.11.060
- Molet, M., Macquet, B., Lefebvre, O., & Williams, K. D. (2013). A focused attention intervention for coping with ostracism. *Consciousness and Cognition*, 22(4), 1262–1270. doi:10.1016/j.concog.2013.08.010

- Momtaz, Y. A., Hamid, T. A., Yusoff, S., Ibrahim, R., Chai, S. T., Yahaya, N., & Abdullah, S. S. (2012). Loneliness is a risk factor for hypertension in later life. *Journal of Aging and Health, 24*(4), 696–710. doi:10.2277/08982643114311305
- Murthy, V. (2017, September 27). Work and the loneliness epidemic. *Harvard Business Review*. Retrieved from <https://hbr.org/cover-story/2017/09/work-and-the-loneliness-epidemic>
- Nugent, C. N., & Daugherty, J. (2018). A demographic, attitudinal, and behavioral profile of cohabiting adults in the United States, 2011-2015. *National Health Statistics Reports, 111*, 1–11.
- Panksepp, J., Herman, B. H., Conner, R., Bishop, P., & Scott, J. P. (1978). The biology of social attachments: Opiates alleviate separation distress. *Biological Psychiatry, 13*(5), 607–618. doi:10.1016/0361-9230(78)90014-X
- Panksepp, J., Vilberg, T., Bean, N. J., Coy, D. H., & Kastin, A. J. (1978). Reduction of distress vocalization in chicks by opiate-like peptides. *Brain Research Bulletin, 3*(6), 663–667. doi:10.1016/0361-9230(78)90014-X
- Panksepp, J. (2003, October). Feeling the pain of social loss. *Science, 302*(5643), 237–239. doi:10.1126/science.1091062
- Paolacci, G., Chandler, J., & Ipeirotis, P. G. (2010). Running experiments on Amazon Mechanical Turk. *Judgment and Decision Making, 5*(5), 411–419.
- Pinborough-Zimmerman, J., Satterfield, R., Miller, J., Bilder, D., Hossain, S., & McMahon, W. (2007). Communication disorders: Prevalence and comorbid intellectual disability, autism, and emotional/behavioral disorders. *American Journal of Speech-Language Pathology, 16*(4), 359–367. doi:10.1044/1058-0360(2007)039
- Prescott, J. W. (1976). Somatosensory deprivation and its relationship to the blind. In Z. S. Jastrzemska (Ed.), *The effects of blindness and other impairments on early development* (pp. 65–121). New York, NY: American Foundation for the Blind.
- Prescott, J. W. (1979). Deprivation of physical affection as a primary process in the development of physical violence: A comparative and cross-cultural perspective. In D. G. Gil (Ed.), *Child abuse and violence* (pp. 66–137). Washington, DC: American Orthopsychiatric Association.
- Prescott, J. W. (1980). Somatosensory affectional deprivation (SAD) theory of drug and alcohol use. In D. J. Lettieri, M. Sayers, & H. W. Pearson (Eds.), *Theories on drug abuse: Selected contemporary perspectives* (pp. 286–302). Washington, DC: National Institute of Drug Abuse.
- Qualter, P., Quinton, S. J., Wagner, H., & Brown, S. (2009). Loneliness, interpersonal distrust, and alexithymia in university students. *Journal of Applied Social Psychology, 39*(6), 1461–1479. doi:10.1111/j.1559-1816.2009.00491.x
- Russell, D. W. (1996). UCLA loneliness scale (version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment, 66*(1), 20–40. doi:10.1207/s15327752jpa6601_2
- Schutz, W. C. (1958). *FIRO: A three-dimensional theory of interpersonal behavior*. New York, NY: Rinehart.
- Shapiro, D. N., Chandler, J., & Mueller, P. A. (2013). Using Mechanical Turk to study clinical populations. *Clinical Psychological Science, 1*(2), 213–220. doi:10.1177/2167702612469015
- Smyth, J. M., & Pennebaker, J. W. (2008). Exploring the boundary conditions of expressive writing: In search of the right recipe. *British Journal of Health Psychology, 13*(1), 1–7. doi:10.1348/135910707X260117
- Stickley, A., & Koyanagi, A. (2016). Loneliness, common mental disorders and suicidal behavior: Findings from a general population survey. *Journal of Affective Disorders, 197*, 81–87. doi:10.1016/j.jad.2016.02.054
- Stravynski, A., & Boyer, R. (2001). Loneliness in relation to suicide ideation and parasuicide: A population-wide study. *Suicide & Life-Threatening Behavior, 31*(1), 32–40. doi:10.1521/suli.31.1.32.21312

- Thurston, R. C., & Kubzansky, L. D. (2009). Women, loneliness and incident coronary heart disease. *Psychosomatic Medicine*, 71(8), 836–842. doi:10.1097/PSY.0b013e3181b40efc
- U.S. Census Bureau. (2019). Census regions and divisions of the United States. Retrieved from https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf. Accessed February 19, 2019.
- Victor, C. R., & Yang, K. (2012). The prevalence of loneliness among adults: A case study of the United Kingdom. *Journal of Psychology*, 146(1–2), 85–104. doi:10.1080/00223980.2011.613875
- Williams, K. D. (2007). Ostracism. *Annual Review of Psychology*, 58(1), 425–452. doi:10.1146/annurev.psych.58.110405.085641