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Shame and Social Interaction Quantity and Quality in Daily Life: The Moderating Effect of Social Anxiety

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SHAME AND SOCIAL INTERACTION QUANTITY AND QUALITY IN DAILY LIFE: THE MODERATING EFFECT OF SOCIAL ANXIETY

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Abstract

Frequent and fulfilling engagement in social interaction is paramount to human success and wellbeing. Yet, many individuals do not engage in social interactions of sufficient quantity and/or quality. Though some research indicates shame influences social behavior, the nature of this effect is unclear. Some research suggests shame is associated with effective engagement in social interaction, whereas other work indicates shame is associated with maladaptive avoidance of social interaction. One potential explanation for equivocal results may be a lack of accounting for mental health concerns, such as social anxiety. Social anxiety is positively associated with social impairments and shame, yet research evaluating relations of each of these variables, or their temporal effects, is limited. Accordingly, the present study aimed to identify the relations of social interaction quantity and quality, state shame, and trait social anxiety symptom severity using a daily process experience sampling method in a college student sample (N = 64). Cross-sectional results suggested that state shame was positively associated with trait social anxiety symptom severity, social interaction quantity, and negative social interaction quantity and inversely associated with positive social interaction quantity. Trait social anxiety symptom severity was positively associated with state shame, inversely associated with social interaction quantity, and attenuated the shame-interaction quantity relation, but was unrelated to positive and negative social interaction quality. State shame was not a predictor of social interaction quantity or quality at next timepoint. High social interaction quantity predicted subsequent elevations in state shame at high levels of trait social anxiety symptom severity only. Negative social interaction quality predicted subsequent decreases in state shame and positive social interaction quality was unrelated. Results provide support for the social approach theory of shame and are discussed with consideration of contextual implications and study limitations.

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Introduction

Social interaction is vital to human success and well-being. Across human evolutionary history, individuals adopted conflict resolution strategies characterized by effective social behavior, such as cooperation and formation of alliances (G. Snyder, 2007; Tomasello & Gonzalez-Cabrera, 2017). These behaviors were exhibited by individuals who demonstrated social approach, assertion, and generosity (Anderson et al., 2001; Burgoon et al., 1998; Halevy et al., 2012). Positive social behaviors enhanced individual survival and reproduction, facilitating a genetic advantage for individuals who approached and engaged with others (Tomasello, 2010). Thus, interaction with others enabled human beings to survive, reproduce, and flourish.

Social interaction continues to be beneficial in the present day. Social interaction quantity, or frequency of social interaction, and social interaction quality, or subjective satisfaction derived from interaction with others, are two aspects of social interaction that are of particular interest to researchers (Fiorillo & Sabatini, 2011). Social interaction quantity and quality are associated with a variety of positive consequences. For example, quality of life is predicted by social interaction, such that following engagement in social interaction, individuals report significant quality of life increases across social, physical, and psychological domains (Datta et al., 2015). Investigation into specific domains of life reveal considerable benefits associated with high quantity and quality of social interaction. Individuals who engage in frequent and meaningful social interactions report better interpersonal relationships with their friends (Emmers-Sommer, 2004; Parker & Asher, 1993), family members (Dorrance Hall & Shebib, 2020), and romantic partners (Emmers-Sommer, 2004; Levenson & Gottman, 1985). Positive consequences also extend to education (e.g., M. Richardson et al., 2012) and the

workplace (e.g., Mathieu et al., 2019). Thus, engaging in frequent and high-quality social behavior has wide-ranging benefits.

In contrast, insufficient quantity and quality of social interaction appears associated with negative consequences. For example, loneliness and lack of emotional support are associated with low quality of life (e.g., Kuczynski et al., 2019; Moreno-Tamayo et al., 2020) and high rates of psychiatric disorders (e.g., Porcelli et al., 2019), suicide-related behavior, and non-suicidal self-injury (Shaw et al., 2021). Despite these poor outcomes, rates of loneliness and isolation are increasing (Cacioppo & Cacioppo, 2018; Holt-Lunstad, 2017), which may be of relevance to college students who are particularly susceptible to negative consequences of social isolation. For example, college-aged individuals are more likely to respond to social stress with avoidance relative to younger individuals (Bangee et al., 2014; Qualter et al., 2013), and socially avoidant behavior in college students is predictive of internalizing problems and interpersonal difficulties (Nelson, 2013). To inform methods to reduce and prevent occurrence of these outcomes in college students, identifying factors associated with impairment in social behavior is indicated.

Two factors, shame, a self-conscious emotion characterized by negative evaluations of the self (Tangney et al., 1996), and social anxiety, defined as the fear of anticipated negative evaluation by others (Hofmann et al., 2010), may partially explain college students' difficulties with social interaction quantity and quality. Yet, results of research evaluating the relation of social behavior and shame have been equivocal. Some researchers report shame is associated with approaching others and engaging in prosocial interactions (e.g., de Hooge et al., 2018), whereas others indicate shame is associated with avoiding interpersonal interactions (e.g., Chao et al., 2011; Leith & Baumeister, 1998). One reason for such discrepancies may be inattention to mental health considerations, such as social anxiety, within some investigations.

Indeed, social anxiety exerts a clear negative effect on social behavior (e.g., Rodebaugh et al., 2014; Sparrevohn & Rapee, 2009). Furthermore, shame and social anxiety often co-occur (e.g., Levinson et al., 2016); researchers consistently report a moderate positive association between the two (e.g., Fergus et al., 2010; P. Gilbert, 2000; Matos et al., 2013). Notably, some research indicates that, in the context of social anxiety symptoms, shame predicts high social avoidance and anxiety symptoms during interpersonal interactions (Lutwak & Ferrari, 1997). Thus, individuals who experience both shame and social anxiety may avoid more social interactions and, when they do engage in social interaction, have more aversive experiences relative to individuals who experience shame but not social anxiety.

However, several limitations of existing research have led to an incomplete account of these relations. For example, Lutwak and Ferrari (1997) examined proneness to feel shame (i.e., trait-level shame), rather than shame experienced in the present-moment (i.e., state-level shame), which are theorized to be different constructs (c.f. Tangney et al., 1996). Moreover, these results were based on self-reported cross-sectional data, which precludes identification of temporal relations. Of note, no studies have examined state shame and social interaction quantity and quality in the context of social anxiety. Thus, intensive longitudinal research designs that may allow for additional specificity of the relations of shame, social anxiety, and social interactions across time are warranted.

Use of experience sampling methods (ESM) may alleviate some limitations of prior research. Using ESM to conduct emotion and social behavior research appears more useful than cross-sectional self-report methods. For example, relative to typical self-report methods, ESM enables more accurate assessment of emotion and behavior patterns due to the capture of high frequency responses that are closer in time to the experienced event, which reduces retrospective

response biases (Lucas, 2000; Scollon et al., 2009). Moreover, some ESM designs, such as signal-contingent (i.e., responses are provided when prompted by researchers) daily process designs, facilitate greater validity in linking emotion to specific situations or circumstances, as well as the temporal natures of such relations, as they occur in daily life (Lucas, 2000). For instance, the only study designed to examine the relations of shame, social anxiety, and social behavior using ESM suggested that trait social anxiety predicts shame experienced during social interactions (Lazarus & Sahar, 2018). Yet, no study using ESM has examined how shame and social anxiety predict initial engagement in social interaction, nor if social interaction predicts state shame following social interactions. Thus, applying daily process ESM in the context of social interaction quantity and quality, shame, and social anxiety may clarify how these variables influence one another in daily life.

Building upon extant research, the present study will use daily process ESM to evaluate relations of social interaction quantity and quality, shame, and social anxiety symptoms in a sample of college students. Specific aims include (a) identifying relations of these variables, (b) clarifying the moderating effect of social anxiety on the shame-social interaction relations, and (c) investigating the time-dependent relations of these constructs. Specifying how shame and social anxiety may lead to social interaction deficiencies may inform interventions that reduce risks associated with low levels of social behavior.

Social Interaction

Outcomes Associated with Quantity and Quality

Engaging in frequent social interaction is associated with wide-reaching positive outcomes. For example, considerable research indicates that high social interaction quantity, or the frequency at which social interactions occur (Fiorillo & Sabatini, 2011), is associated with

greater psychological health and general well-being (Fiorillo & Sabatini, 2011; Ono et al., 2011). This relation has been observed across a variety of research methods, including use of mechanical clickers to count interactions as they occur (Sandstrom & Dunn, 2014a), retrospective and momentary self-reports (Kushlev et al., 2018; Lucas et al., 2008; Rohrer et al., 2018; Srivastava et al., 2008; Sun et al., 2020; Watson et al., 1992), and observer-reports (Mehl et al., 2010; Milek et al., 2018; Sun et al., 2020). Quality of life is also predicted by social interaction. Following engagement in social interaction, individuals report significant quality of life increases across social, physical, and psychological domains, and those who interact on more occasions experience significantly greater increases in these domains (Datta et al., 2015). Yet, social interaction quantity alone does not appear to fully account for the relations of social interaction and associated outcomes. Researchers theorize that the characteristics, rather than mere frequency, of interactions underlie good outcomes predicted by social interaction quantity (Datta et al., 2015; Fiorillo & Sabatini, 2011; Ono et al., 2011). Thus, it is important to examine how individuals *perceive* social interactions, in addition to the quantity of social interactions.

The examination of social interaction quality, or subjective satisfaction derived from interaction with others (Fiorillo & Sabatini, 2011), may clarify relations of social behavior and positive outcomes. Researchers theorize that individuals are reinforced by interactions that contribute to the formation of strong and stable interpersonal relationships (Baumeister & Leary, 1995). Accordingly, Baumeister and Leary (1995) suggest that social interactions should be frequent in quantity and perceived as satisfying and non-aversive for a person to realize full benefits. Extant research supports this theory. Individuals who report supportive and satisfying (versus non-supportive or non-satisfying) relationships also report greater well-being (Lyubomirsky et al., 2005). This finding has also been supported via observer ratings of

behavior. In one study, researchers coded audible verbal behavior for quality of social interactions and found a positive association of social interaction quality and life satisfaction (Milek et al., 2018). High-quality interactions may also be protective against negative outcomes. For example, results of one study indicated that supportive social interactions buffered against the adverse effects of negative social interactions (Sloan, 2012). Thus, high-quality social interactions appear to have a stronger effect on outcomes relative to low-quality interactions, further highlighting the importance of the quality of interactions. As such, social interaction quality appears critical to the occurrence of beneficial outcomes, and nonoccurrence of detrimental outcomes, for individuals.

Additional research highlights the importance of measuring objective quantity and subjective quality of social interactions simultaneously. Extant research on social support, a construct assessed within psychological science that incorporates quantity and quality of social interaction (Wills & Fegan, 2001), elucidates the importance of both constructs. A meta-analysis (Haber et al., 2007) identified a moderate correlation of received social support, defined as specific instances of social support provided to recipients (Sarason et al., 1990), and perceived social support, defined as global satisfaction with support received (Sarason et al., 1990). Yet, social support received accounted for just 10-15% of the variance in perceived social support, which further suggests assessing the occurrence of social interactions (i.e., quantity) is best supplemented by measures of perceptions of social interaction quality. Indeed, quantity and quality each appear important in understanding related outcomes. For example, interaction quality mediates the relation of interaction quantity and adjustment to stressful life events (Wethington & Kessler, 1986) and college student academic self-efficacy (Altermatt, 2019).

Thus, if one were to examine occurrence of social transactions without examining perceptions of interactions, the true relations between constructs may be overlooked.

Contextual Factors Associated with Interaction Quantity and Quality

It is also important to consider contextual factors that may impact outcomes associated with social interactions, as outcomes may differ among specific population, relationship, and research contexts. For example, relative to other populations, social interaction may be especially advantageous for college students. Social interaction quantity and quality result in positive education-related benefits among this population. The establishment and maintenance of quality social interactions with peers is a strong predictor of academic performance and retention in college student samples (M. Richardson et al., 2012; Robbins et al., 2004). Indeed, college students who feel connected to and involved with their college community demonstrate better academic performance and retention rates relative to individuals who report lower levels of social interaction and support (e.g., Flynn, 2014; Purswell et al., 2008). Among graduate students, social support is positively associated with program satisfaction (Tompkins et al., 2016). Among undergraduates, social support is associated with college satisfaction broadly (Barry & Okun, 2011) and perceptions of autonomy, competence, and overall satisfaction with one's academic major (Schenkenfelder et al., 2020). As such, frequent high-quality social interactions are associated with both academic achievement and satisfaction, outcomes that emphasize the importance of having an accurate understanding of social quantity and quality in the context of college populations.

Researchers have also investigated social interaction quality across relationship contexts, including the differential effects of interaction quality when interacting with close (e.g., family; friends) versus distant others (e.g., acquaintances; strangers). Some of this research suggests

interactions with close (vs. distant) others presents opportunities for interactions of greater quality (Venaglia & Lemay, 2017). Individuals tend to rate interactions that occur with close others as being of higher quality than interactions that occur with weakly-tied others (Mueller et al., 2019). Yet, other researchers suggest that differences in relationship quality in interactions between close versus distant others are minimal (Sandstrom & Dunn, 2014b), as evidenced by equivalent levels of happiness and belongingness reported by individuals who interact with partners of varied distance (Dunn et al., 2007; Sandstrom & Dunn, 2014b). Indeed, interactions with strangers or acquaintances can be rewarding. For example, public transit commuters who interact with a stranger report more positive feelings compared to those who do not interact with anyone (Epley & Schroeder, 2014). Likewise, café patrons who engage in brief, genuine social interactions with a barista report greater satisfaction relative to patrons who forego social interaction (Sandstrom & Dunn, 2014b). Thus, research suggests individuals often report subjective satisfaction following interactions, regardless of the closeness of the other individual.

Some researchers have also applied multimethod evaluations to the study of quantity and quality of social interaction. Using electronically activated audio recorders and momentary self-report assessments conducted four times a day for one week, researchers explored the effect of researcher-observed versus self-reported quantity and quality of social interactions on well-being (Sun et al., 2020). Results indicated that researcher-observed and self-reported quantity and quality of social interactions were each associated with overall well-being. However, the effect size associated with social interaction quality was larger and more consistent for self-reported and within-person associations relative to researcher-observed and between-person associations.

Several conclusions can be drawn from these results. First, the convergence of findings across methods suggests the relation of social interaction quality and well-being are not simply

effects of method bias. Second, the stronger relation associated with self-report relative to observational methods indicates self-report may better account for specific, ideographically perceived aspects of interaction quality in daily life, such as the extent to which participants liked their interaction partners. Third, investigating within-person changes in social behavior offers empirical value, as between-person comparisons may not adequately account for individual differences. For example, social interaction quantity may be positively associated with well-being within a group, though such analyses may not capture individual-level fluctuations that may be affected by contextual or personal factors associated with specific interactions (e.g., greater than typical decreases in well-being when an individual engages in social interaction when experiencing specific distress). Thus, researchers seeking to examine social interaction quantity and quality outside of a laboratory should include self-report measures and analyze findings within-person to best understand individual experiences.

Social Interaction Challenges

Despite the positive outcomes associated with social behavior, many individuals do not engage in frequent and fulfilling social interactions. Loneliness and social isolation appear to be increasing over time (Cacioppo & Cacioppo, 2018; Holt-Lunstad, 2017); the number of United States adults who report having no close relationships has tripled since the 1980's (McPherson et al., 2006). Researchers postulate that this change has occurred due to shifts in societal values, modes of communication (e.g., cell phones; internet), and demographic characteristics. The combination of these factors is thought to have led to fewer close ties and more disconnected and geographically dispersed relationships. Such effects are especially stark for those with high education levels. Individuals with more education are less likely to interact with members of their local community and are more likely to interact with less-localized individuals of similar

educational achievement, often via technology (McPherson et al., 2006). As such, college students may be limited in the quantity and overall quality of interactions they experience. Given associations between educational attainment and trends in social interaction, the college student population is an important group within which to explore factors that affect social behavior.

Additional developmental factors seem to influence social interactions in college students. College students are especially susceptible to experiencing loneliness or isolation, as they are tasked with adapting to many life changes, including a new social context (Qualter et al., 2015). For example, the shift to college often requires individuals to develop new relationships on campus while navigating changes in existing relationships. Notably, this commonly occurs at an age in which social and romantic interactions are particularly important for most (Qualter et al., 2015). Further complicating social adjustment is the number of new experiences one has in college, including a greater number and variety of social interactions, which is theorized to lead to greater uncertainty about what may be considered appropriate social behavior within each interaction (Thompson & Rapee, 2002). Thus, individuals who were socially skilled in other environments may not have the learning history required to successfully navigate new contexts, which may impair social behavior. Indeed, college-aged individuals are more likely to avoid social situations in response to social stress relative to younger individuals (Bangee et al., 2014; Qualter et al., 2013).

When college students do engage in effective social behavior, their perceptions of interaction quality may be influenced by misconceptions about college. Extant research indicates most incoming students do not have accurate social expectations for college (Smith & Wertlieb, 2005). For example, incoming students predict they will make more friends and get along better with their roommates than they actually do. Operating under these false expectations may lead to

perceptions of inadequate social interactions even when quantity is high. Indeed, many students who report sufficient quantity of social interaction still feel lonely or isolated if the quality of their social interactions are discrepant from their expectations (Hawkley et al., 2003; T. Richardson et al., 2017). Thus, college students are often challenged by new social contexts and less satisfied with their interactions that do not meet expectations. As such, identifying factors that relate to social interaction quantity and quality may highlight avenues by which outcomes related to social behavior may be improved for college student populations. One variable that appears related to engagement in social interactions is shame.

Shame

Shame is a self-conscious emotion that occurs in response to persistent and global negative self-perceptions, often in response to perceived moral or social transgressions (Ferguson et al., 1991; Izard, 1977; Kaufman, 1989; H. Lewis, 1971; Tangney et al., 1996). Though it is related to other self-conscious emotions such as guilt and embarrassment, shame is a distinct emotional construct. Guilt is associated with specific unfavorable behavioral attributions (e.g., "The action I took was bad"), whereas shame is characterized by generalized unfavorable internal attributions (e.g., "I am bad"; Klass, 1990; Lindsay-Hartz et al., 1995; Tangney & Dearing, 2002). In contrast to the perceptions of personal responsibility present in guilt and shame, embarrassment is characterized by fleeting and accidental behavior violations that, while unfavorable, are perceived by an individual as being largely out of their control (N. Eisenberg, 2000; Klass, 1990; Modigliani, 1968; Tangney et al., 1996). To illustrate these differences, imagine that an individual says something unfriendly to an acquaintance. If they feel negatively about that behavior, they are experiencing guilt. If they feel negatively about themselves, they

are experiencing shame. If they view the statement as being an accidental slip of the tongue that is unrelated to their perception of themselves, they are experiencing embarrassment.

Shame has been defined and evaluated at the state and dispositional levels. State-level shame, often referred to as experienced shame (e.g., de Hooge et al., 2008), is conceptualized as shame experienced in the present moment (Tangney & Dearing, 2002). In contrast, the tendency to experience shame on a dispositional level is defined as trait shame, also called shame-proneness (Harder et al., 1992; Tangney, 1999). In college student populations, trait shame tends to be moderately elevated (Conroy et al., 2015; O'Leary et al., 2019; Wielgus et al., 2018) and state shame appears to frequently occur at low intensity with infrequent, high-intensity bursts (Conroy et al., 2015; Merz & Roesch, 2011; Turner, 2014). Across populations, high state and trait shame are associated with negative outcomes including presence of psychiatric symptoms (Allan et al., 1994; Leonard et al., 2020; Porter et al., 2018; Rüsch et al., 2007), non-suicidal self-injury (Mahtani et al., 2017; Schoenleber et al., 2014; VanDerhei et al., 2014; Wielgus et al., 2018), and suicide-related thoughts and behaviors (Bryan et al., 2013; Hastings et al., 2002; Kõlves et al., 2011), as well as poor physical health (Dickerson et al., 2004; Lamont, 2015, 2019) and low quality of life (Rüsch et al., 2007; Singh et al., 2016).

Researchers examining shame frequently highlight associations between shame and judgements about the self. For example, state shame is positively associated with many negative self-related feelings such as incompetence, powerlessness, worthlessness, inadequacy, and inferiority (Izard, 1991; Keltner & Harker, 1998; M. Lewis, 1992; Tangney, 1999; Tangney et al., 1996, 2007; Wicker et al., 1983). These feelings may be especially troublesome as they frequently include comparisons of the self to others (de Hooge, 2013; Tangney & Dearing, 2002). Indeed, existing evidence suggests that shame is associated with heightened focus on self-

other relationships. For example, individuals experiencing shame demonstrate increased self-focused attention, hypervigilance to the potential of evaluation by others, and sensitivity to the words and perceptions of others (Fessler, 2004; P. P. Gilbert, 2007; Izard, 1991; Sabini & Silver, 1997; Tangney & Dearing, 2002). Moreover, the effects of shame-related self-perceptions may impact how individuals interact with others.

Extant research indicates that shame is related to many interpersonal problems. For example, trait shame is positively associated with interpersonal impairment among individuals with mental health concerns, including borderline personality disorder (Cameron et al., 2021) and eating disorders (Sanftner et al., 1995). Yet, interpersonal impairment associated with shame is not only relevant in the context of mental illness. Shame-prone undergraduate college students report lower interpersonal problem-solving self-efficacy, which is corroborated by observers who identify poorer quality solutions generated by these participants relative to non-shame-prone individuals (Covert et al., 2003). In another study, college students were asked to recall a time they experienced interpersonal conflict and report emotional and behavioral consequences of the conflict (Leith & Baumeister, 1998). Results indicated that trait shame was positively associated with long-term interpersonal problems, such as low empathy for the other person, ongoing relationship conflict, and relationship dissolution. Together, these findings indicate that shame is associated with detriments in actual and perceived interpersonal performance and may have momentary and long-term social consequences for individuals with and without mental illness. Yet, researchers remain divided on if shame serves an adaptive or maladaptive social function.

The Social Purpose of Shame

Researchers theorize that shame signals a moral transgression and arises in response to threats to interpersonal relationships (Kaufman, 1989; H. Lewis, 1971). However, the specific

function of shame remains debated among scholars. Many researchers suggest that, despite associated interpersonal difficulties, the onset of shame is predictive of engagement in social interactions (de Hooge et al., 2008, 2018; Keltner & Harker, 1998; Roseman et al., 1994; Tangney et al., 1996). Others, however, suggest shame leads to avoidance of social interactions (Chao et al., 2011; Leith & Baumeister, 1998; Scherer & Wallbott, 1994; Tangney et al., 1996; Wicker et al., 1983). Each of these theories, and their accompanying empirical evidence, is reviewed below.

As noted, some researchers theorize shame increases the likelihood of social interaction. Specifically, shame is posited to encourage efforts to repair social relationships following damage of one's self-image or reputation (Gausel & Leach, 2011; P. Gilbert, 1997). Even if unpleasant, the most direct way to remedy a concern regarding self-image is to identify means of self-improvement and enact behavior change (Ahmed et al., 2001; Ferguson et al., 2007; Miller & Tangney, 1994), which may include engagement in social behavior (Gausel & Leach, 2011). Social interaction while experiencing shame may lead to positive social consequences, such as emotional support and de-escalation of conflict (Gausel & Leach, 2011; P. Gilbert, 1997). Given the relations of shame and perceived social transgressions (e.g., Ferguson et al., 1991; Kaufman, 1989), these social consequences may be especially reinforcing to individuals experiencing shame. Thus, experiencing shame may serve to increase the likelihood of subsequent engagement in social behavior.

This shame-approach theory has received some empirical support. For example, shame is positively correlated with apologizing and self-reported desire to make amends with others (Roseman et al., 1994; Tangney et al., 1996). Such reparative behavior frequently elicits forgiveness and expressions of sympathy from others (Keltner & Harker, 1998). Experimental

research indicates that when shame is induced imaginally, autobiographically, or experientially, participants report greater imagined engagement in prosocial, rather than antisocial, behavior relative to those who did not have shame induced (de Hooge et al., 2008). Though this research indicates shame is associated with prosocial behavior, it is unclear if, given the opportunity, individuals would opt not to engage in any interaction at all. Moreover, a substantial limitation of the study is a lack of measurement of overt, non-imagined observable behavior. To further explore these relations, de Hooge and colleagues (2018) induced shame experimentally in subsequent follow-up experiments. Following the inductions, participants were asked to indicate whether they would like to work on a task alone or with others. Results indicated that shame was associated with higher preferences to work with others. Of note, shame was induced by providing feedback indicating participants earned low scores on a sham intelligence task. Thus, the belief that one's intelligence was low (rather than shame) may have motivated individuals to prefer working with others.

Other researchers posit that shame leads to social avoidance behavior. Individuals experiencing shame frequently view their failures as being global and unchangeable (M. Lewis, 1992; Tangney & Dearing, 2002). The belief that one is inherently flawed may influence shame-experiencing individuals to protect themselves from additional failure and distress by hiding, avoiding, and/or withdrawing from social interaction (P. Gilbert & Andrews, 1998). Avoidance of others may also decrease the probability of being critically evaluated or condemned by others (Braithwaite, 1989; Gausel & Leach, 2011; Scheff, 2000). Therefore, avoidance of social behavior by a person experiencing shame may be negatively reinforced via the reduction of opportunities for negative evaluation by others. As a result, shamed individuals may engage in less social behavior.

The shame-avoidance theory is also supported by empirical research. Behaviorally, shame is associated with reductions in interpersonal communication and relational withdrawal (Leith & Baumeister, 1998; Scherer & Wallbott, 1994), despite the potential for harm to interpersonal relationships. Participants who recall experiences characterized by shame (versus guilt or embarrassment) recollect engaging in more social avoidance and less social approach (Tangney et al., 1996; Wicker et al., 1983), though this finding is limited by retrospective self-report methodology. Finally, in contrast to the de Hooge et al. (2018) study discussed above, Chao et al. (2011) suggests that shame induced in a research laboratory is associated with preference to work alone, work longer on a difficult individual task before asking for help, and to choose leisure activities that are isolation-based (Chao et al., 2011). However, this finding may be culturally bound, as the study was conducted using a Taiwanese sample, who appear to be especially prone to shame due to an enhanced focus on social evaluation within the culture (Bear et al., 2009; Bedford & Hwang, 2003).

Indeed, some evidence indicates that engaging in social approach versus avoidance behavior when experiencing shame is culturally dependent. Young and colleagues (2021) theorized behavioral tendencies to approach or withdraw from social interactions when experiencing shame are influenced by cultural values and social hierarchies. Regarding cultural values, focus has been placed on clarifying the effect of individualism, defined by independence, autonomy, and personal goals, versus collectivism, defined by interdependence, mutual obligations, and group-based goals (Oyserman et al., 2002; Triandis, 1995). Social hierarchies have been divided into those that are vertical hierarchies, marked by distinct hierarchical differences in status between group members, and horizontal hierarchies, or those wherein status equality between group members is afforded institutionally and attitudinally (Shavitt et al., 2010;

Triandis, 1995). Results of a large, multinational study evaluating associations of these cultural orientations and shame-associated behaviors indicated that individuals with a vertical individualist cultural orientation, which was common to United States participants, were likely to report withdrawal tendencies, whereas individuals with horizontal individualistic or collectivistic cultural orientations reported greater approach tendencies (Young et al., 2021). As such, vertical individualists may experience greater reinforcement from shame-associated social avoidance, perhaps as a result of prioritizing their own versus other's needs (Moon et al., 2018), perceiving their relationships as transactional versus transformational (Oishi et al., 2015), and viewing themselves as being in competition with, versus integrated into, their social environment (Oishi et al., 2015; Young et al., 2021). Thus, cultural orientation may partially explain variation in decisions to approach or avoid when experiencing shame and result in greater social avoidance behavior among those living in the United States.

The conflicting findings regarding state shame and its effect on social behavior outlined above informed the development of an integrated theory of the function of shame that suggests engagement in, or avoidance of, social behavior when experiencing shame may be dependent upon the likelihood of receiving rewards or punishments (de Hooge, 2013). For instance, shame may predict engagement in social behavior when an individual anticipates rewarding social interactions. However, if an individual perceives high risk of punishment (e.g., risk of conflict or further condemnation), shame may predict social avoidance. Indeed, the decision to approach or avoid others when experiencing shame appears dependent upon which outcome an individual perceives to be the most likely to result in a reduction in self-conscious emotions and self-critical thoughts (de Hooge et al., 2010). For example, research has demonstrated that desire to engage in social behavior when experiencing shame is initially strong and weakens as opportunities for

reinforcement of prosocial behavior deplete (de Hooge et al., 2011). Therefore, social behavior may be highly dependent upon learning history, such that individuals who have been conditioned to perceive high likelihood of threat in the context of social interactions may be more likely to avoid rather than approach others when experiencing shame.

Moreover, social approach and avoidance may predict future shame. Through increased exposure to social interactions, individuals may learn new social skills that reduce their likelihood of making social blunders that often occasion shame responses. Indeed, it is theorized that through repeated social interactions, individuals learn to more accurately anticipate social rewards and punishments that aid them in optimizing their social behavior (Heerey, 2014; Joiner, 2000). In contrast, avoidance of social behavior may limit opportunities to learn social skills and interpersonal problem-solving strategies (Trew, 2011), which may maintain social difficulties associated with shame. As such, low quantity of social interactions may perpetuate shame, whereas high social interaction quantity may ultimately attenuate medium- to long-term shame experiences.

Alternatively, shame may result in adaptive approach behavior among psychologically healthy individuals and maladaptive avoidance behavior among individuals with certain mental health concerns. In a sample of individuals with chronic and complex PTSD, state and trait shame were positively associated with social withdrawal, especially among individuals with elevated dissociation symptoms (Dorahy et al., 2013). In another study, individuals with and without depression completed various trials of a computerized decision-making task (Fernández-Theoduloz et al., 2019). In some trials, participants were able to work independently, and in others they believed they were working with others. When participants completed trials in which they believed they were paired with individuals of higher skill, they reported higher levels of

shame and greater preference to work independently relative to trials in which they believed they were paired with individuals of similar ability. Furthermore, depressed individuals reported higher shame and greater overall preference to work alone relative to individuals without depression. These results may be due to increased sensitivity to social comparison among individuals with depression (Fernández-Theoduloz et al., 2019; Swallow & Kuiper, 1988), whereas psychologically healthy individuals may experience less shame and be more inclined to engage with others on tasks. As such, examination of specific mental health symptomology may help explain some of the variation reported by shame researchers.

Of note, social anxiety symptoms are commonly associated with both elevated shame and social-behavioral deficits. Yet, the relations of social anxiety, shame, and social interactions have not been fully specified. Indeed, social anxiety symptom severity may be one variable that influences whether individuals experiencing shame choose to engage in social interaction. Accordingly, I next turn to social anxiety, with a review of research that places particular emphasis on social anxiety symptom severity.

Social Anxiety

Social anxiety is characterized by intense fear or anxiety in social situations (American Psychiatric Association [APA], 2013). Individuals with heightened symptoms of social anxiety exhibit a pronounced and persistent fear of one or more social (e.g., having a conversation, attending a party) and/or performance (e.g., presenting at a meeting, playing a sport) situations in which they believe they may be scrutinized by others. They often report fear they will engage in behaviors that will be negatively evaluated by others. As a result, individuals with social anxiety symptoms may frequently avoid social situations or endure them with intense distress.

Experiencing persistent, distressing, and impairing symptoms of social anxiety may lead to the development of social anxiety disorder (SAD; APA, 2013). SAD is one of the most common psychiatric diagnoses. Approximately 7% of the adult population in the United States meets criteria for past-year SAD (Harvard Medical School, 2007), and lifetime prevalence is estimated to be approximately 12% (Kessler et al., 2005). Epidemiological studies suggest SAD is more common in women (versus men; APA, 2013; Asher et al., 2017) and young adults. Approximately 10% of individuals 17 to 18 years of age report behavior consistent with diagnostic criteria for SAD (Burstein et al., 2011; Feehan et al., 1994; Merikangas et al., 2010) and onset of SAD in 90% of lifetime cases occurs before 24 years of age (Kessler et al., 2005), which may be due to developmental shifts from reliance on family members to reliance on peers, as well as the development of higher-order cognitive abilities (Leigh & Clark, 2018). Indeed, most individuals experience a brief increase in social fears during the years that mark the transition from adolescence to young adulthood (Weems & Costa, 2005). Furthermore, individuals who experience SAD symptom onset prior to age 25 report greater dissatisfaction with their social relations than individuals whose symptoms begin after age 25 (Fehm et al., 2008). Thus, college-aged young adults are a population that warrant specific attention from social anxiety researchers.

Social anxiety is associated with several negative educational, occupational, and health consequences. Individuals with SAD are more likely to drop out of school relative to individuals without SAD (Stein & Kean, 2000), which may provide an explanation for the inverse association of SAD and educational attainment (Katzelnick & Greist, 2001; Wittchen et al., 1999). Individuals with (versus without) SAD are also more likely to experience substance dependence (Wittchen et al., 1999), disordered eating (Kerr-Gaffney et al., 2018), and suicide

attempts (Wunderlich et al., 1998), each of which are especially salient in the college population (D. Eisenberg et al., 2011; Kerr-Gaffney et al., 2018; C. Liu et al., 2019). Sub-threshold social anxiety symptoms are also problematic (Fehm et al., 2008). In a nonclinical sample, social anxiety symptoms were inversely related to self-reported quality of life (Kirk et al., 2019). In the college setting, social anxiety symptoms are associated with low academic achievement over time (Brook & Willoughby, 2015) and high academic dishonesty (Wowra, 2007). Socially anxious individuals also tend to enter careers later than non-socially anxious individuals, are less likely to be in higher-level job positions and achieve occupational stability (Caspi et al., 1988), and experience numerous negative physical- and mental-health related outcomes (e.g., Buckner et al., 2020; Cloutier et al., 2016; Melo et al., 2016; Spettigue et al., 2020; Wowra, 2007).

Notably, social anxiety is also associated with significant deficits in interpersonal functioning, including low social interaction quantity and poor social interaction quality. A review of this topic below suggests several factors may lead to poor social interactions in the context of social anxiety, preeminently avoidance behavior.

Social Anxiety and Social Interactions

Individuals with elevated levels of social anxiety symptoms report impairment across many interpersonal domains. For example, social anxiety symptoms impact quantity and quality of romantic relationships. Socially anxious individuals are less likely to be married or in a romantic relationship, are more likely to marry their first partner, and tend to marry later in life relative to individuals who are not socially anxious (Caspi et al., 1988; Lampe et al., 2003; Sanderson et al., 1990). They also report less satisfying spousal relationships that include lower levels of relationship intimacy relative to their non-anxious counterparts (McLeod, 1994; Wenzel, 2002). Moreover, research indicates that individuals with SAD report less emotional

expression, self-disclosure, and intimacy relative to individuals without SAD (Sparrevohn & Rapee, 2009). Indeed, a dearth in self-disclosure mediated the relation of social anxiety symptoms and romantic relationship quality (Cuming & Rapee, 2010).

Social anxiety symptoms are also associated with lower quality friendships (Rodebaugh, 2009; Rodebaugh et al., 2014; Schneier et al., 1994). Observations of socially anxious individuals' interactions with friends shed some light on specific social deficits that may influence social interaction quality. In one study, participants video-recorded a 10-minute interaction with a friend (Kuder & Grover, 2014). Participants self-reported interpersonal skills and videos were reviewed and rated by researchers. Individuals with higher levels of social anxiety symptoms reported low comfort and competence during the interaction, which was commiserate with observer ratings. Though this work indicates individuals with social anxiety symptoms report poor relationship quantity and quality within romantic and friend relationships, which is also evidenced behaviorally as social skills deficits, this research did not identify social anxiety as the cause of such problems.

However, some researchers have examined causal relations of social anxiety and relationship quality in young adults. For example, longitudinal research revealed that perceived social support predicted social anxiety symptom severity in a clinical sample across time, but not vice-versa (Rapee et al., 2015). Similar results were observed in a study utilizing a nonclinical population. Friend-dyads that included one participant who reported high or low social anxiety symptoms were recruited to participate in a longitudinal study evaluating the effect of social anxiety on friendship quality (Rodebaugh et al., 2015). Participants self-reported social anxiety symptoms and completed measures of relationship intimacy, liking, and satisfaction at baseline and six-month follow-up assessment time points. Notably, social anxiety did not predict

friendship quality across time. Rather, friendship quality predicted future social anxiety. Results of these studies suggest that poor quality interactions may lead to increased social anxiety, whereas social anxiety may have minimal effects on pre-established relationships. Though these results are useful in clarifying overarching patterns among these variables, no known studies have examined the causal effects of social interaction quality and social anxiety using daily measures. For example, Rodebaugh and colleagues (2015) assessed broad relationship quality in a specific relationship, but this may have obfuscated patterns present in day-to-day interactions within a person's larger social network. As such, additional research is needed to examine these patterns in other contexts.

Several behavioral factors, such as behavioral avoidance, experiential avoidance (i.e., behavioral actions in the service of reducing or modifying unwanted thoughts, feelings, and physical sensations, Hayes et al., 1996), and various cognitive factors, seem to affect social interaction quantity and quality for individuals with social anxiety, thus likely influencing the negative outcomes detailed above. One factor that may lead to low social interaction quantity and quality among those with social anxiety symptoms is behavioral avoidance of feared stimuli. Indeed, most individuals with social anxiety desire interpersonal relationships, yet often cope with anxiety-related symptoms by avoiding social interaction (Stein & Stein, 2008). Some research suggests that social avoidance may provide initial relief from social anxiety, yet function to maintain long-term symptomology. For example, when an individual with social anxiety withdraws from or avoids a social situation to prevent experiencing a perceived threat, the nonoccurrence of the threatening stimulus is paired with the avoidance behavior. In this scenario, avoidance of social interaction is negatively reinforced, thus increasing the probability of avoidance in the future (Clark & Wells, 1995; Stangier et al., 2006).

However, other research indicates that avoidance behavior does not affect anxiety symptoms across time among those with SAD (Rudaz et al., 2017). The researchers speculated that one reason for this unexpected finding may be the difficulty of completely avoiding social interactions. Moreover, they postulated that individuals with SAD may be less likely to be reinforced by approach behavior relative to individuals with other anxiety diagnoses, given the unique propensity for socially anxious individuals to perceive ambiguous social stimuli negatively (Bögels & Mansell, 2004; Clark & McManus, 2002; Hirsch & Clark, 2004). As such, socially anxious individuals may be positively punished by engagement in social behavior due to the experience of unpleasant emotions during interpersonal interactions.

One common response when a socially anxious individual must interact with others is to engage in experiential avoidance (Kashdan et al., 2013) that, paradoxically, appears to worsen social anxiety symptoms and reduce positive perceptions of interpersonal interactions (Kashdan et al., 2013, 2014). For example, many individuals with social anxiety attempt to suppress thoughts and emotions (e.g., Glick & Orsillo, 2011; Spokas et al., 2009), a common experiential avoidance strategy. Yet, suppression often results in an increased likelihood of having unwanted thoughts (Wenzlaff & Wegner, 2000). As such, extreme focus on reducing or otherwise managing social anxiety symptoms may limit one's ability to attend to, and engage in, present-moment social interactions (Hayes et al., 2006), potentially leading to social blunders that reduce the perceived quality of social interactions. In sum, avoidance of external stimuli is likely to result in limited social interaction quantity, whereas avoidance of internal experiences may negatively influence social interaction quality.

Specific cognitive factors have also been identified as detrimental to social interactions in the context of social anxiety symptoms. Individuals who experience social anxiety appear to

have a threat-sensitivity bias, such that they seem to perceive others who are happy or angry to be dominant, which leads to avoidance of such individuals or engagement in submissive behavior (Clark & Wells, 1995; Heuer et al., 2007; Öhman, 1986, 2009; Roelofs et al., 2010). This propensity to avoid positive and negative social stimuli may lead to low interaction quantity, whereas a submissive interaction style may negatively influence the quality of social interactions. Likewise, social anxiety is positively associated with self-focused attention, defined as awareness of internally generated information (e.g., physical states; thoughts; beliefs; attitudes; memories) related to the self (Clark & Wells, 1995; Ingram, 1990; Spurr & Stopa, 2002). Self-focused attention and anxious arousal bidirectionally influence each other, such that as social anxiety symptoms increase (e.g., sweating), attempts to manage these symptoms lead to elevated self-focused attention (e.g., hyperawareness of sweating; Cheek & Briggs, 1990; Kowalski & Leary, 1990), which in turn predicts further elevated symptoms (Woody, 1996). Consequently, as self-focused attention increases, individuals have less cognitive resources available to concentrate on the social interaction at hand, which may lead to poor interpersonal performance (Clark & McManus, 2002; Perowne & Mansell, 2002; Rapee, 1993).

Moreover, maladaptive interpersonal behaviors are likely to lead to poor social interaction quality for socially anxious individuals. For example, individuals high in social anxiety may over- or under-disclose personal information, ask fewer questions, engage in more self-focused talk, and seek more reassurance from their interaction partners in conversation (e.g., DePaulo et al., 1990; Heerey & Kring, 2007; Meleshko & Alden, 1993; Thompson & Rapee, 2002). Nonverbal behavior, which is critical to social communication (Krauss et al., 1996), is also impacted by social anxiety and efforts to regulate it. Individuals with social anxiety engage in more fidgeting (Heerey & Kring, 2007; Okazaki et al., 2002) and less eye-contact

(Moukheiber et al., 2010), smiling (Del-Monte et al., 2013; Heerey & Kring, 2007), and spontaneous and voluntary affective expression (Melfsen et al., 2000) relative to individuals without social anxiety. Research indicates that such maladaptive social behaviors are more likely to occur between a socially anxious and a non-socially anxious individual, and result in lower self-reported interaction quality, relative to two non-socially anxious individuals (Heerey & Kring, 2007).

Indeed, the relations between social anxiety and social interaction quantity and quality are complex. Efforts to avoid anxiety-related stimuli behaviorally and experientially may negatively affect socially anxious individuals' interpersonal behavior and ultimately lead to lower quantity and quality of social interactions. Thus, it may be useful to consider social anxiety symptoms when examining associations between shame and social behavior. In the following section, the specific associations of shame and social anxiety symptoms, as well as their social interaction implications, will be discussed.

Shame and Social Anxiety

Though researchers have suggested that shame and social anxiety are each characterized by negative evaluations of the self, shame and social anxiety are conceptualized as independent constructs by well-established theorists. For example, Clark and Wells (1995) posit that a key feature of social anxiety is the strong desire to be perceived positively by others, yet believing one is incapable of doing so. Similarly, Rapee and Heimberg (1997) postulate that social anxiety occurs when an individual places high value on social approval and believes they have failed to meet the demands of others. However, these theories emphasize that the negative self-evaluations observed in the context of social anxiety are specific to feared social situations, which differs from the generalized negative self-appraisal characteristic of shame as an

overarching construct. In addition, consideration of how others perceive oneself is not a prerequisite for shame, as shame can occur independent of social contexts, consequences, or considerations (Tangney & Dearing, 2002). As such, shame and social anxiety are regarded as separate constructs.

Despite the unique characteristics of shame and social anxiety, the constructs appear related based upon several lines of inquiry. Correlational studies suggest a moderate positive association of trait shame and social anxiety symptom severity (Cândea & Szentágotai-Tătar, 2018; Fergus et al., 2010; P. Gilbert, 2000; Harder et al., 1992; Matos et al., 2013; Michail & Birchwood, 2013). In contrast, guilt-proneness is not associated with social anxiety symptoms (Fergus et al., 2010; P. Gilbert, 2000; Hedman et al., 2013), indicating that social anxiety is associated with negative perceptions about the self rather than negative perceptions about one's behavior. Trait shame is also positively associated with hallmark symptoms of SAD, including interpersonal anxiety, fear of negative evaluation, and social-oriented avoidance and distress (Lutwak & Ferrari, 1997). Longitudinal research also indicates a positive association of shame and social anxiety, in that high baseline shame predicts high social anxiety symptoms two months in the future (Levinson et al., 2016). Furthermore, reductions in trait shame during an intensive outpatient anxiety treatment program are associated with lower social anxiety symptomology following treatment (Fergus et al., 2010). Hedman and colleagues (2013) reported similar results regarding shame and social anxiety symptoms following provision of a CBT for individuals diagnosed with social anxiety disorder.

Beyond such associations, social anxiety symptom severity may modify relations of shame and interpersonal interaction quantity and quality, perhaps due to limited or inappropriately applied emotion regulation skills. Considerable research suggests individuals

with elevated levels of social anxiety experience broad emotion regulation difficulties (e.g., Jazaieri et al., 2015) that may underlie distress intolerance (Bardeen et al., 2015). Though the cause of such inability to tolerate distressing situations is unclear, the previously discussed heightened self-awareness, combined with high threat-perception, may lead to distressing experiences becoming overwhelming and, in turn, frantic or otherwise dysregulated behavioral attempts to avoid or otherwise manage such events. Accordingly, individuals with elevated levels of social anxiety symptoms may have greater difficulty accepting experiences of shame (an emotion generally considered particularly noxious), focusing on the present moment, and engaging in meaningful behaviors.

These difficulties may result in inefficient emotion regulation strategies. Indeed, individuals with social anxiety symptoms frequently engage in ineffective attempts to regulate emotion when experiencing distress, including excessive rumination (e.g., Abbott & Rapee, 2004; Clark & Wells, 1995; Edwards et al., 2003; Jazaieri et al., 2015), suppression (e.g., Bates et al., 2021; Dryman & Heimberg, 2018; Jazaieri et al., 2015), and efforts at overt and experiential avoidance (e.g., Asher et al., 2021; Clark & Wells, 1995; Jazaieri et al., 2015; Stein & Stein, 2008). Moreover, some evidence indicates that state shame partially mediates the social anxiety symptom-rumination relation following stressful events (Cândea & Szentágotai-Tătar, 2016), which suggests shame accounts for some maladaptive behaviors in the context of social anxiety symptoms. However, assessment across only two time points precludes strong inference regarding causal pathways within this study. Nevertheless, similar relations may exist between shame, social anxiety, and other behaviors associated with emotion dysregulation for individuals who experience elevated social anxiety symptoms. However, such relational dynamics are unlikely to be detected using cross-sectional self-report methodology that is commonly applied

to the study of shame and social anxiety given the context-specific and time-limited dynamics of shame in the context of social interactions. Indeed, ESM may be more appropriate to such investigations.

Applicability of Experience Sampling Methods

Relative to cross-sectional self-report methods, ESM is likely a more useful tool for the assessment of emotion and social behavior. For example, emotional states are brief, typically lasting between 10 and 20 minutes (Verduyn et al., 2009). ESM facilitates the capture of brief experiences and reduces retrospective response biases by eliciting responses that are closer in time to the experienced event (Lucas, 2000; Scollon et al., 2009). Emotion researchers have also observed that relations of negative emotional states are larger between-person than within-person (Vansteelandt et al., 2005; Zelinksi & Larsen, 2000). As such, research designs that utilize momentary assessments may capture the complexity of emotional experiences within individuals that may be otherwise missed using other methods. Moreover, ESM designs that include multiple discreet assessments within each day facilitate the linkage of emotion to specific situations or circumstances (such as social behavior), allow for a more precise examination of temporal relations (Lucas, 2000), and increase the overall validity of emotion research (Augustine & Larsen, 2012).

Himmelstein and colleagues (2019) compared two types of ESM designs in the measurement of emotion and social behavior in undergraduate students. Participants were assigned to signal-contingent or event-contingent conditions and reported their affect and social behavior for one week. In signal-contingent designs, responses are elicited from participants at varying times each day. In event-contingent designs, participants are required to self-initiate a survey whenever a specific event occurs. Results indicated no overall difference in data quality

between groups, which suggests either method may be of use to researchers designing similar studies. Yet, each contingency type evidenced one considerable limitation that may impact results.

Relative to event-contingent designs, signal-contingent designs reduce participant burden and attrition by (a) reminding participants to complete surveys throughout the day and (b) reducing need for participants to consistently identify event beginnings and endings accurately (Ebner-Priemer & Trull, 2009; Moskowitz et al., 2009). As such, signal-contingent designs appear superior when considering participant burden. Yet, participants assigned to event-contingent responding appear to report a greater number of social interactions than participants assigned to signal-contingent responding (Himmelstein et al., 2019). Event-contingent designs may be better suited for measuring social interaction quantity. Nevertheless, signal-contingent designs excel if a continuous variable (such as emotion) is of important focus in study design, as investigators can include questions about events occurring since the last prompt (such as social interactions) without substantial impact on recall biases. Therefore, signal-contingent designs appear to offer the most benefits and least disadvantages when conducting research on emotion and social behavior in undergraduate student populations (Himmelstein et al., 2019).

Many researchers have utilized ESM to assess social interaction quantity and quality (e.g., Himmelstein et al., 2019; H. Liu et al., 2019; Oren-Yagoda et al., 2022), shame (e.g., Kerr et al., 2021; Luoma et al., 2018; Shahar et al., 2015), and social anxiety symptoms (e.g., Goodman et al., 2021a; Oren-Yagoda et al., 2022; Walz et al., 2014), though just one study has been conducted to examine these variables concurrently. Lazarus and Sahar (2018) assessed the relation of social anxiety symptoms to shame experienced during daily social interactions and found that trait social anxiety predicted shame during social interactions. This result provides

evidence at the daily level for high shame in the context of social interactions among those with social anxiety symptoms. In addition, this study linked social interaction shame to self-criticism later in the day, dependent upon level of social anxiety symptom severity. Though participants did not report levels of shame outside of social interactions, persistent elevations in self-criticism across time suggest that shame may have remained elevated outside of the specific social interaction timeframe. More specifically, social interactions may have had a direct impact on shame that was dependent upon the level of social anxiety symptoms, though more research is needed to support this explanation. However, the study was limited by twice-daily only assessments that utilized wide response windows (i.e., participants were asked to respond at any point during the morning or afternoon and again near bedtime). Thus, it is not clear if the variables were affected by other contextual factors.

Summary and Purpose of the Present Study

Engagement in frequent, high-quality social interactions is associated with a variety of positive consequences, while disengagement and poor-quality interactions are associated with negative outcomes. Yet, many individuals do not engage in frequent, fulfilling social interactions. College students are especially susceptible to social interaction deficits and impairments (Bangee et al., 2014; Qualter et al., 2013; T. Richardson et al., 2017) that are, in turn, associated with myriad negative outcomes (Kuczynski et al., 2019; Moreno-Tamayo et al., 2020; Porcelli et al., 2019; Shaw et al., 2021). As such, identification of variables that influence the quantity and quality of social interactions in this population may highlight productive behavioral targets for interventions designed for intervening in cases of maladaptive social behavior.

Shame is posited to influence social behavior and is associated with short- and long-term interpersonal impairment in college student populations (Covert et al., 2003; Leith & Baumeister, 1998). Yet, the mechanistic action of shame on social behavior is not well understood; research results are mixed on whether shame leads to effective social engagement or maladaptive social avoidance (e.g., Chao et al., 2011; de Hooge et al., 2018; Leith & Baumeister, 1998). A common limitation of research that examines shame and social interaction is lack of assessment of constructs that may modify shame-social behavior relations, such as psychiatric symptoms (e.g., Chao et al., 2011; de Hooge et al., 2018; Leith & Baumeister, 1998). This omission may contribute to the currently obfuscated understanding of the effect of shame on social behavior.

One specific mental health concern that is associated with social interaction difficulties and shame is social anxiety (e.g., Cândea & Szentágotai-Tătar, 2018; Fergus et al., 2010), which is especially prevalent in young adults (e.g., Burstein et al., 2011). In the context of social anxiety, shame is associated with social avoidance behavior and negative interpersonal outcomes (e.g., Lutwak & Ferrari, 1997). Thus, social anxiety may function as a moderator of shame-social interaction relations, such that individuals without significant mental health concerns may respond to shame in adaptive, pro-social manners, whereas individuals with social anxiety may respond in maladaptive ways.

Yet, minimal research has examined the relation of shame and social anxiety, and no research has examined the moderating relation of social anxiety symptoms on the relations of shame and social interaction quantity and quality. As such, it is unclear if social anxiety symptomology affects relations of shame and social behavior. Accordingly, the present study aimed to identify (a) relations of social interaction quantity and quality, state shame, and trait

social anxiety symptom severity, (b) the moderating effect of trait social anxiety symptomology on the state shame-social interaction quantity and quality relations, and (c) the temporal relations of state shame to social interaction quantity and quality using a 10-day signal-contingent, daily process ESM design. In brief, participants attended a web-based orientation session and completed an initial survey battery, which included a measure of trait social anxiety symptom severity. They were then asked to complete four brief surveys daily for ten days, which included measures of social interaction quantity, social interaction quality, and state shame within the time since the previous survey. Clarification of relations of shame and social behavior in the context of social anxiety symptomology may inform future avenues for intervention.

Aims and Hypotheses of the Proposed Study

Aim 1

Identify relations of social interaction quantity, social interaction quality, state shame, and trait social anxiety symptom severity.

Hypothesis 1

State shame will negatively relate with social interaction quantity and positive social interaction quality and positively relate with negative social interaction quality.

Hypothesis 2

Trait social anxiety symptom severity will negatively relate with interaction quantity and positive social interaction quality and positively relate with state shame and negative social interaction quality.

Aim 2

Clarify the effect of trait social anxiety symptom severity on the relations of state shame and social interaction quantity and quality.

Hypothesis 3

The association of state shame and social interaction quantity will be positive at low levels, and inverse at high levels, of trait social anxiety symptom severity. No effect will be observed at mean levels of trait social anxiety symptom severity.

Hypothesis 4

The association of state shame and positive social interaction quality will be positive at low levels, and inverse at high levels, of trait social anxiety symptom severity. No effect will be observed at mean levels of trait social anxiety symptom severity.

Hypothesis 5

The association of state shame with negative social interaction quality will be inverse at low levels, and positive at high levels, of trait social anxiety symptom severity. No effect will be observed at mean levels of trait social anxiety symptom severity.

Aim 3

Identify temporal relations of state shame and social interaction quantity and quality as moderated by trait social anxiety symptom severity.

Hypothesis 6

State shame will predict next-timepoint high social interaction quantity and positive social interaction quality, and low negative social interaction quality, at low levels of trait social anxiety symptom severity. State shame will predict next-timepoint low social interaction quantity and negative social interaction quality, and high positive social interaction quality, at high levels of trait social anxiety symptom severity.

Hypothesis 7

Positive social interaction quality will predict low next-timepoint state shame at low levels of trait social anxiety symptom severity. Negative social interaction quality will predict high next-timepoint state shame at low levels of trait social anxiety symptom severity. These effects will be attenuated at high levels of trait social anxiety symptom severity.

Method

Participants

Recruitment

Participants were recruited from the University of South Dakota (USD) campus via the online university SONA system, web advertisements (hosted at https://www.berthlab.org and https://www.mymindfuldays.com), and flyers placed on campus. Recruitment materials advertised a study about emotions and social interactions. Eligible participants were undergraduate students over the age of 18 who reported reading at or above a tenth-grade level. There were no exclusion criteria for the study.

Researchers recommend a level-two sample size of at least 50 participants to prevent statistical bias when conducting two-level multilevel modeling analyses (Maas & Hox, 2005). For instance, the only known multilevel model study that examined social behavior, shame, and social anxiety included 59 level-two participants (Lazarus & Sahar, 2018). As such, approximately 60 retained participants were estimated to be sufficient for adequate power. Given that a recent review found that the average attrition rate of smartphone-based ESM studies is approximately 17% and unimpacted by study duration or number of daily prompts (de Vries et al., 2021), recruitment of 71 participants was planned.

Sample

Seventy-two participants were recruited. One participant was excluded due to noncompletion of the initial survey battery (see Procedure, below) and 5 participants were excluded due to insufficient response rates (see Analytic Strategy, below). Demographic characteristics of retained participants are presented in Table 1. Participants (N = 66; M_{age} = 18.89, SD_{age} = 2.03; Range = 18-32) were primarily single (72.7%), heterosexual (87.9%), and female (80.3%). All participants reported being cisgender. Self-reported race was as follows: White = 71.2%; Asian/Asian American = 15.2%; Black/African American = 7.6%; Hispanic/Latino = 4.5%; and American Indian/Alaska Native = 1.5%. Nearly all participants were full-time students (97.0%). Most were unemployed (53.0%) or employed part-time (45.5%). Median reported household/family income was in the $60,000-69,000 range, though 31.8% of participants reported a household/family income of greater than $100,000.

Measures

Initial Survey Battery

Demographics Questionnaire. A standardized demographic questionnaire was used to gather demographic information including age, sex assigned at birth, ethnicity, gender identity, sexuality, relationship status, student status, employment status, and household income (see Appendix A).

Liebowitz Social Anxiety Scale-Self Report (LSAS-SR; Liebowitz, 1987). The LSAS-SR is a 24-item self-report measure used to assess past-week social anxiety symptom severity across a variety of social situations (e.g., “eating in public places”; “giving a report to a group”; see Appendix B). Participants respond to each item across two symptom dimensions: fear and avoidance. First, participants report how anxious or fearful they feel, or imagine they would feel,

Table 1

Participant Characteristics

Variable	*M* (SD)
Age	18.89 (2.03)
	N (%)
Sex Assigned at Birth/Gender Identity [a]	
Female	53 (80.3%)
Male	13 (19.7%)
Race	
White	47 (71.2%)
Asian/Asian American	10 (15.2%)
Black/African American	5 (7.6%)
Hispanic/Latino	3 (4.5%)
American Indian/Alaska Native	1 (1.5%)
Sexuality	
Straight/Heterosexual	58 (87.9%)
Bisexual	4 (6.1%)
Asexual	2 (3.0%)
Pansexual	1 (1.5%)
Questioning/Unsure	1 (1.5%)
Relationship Status	
Single, never married	48 (72.7%)
Long-term committed relationship	18 (27.3%)
Student Status	
Full-time student	64 (97.0%)
Part-time student	2 (3.0%)
Employment Status	
Unemployed	35 (53.0%)
Employed part-time	30 (45.5%)
Employed full-time	1 (1.5%)
Household Income	
Less than $9,999	6 (9.1%)
$10,000 - $19,999	6 (9.1%)
$20,000 - $29,999	4 (6.1%)
$30,000 - $39,999	3 (4.5%)
$40,000 - $49,999	3 (4.5%)
$50,000 - $59,999	5 (7.6%)
$60,000 - $69,999	7 (10.6%)
$70,000 - $79,999	3 (4.5%)
$80,000 - $89,999	3 (4.5%)
$90,000 - $99,999	5 (7.6%)
$100,000 or more	21 (31.8%)

[a] Sex assigned at birth and gender identity were equivalent for all participants.

when in different situations using a 4-point scale (0 = *none* to 3 = *severe*). Second, participants report how often they avoid, or imagine they would avoid, the situation using a 4-point scale (0 = *never* to 3 = *usually*). The LSAS-SR provides 3 scores, each calculated as the sum of all items: Total score (Range = 0-144); Social interaction fear and avoidance (Range = 0-66); and Performance fear and avoidance (Range 0-78). Higher scores indicate greater social anxiety symptom severity. Extant research suggests that severity cutoffs can be used to determine symptom severity: ≤ 29 = little to no social anxiety; 30-59 = moderate social anxiety; and ≥ 60 = severe social anxiety (Rytwinski et al., 2009).

The LSAS-SR is a valid and reliable measure of social anxiety symptom severity. It correlates as expected with conceptually related measures, such as the clinician-administered LSAS and other measures of social anxiety (Baker et al., 2002; Fresco et al., 2001; LeBeau et al., 2016). The LSAS-SR also discriminates social anxiety from similar constructs, such as depression and anxiety sensitivity (Baker et al., 2002; Fresco et al., 2001). It has adequate internal consistency (αs = .94-.95) and test-retest reliability (αs = .79-.83). Between-person internal consistency in the current study was adequate, α = .95.

Momentary Measures

Social Interaction Quantity. Social interaction quantity was assessed using a single item previously used in ESM research (Zhaoyang et al., 2018, 2019), whereby participants respond to the prompt "since the last assessment, how many social interactions have you had? A social interaction is defined as talking to someone in person, by phone, or online" (see Appendix C).

Social Interaction Quality. To assess quality of social interaction, participants considered the social interaction since the last assessment that they found to be most impactful (see Appendix D). Participants reported the duration of the interaction in minutes and reported

the modality of the interaction (in-person; phone; online). They also reported with whom their most impactful social interaction occurred, including their relation to the primary interaction partner and who else was present, using a drop-down list. Response options were modified for the present study from the Rochester Interaction Record (Reis & Wheeler, 1991) and included: romantic partner; parent; close relative; non-close relative; close friend; non-close friend; roommate; work or school colleague; teacher or professor; acquaintance; and other.

Positive and negative interactions are best treated as separate constructs (e.g., Cundiff et al., 2016; Joseph et al., 2014). Accordingly, social interaction quality of the selected interaction was measured across two dimensions: positive and negative. Participants respond to the items "overall, how pleasant or positive was this interaction" and "overall, how unpleasant or negative was this interaction", each using a 7-point Likert-type scale (1 = *not at all* and 7 = *extremely*). Higher scores indicate greater positive or negative social interaction quality. Extant research has demonstrated divergence between these two items, with the positive and negative items being correlated at -.54 within-person and -.49 between-person (Zhaoyang et al., 2018).

Zero Interaction Questionnaire (ZEQ; Zhaoyang et al., 2019). The ZEQ is a 3-item self-report measure created for a similar ESM social interaction study to match response burden of participants who deny engaging in social interactions to participants who report engagement in social interactions (see Appendix E; Zhaoyang et al., 2019). Participants respond to questions about their typical social interaction experiences. Items include: "why do you think you did not interact with anyone since the last assessment?" and "how typical is it for you to not interact with anyone during the last few hours?". In the present study, the ZEQ was used to account for response burden only and was not used in analyses.

State Shame and Guilt Scale – Shame Subscale; (SSGS-S; Marschall et al., 1994). A subscale of the 10-item State Shame and Guilt Scale, the SSGS-S is a 5-item self-report measure used to assess present-moment experiences of shame (see Appendix F). Participants report their present moment feelings using a 5-point Likert-type scale (1 = *not feeling this way at all* to 5 = *feeling this way very strongly*). Items include "I feel like a bad person" and "I feel worthless, powerless". The SSGS-S was used to account for response burden only and was not included in analyses (see Procedure, below).

State Shame and Guilt Scale – Shame Subscale – Modified; (SSGS-S-M). Modified for the present study from the SSGS-S (see above; Marschall et al., 1994), the SSGS-S-M is a 5-item self-report measure used to assess shame experienced during social interactions (see Appendix G). Instructions were modified such that participants reported how they felt during their most impactful interaction that occurred since the last interaction rather than how they felt in the present moment. Anchors on the 5-point Likert-type scale were modified from present to past tense (1 = *did not feel this way at all* to 5 = *felt this way very strongly*). Items were modified from present to past tense and included "I felt like I was a bad person" and "I felt worthless, powerless". Total score (Range = 1-25) is calculated as the sum of all items, with higher scores indicating higher levels of state shame. The parent measure has demonstrated test-retest reliability and convergent and discriminant validity with other measures of emotion (Marschall et al., 1994). In addition, the parent measure has been used in ESM research, where it evidenced adequate internal consistency (αs = .87-.89; Luoma et al., 2018; Ma & Kelly, 2019; Sanftner & Crowther, 1998). Internal consistency, adjusted for observation- and person-level variance (see Analytic Strategy), was adequate in the present study (α = .85).

Procedure

All procedures were approved by the local Institutional Review Board. Interested individuals attended a one hour online introductory session via their personal computer using the videoconferencing platform Zoom between September 2022 and February 2023. During this session, individuals provided informed consent and were oriented to the study procedure. Participants then completed an initial survey battery, which included the demographic questionnaire and the LSAS-SR, in addition to other measures not related to the present study. Completion of this survey ended participation in the introductory session.

Beginning the next day, participants completed four surveys per day for 10 days using their mobile phone or personal computer. Distribution times for each survey were randomized within pre-designated time blocks: between 10:00 and 12:00; 13:00 and 15:00; 16:00 and 18:00, and 19:00 and 21:00 (e.g., Survey 1 sent to each participant at 10:05 am on their first day). Participants were provided two hours to access each survey.

At each assessment period, participants first completed the measure of Social Interaction Quantity. Participants who reported a social interaction since the last assessment next completed the Social Interaction Quality measure followed by the SSGS-S-M. Completion of this measure occurred following the Social Interaction Quality measure to ensure participants had a prior understanding of their most impactful interaction. To match response burden, participants who reported engaging in zero social interactions since the last assessment completed the ZEQ and the SSGS-S. As previously noted, these measures were not used in the study analyses.

Compensation occurred via SONA research credit and entries into a raffle to win one of five $50 gift cards. Six SONA credits and three raffle entries were earned for the completion of the introductory session. Participants also earned one SONA credit and one raffle entry for every

momentary assessment completed. Participants who completed at least 32 momentary assessments (80% of total assessments) received three bonus raffle entries and those who completed all 40 assessments received five bonus raffle entries.

Analytic Strategy

Preliminary data screening was conducted in SPSS (version 28). Simulations of daily diary ESM data indicated that calculation of summary scores is acceptable when participants complete at least four out of seven surveys (57.14%) in a given week (Griffiths et al., 2022). As such, five participants were excluded listwise from analyses for responding to <58% of the momentary surveys. In addition, ten occasions of duplicate responses (i.e., two responses by the same participant for the same observation) were identified within the dataset. In these instances, incomplete observations (n = 2) or the second submitted response (n = 8) were excluded. Following these exclusions, a missing values analysis was conducted to determine presence of missing data. No missing data was observed at Level 2. At Level 1, three participants did not respond to the Social Interaction Quality or SSGS-S-M measures on four occasions. Retention of cases containing missing data at Level 1 is permittable within the larger dataset with the caveat that these cases be excluded from analyses if values are missing on a variable included in the analysis (Nezlek, 2011; Raudenbush & Congdon, 2021). As such, these cases were excluded listwise when running analyses.

Frequency distributions were examined for skewness, kurtosis, and normality. Scatter plots were examined for linearity. State shame, social interaction quantity, positive social interaction quality, and negative social interaction quality were determined to be nonnormal. As such, each variable was log-transformed (Tabachnick & Fidell, 2013). Logarithmic transformations resulted in normal distributions for measures of social interaction quantity and

positive social interaction quality. However, logarithmic transformations of state shame and negative social interaction quality reduced skew and kurtosis but did not achieve normality (see Table 2). Square root and inverse transformations of these variables produced relatively equivalent values. As such, models were tested with and without use of log-transformed variables. When results were equivalent, non-transformed variables are reported for ease of interpretation. When results differed, models with transformed variables are reported below. Mahalanobis distance statistics and visual inspection of plots of predicted versus standardized residuals did not reveal any multivariate outliers. An independent samples t-test was used to evaluate if LSAS scores differed by participant sex.

Table 2

Skewness and Kurtosis of Non-Transformed and Log-Transformed Momentary Variables

Variable	Non-Transformed		Log-Transformed	
	Skewness	Kurtosis	Skewness	Kurtosis
Quantity	4.57	33.18	0.18	0.97
Positive Quality	-1.01	0.23	-1.35	0.94
Negative Quality	2.40	5.25	1.33	0.83
State Shame	4.91	29.97	11.89	0.87

Evaluation of specific hypotheses, as detailed below, was accomplished by use of hierarchical linear modeling analyses conducted using the statistical program HLM (Version 8.2; Raudenbush & Congdon, 2021). Data were structured such that Level 1 (L1) observations (i.e., data obtained from surveys administered four times daily) were nested within persons, represented at Level 2 (L2). Missing data were excluded listwise as described above (see Nezlek, 2011; Raudenbush & Congdon, 2021). In each model, L1 random error terms were evaluated to ensure proper model specification. Significant random error terms suggest that some between-group variance is otherwise unaccounted for within the model, whereas insignificant random

error terms indicate that any missing between-groups variance is negligible (Snijders & Bosker, 2011). As such, it is recommended that insignificant random error terms (p >.15) be dropped from the model for parsimony, and significant random error terms be retained so as to account for the missing between-groups model variance (Nezlek, 2011; Snijders & Bosker, 2011). Accordingly, random error terms in the present study were retained only if the 85% confidence interval differed from zero. Random intercepts and slopes of retained random error terms were included and allowed to covary. Robust standard errors, which improve the reliability of hypothesis testing when assumptions of normality are violated (Maas & Hox, 2004; Raudenbush & Bryk, 2001; Raudenbush et al., 2019), were utilized in all analyses.

Unconditional random coefficient models (see Nezlek, 2011) were used to calculate within-person mean state shame, social interaction quantity, positive social interaction quality, and negative social interaction quality. The unconditional model is as follows:

Level 1: $Y_{ij} = \beta_{0j} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \mu_{0j}$

In this model, Y_{ij} represents observation i for person j, β_{0j} estimates average state shame, social interaction quantity, positive social interaction quality, or negative social interaction quality for individual j. The L1 error term, or the variance of the outcome across observations, is represented by r_{ij}. At L2, the grand mean of the L1 means is represented by γ_{00}. The error term at L2, or the variance of the outcome across persons, is represented by μ_{0j}.

Participant sex was contrast-coded (male = -1; female = 1) and added to each unconditional model at L2 to determine if within-person means differed by sex (see Nezlek, 2011). These models were structured as follows:

Level 1: $Y_{ij} = \beta_{0j} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Sex}) + \mu_{0j}$

In these models, the difference in the L1 outcome between sexes is represented by $\gamma_{01.}$ A significant coefficient indicates the outcome differs by sex. A negative coefficient suggests values of the outcome are greater for males and a positive coefficient suggests values of the outcome are greater for females. Insignificant coefficients indicate no difference between sexes.

Additionally, a three-level unconditional random coefficient model, accounting for observation-level and person-level variance, was used to calculate SSGS-S-M internal consistency (i.e., the random L1 coefficient reliability estimate; Nezlek 2011, 2016). Data were structured such that L1 items were nested within L2 observations, which were nested within Level 3 (L3) persons. The unconditional model is as follows:

Level 1: $Y_{ijk} = \pi_{0jk} + e_{ijk}$

Level 2: $\pi_{0jk} = \beta_{00k} + r_{0jk}$

Level 3: $\beta_{00k} = \gamma_{000} + \mu_{00k}$

In this model, Y_{ijk} represents item *i* at observation *j* for person *k*. The π_{0jk} coefficient estimates the mean response to items at observation *j* for person *k*. The β_{00k} coefficient represents the mean response for the items for person *k* across all days. The γ_{000} coefficient represents the grand mean of all responses. Error terms are represented by e_{ijk}, r_{0jk}, and μ_{00k}.

Results

Participants in the final retained sample (N = 66) completed 2,288 of 2,640 possible observations (86.67% completion rate). Descriptive statistics of study variables are presented in Table 3. Neither average between-person social anxiety symptom severity, $t(64) = -1.55$, $p = .13$, nor state shame, $\gamma_{01} = -0.28$, $t(64) = -1.27$, $p = .21$, social interaction quantity, $\gamma_{01} = -0.74$, $t(64) =$

-0.61, p = .55, positive social interaction quality, γ_{01} = 0.11, $t(64)$ = 0.58, p = .57, or negative social interaction quality, γ_{01} = -0.02, $t(64)$ = -0.20, p = .84 differed by participant sex.

Social anxiety symptom severity was within the moderate range according to suggested measure severity scores (Rytwinski et al., 2009). Levels of state shame were low, consistent with that typically observed in student samples (Merz & Roesch, 2011; Turner, 2014) and ESM research (Luoma et al., 2018). Positive social interaction quality was generally high, whereas negative social interaction quality was low, consistent with prior research (Zhaoyang et al., 2018; 2019). The average number of social interactions reported per timepoint was higher than that reported by community samples of participants who ranged in age from 20 to 80 (Zhaoyang et al., 2018; 2019).

Table 3

Descriptive Statistics of Study Variables

Variable	Non-Transformed		Log-Transformed	
	M	*SD*	*M*	*SD*
SI Quantity	6.30	0.64	0.69	0.03
Positive SI Quality	5.29	0.14	0.33	0.02
Negative SI Quality	1.66	0.08	0.13	0.01
State Shame	5.77	0.12	0.74	0.01
Trait Social Anxiety	49.26	25.45		

Note. SI = Social interaction. Trait social anxiety symptom severity descriptive statistics were calculated between-person. Descriptive statistics of all other variables were calculated within-person.

Participants reported engaging in at least one social interaction during the time since the last assessment on 2,089 of 2,228 (91.3%) observations. Participants engaged in an average of 6.3 interactions per assessment. Across all timepoints, participants reported engaging in a total of 13,815 social interactions (In person = 69.6%; By phone = 17.0%; Online = 13.5%). Interactions designated as “most impactful” by participants (N = 2085) occurred in person 73.6% of the time

(By phone = 19.8%; Online = 6.7%) and the median impactful interaction duration was 30 minutes (*M* = 49.74*;* SD = 58.38; Range = 1-300). Descriptive statistics regarding interaction partners are presented in Table 4. A close friend was most often designated as the primary interaction partner (33.9%) and one or more secondary interaction partners were present for approximately half (52.4%) of the most impactful interactions.

Table 4

Interaction Partner Descriptive Statistics

Relationship	Primary interaction partner *n* (%)	Secondary interaction partner *N*
Close friend	707 (33.9%)	379 (16.6%)
Non-close friend	141 (6.8%)	150 (6.6%)
Romantic partner	312 (15%)	52 (2.3%)
Parent	240 (11.5%)	102 (4.5%)
Close relative	133 (6.4%)	91 (4.0%)
Non-close relative	10 (0.5%)	19 (0.8%)
Roommate	191 (9.2%)	105 (4.5%)
Work or school colleague	160 (7.7%)	153 (6.7%)
Teacher or professor	68 (3.3%)	40 (1.7%)
Acquaintance	69 (3.3%)	101 (4.4%)
Other	54 (2.6%)	42 (1.8%)

Note. N = 2085.

Relations of Study Variables

To assess relations of state shame and social interaction quantity, positive social interaction quality, and negative social interaction quality, within-person mean-centered state shame was added to each unconditional model:

Level 1: $Y_{ij} = \beta_{0j} + \beta_{1j}(\text{Shame}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \mu_{0j}$

$\beta_{1j} = \gamma_{10} + \mu_{1j}$

In these models, β_{1j} represents change (i.e., slope) in social interaction quantity, positive social interaction quality, or negative social interaction quality for each one-unit change in state

shame for individual *j*. At L2, γ_{00} represents the average within person outcome when the individual experiences their mean level of state shame and γ_{10} represents the expected change in the outcome associated with a one-unit change in state shame.

It was hypothesized that state shame would negatively relate with social interaction quantity and positive social interaction quality and positively relate with negative social interaction quality. Use of transformed variables produced different results for the model predicting social interaction quantity only. As such, the model predicting social interaction quantity utilized transformed variables, and the models predicting positive and negative social interaction quality utilized non-transformed variables. The L1 random error term was retained in each model (*p*'s < .15). Contrary to hypotheses, results indicated log-transformed state shame was positively associated with log-transformed social interaction quantity, $\gamma_{10} = 0.16$, $t(65) = 2.73$, $p = .01$. As hypothesized, state shame was negatively associated with positive social interaction quality, $\gamma_{10} = -0.29$, $t(65) = -10.20$, $p < .001$, and positively associated with negative social interaction quality, $\gamma_{10} = -0.40$, $t(65) = 11.39$, $p < .001$. As such, Hypothesis 1 was partially supported.

To assess relations of trait social anxiety symptom severity and state shame, social interaction quantity, positive social interaction quality, and negative social interaction quality, grand mean-centered trait social anxiety symptom severity was added to L2 of each unconditional model:

Level 1: $Y_{ij} = \beta_{0j} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Social Anxiety}) + \mu_{0j}$

At L2, γ_{00} represents the average within-person mean state shame, social interaction quantity, positive social interaction quality, or negative social interaction quality rating. The

coefficient γ_{01} represents the expected change in the outcome associated with a one-unit change in trait social anxiety symptom severity.

It was hypothesized that trait social anxiety symptom severity would negatively relate with social interaction quantity and positive social interaction quality and positively relate with negative social interaction quality. Use of transformed variables led to no differences in results, thus each model used to test this hypothesis utilized non-transformed variables. In accordance with hypotheses, L2 trait social anxiety symptom severity was positively associated with L1 state shame, $\gamma_{01} = 0.02$, $t(64) = 2.33$, $p = .02$, and negatively associated with L1 social interaction quantity, $\gamma_{01} = -0.06$, $t(64) = -2.07$, $p = .04$. Contrary to hypotheses, L2 trait social anxiety symptom severity was not associated with L1 positive, $\gamma_{01} = 0.003$, $t(64) = 0.47$, $p = .64$, or negative, $\gamma_{01} = 0.001$, $t(64) = .32$, $p = .75$, social interaction quality. In sum, Hypothesis 2 was partially supported.

Moderating Effects of Social Anxiety

To clarify the moderating effects of trait social anxiety symptom severity on the relations of state shame and social interaction quantity, positive social interaction quality, and negative social interaction quality, three multilevel mixed effects hierarchical linear regression models were estimated. Each model included within-person mean-centered state shame (L1) and grand mean-centered trait social anxiety (L2) as predictors, as depicted below:

Level 1: $Y_{ij} = \beta_{0j} + \beta_{1j}(\text{Shame}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Social Anxiety}) + \mu_{0j}$

$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Social Anxiety}) + \mu_{1j}$

In these models, Y_{ij} represents observation *i* for person *j*, β_{0j} estimates average social interaction quantity, positive social interaction quality, or negative social interaction quality for

individual *j*, and β_{1j} represents change (i.e., slope) in social interaction quantity, positive social interaction quality, or negative social interaction quality for each one-unit change in state shame for individual *j*. At L2, these means and slopes become outcomes, and γ_{00} represents the expected social interaction quantity, positive social interaction quality, or negative social interaction quality when an individual is at their mean level of state shame. The coefficient γ_{01} represents the expected change in social interaction quantity, positive social interaction quality, or negative social interaction quality associated with a one-unit change in trait social anxiety symptom severity. γ_{10} represents the expected change in social interaction quantity, positive social interaction quality, or negative social interaction quality associated with a one-unit change in state shame and γ_{11} represents the conditional effect on this relation associated with a one-unit change in trait social anxiety symptom severity (i.e., a moderating effect).

Multilevel Model of Social Interaction Quantity

It was hypothesized that the association of state shame with social interaction quantity would be positive at low levels, and inverse at high levels, of trait social anxiety symptom severity, and that no effect would be observed at mean levels of trait social anxiety symptom severity. Use of transformed versus non-transformed variables produced differing results; the model that utilized transformed variables is presented. Model results are presented in Table 5. The L1 error term was retained ($p = .08$). L2 trait social anxiety symptom severity was negatively related, and L1 log-transformed state shame was positively related, to L1 log-transformed social interaction quantity (p's = .02 and .002, respectively). In addition, the relation of L1 log-transformed state shame and L1 log-transformed social interaction quantity varied as a function of L2 trait social anxiety symptom severity, such that a one-unit change in trait social anxiety symptom severity was associated with a 0.004 unit decrease in the logarithmic state

shame-interaction quantity slope (p = .03). Cross-level conditional effects are presented in Figure 1. Effects were significant at mean levels of trait social anxiety symptom severity, β = 0.20, t(64) = 3.33, p = .001, and at low (M – 1SD) levels of trait social anxiety symptom severity, β = 0.32, t(64) = 3.20, p = .002. The effect at high (M + 1SD) levels of trait social anxiety symptom severity was nonsignificant, β = 0.10, t(64) = 1.66, p = .10. As such, Hypothesis 3 was partially supported.

Table 5

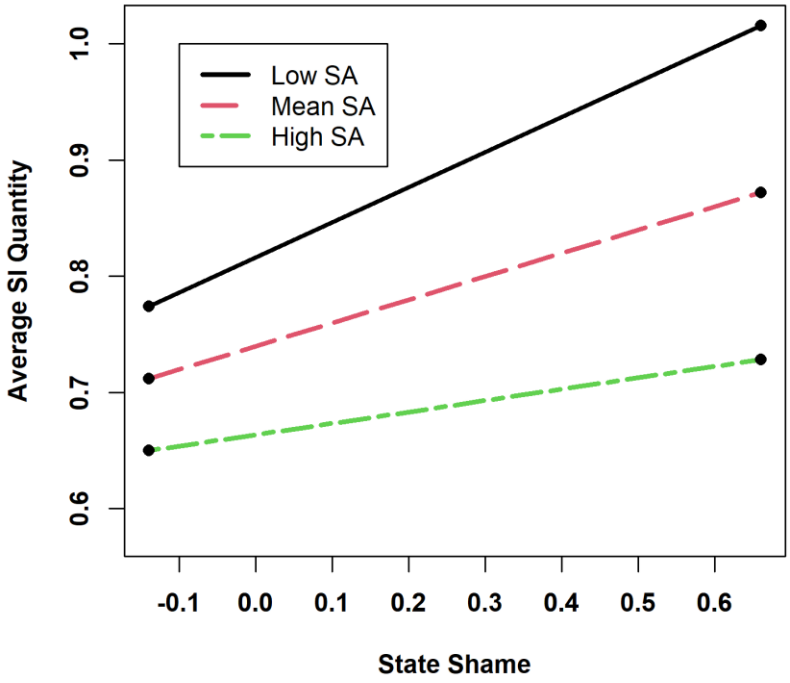
Multilevel Model of Social Interaction Quantity

Fixed effects parameter	*B*	*SE*	*t*(64)	*p*
Intercept (γ_{00})	0.74	0.03	29.49	<.001
Trait Social Anxiety (γ_{01})	-0.003	0.001	-2.42	.02
State Shame (γ_{10})	0.20	0.06	3.19	.002
x *Trait Social Anxiety (γ_{11})*	-0.004	0.002	-2.30	.03
Random effects parameter	*B*	*SD*	χ^2(60)	*p*
Intercept (μ_{0j})	0.04	0.20	1129.14	<.001
State Shame (μ_{1j})	0.01	0.11	76.22	.08
Level-1 (r_{ij})	0.06	0.24		

Note. Social interaction quantity and state shame log-transformed. All predictors mean-centered. State shame entered the model at level 1. Trait social anxiety symptom severity entered at level 2. Italics indicate the effect of trait social anxiety symptom severity on state shame slope.

Figure 1

Conditional Effects of Trait Social Anxiety on the Shame-Social Interaction Quantity Relation



Note. SI = Social interaction. SA = Trait social anxiety symptom severity. State shame and SI quantity were log-transformed. State shame and SA mean centered. State shame entered the model at level 1. SA entered at level 2. Low and high values of SA were +/- 1 *SD* from the mean. Effects were significant (*p*'s < .01) at low and mean, but not high, levels of SA.

Multilevel Model of Positive Social Interaction Quality

It was hypothesized that the association of state shame and positive social interaction quality would be positive at low levels, and inverse at high levels, of trait social anxiety symptom severity, and that no effect would be observed at mean levels of trait social anxiety symptom severity. The model utilized non-transformed variables as there were no differences in results when using transformed variables. Model results are presented in Table 6. The L1 random error term was retained ($p < .001$). L1 state shame was negatively related to L1 positive social interaction quality ($p < .001$), whereas L2 trait social anxiety symptom severity was not related

(p = .65). Results indicated that L2 trait social anxiety symptom severity did not moderate L1 relations of state shame and positive social interaction quality (p = .59). Hypothesis 4 was not supported.

Table 6

Multilevel Model of Positive Social Interaction Quality

Fixed effects parameter	*B*	*SE*	*t*(64)	*p*
Intercept (γ_{00})	5.29	0.14	37.18	<.001
Trait Social Anxiety (γ_{01})	0.003	0.006	0.45	.65
State Shame (γ_{10})	-0.29	0.03	-9.86	<.001
x *Trait Social Anxiety (γ_{11})*	-0.001	0.001	-0.54	.59
Random effects parameter	*B*	*SD*	χ^2(60)	*p*
Intercept (μ_{0j})	1.33	1.15	1431.77	<.001
State Shame (μ_{1j})	0.03	0.17	184.95	<.001
Level-1 (r_{ij})	1.60	1.26		

Note. All predictors were mean-centered. State shame entered the model at level 1. Trait social anxiety symptom severity entered at level 2. Italics indicate the effect of trait social anxiety symptom severity on state shame slope.

Multilevel Model of Negative Social Interaction Quality

It was hypothesized that the association of state shame with negative social interaction quality would be inverse at low levels, and positive at high levels, of trait social anxiety symptom severity, and that no effect would be observed at mean levels of trait social anxiety symptom severity. Use of transformed variables led to no differences in results. As such, the model utilized non-transformed variables. Model results are presented in Table 7. The L1 random error term was retained (p < .001). L1 state shame was positively related to L1 negative social interaction quality (p < .001), whereas L2 trait social anxiety symptom severity was not related (p = .71). In addition, L2 trait social anxiety symptom severity did not moderate L1

relations of state shame and negative social interaction quality (p = .58). Hypothesis 5 was not supported.

Table 7

Multilevel Model of Negative Social Interaction Quality

Fixed effects parameter	*B*	*SE*	*t*(64)	*p*
Intercept (γ_{00})	1.67	0.06	27.82	<.001
Trait Social Anxiety (γ_{01})	0.001	0.002	0.37	.71
State Shame (γ_{10})	0.41	0.04	11.69	<.001
x *Trait Social Anxiety (γ_{11})*	-0.001	0.002	-0.56	.58
Random effects parameter	*B*	*SD*	χ^2(60)	*p*
Intercept (μ_{0j})	0.21	0.45	380.07	<.001
State Shame (μ_{1j})	0.05	0.22	311.48	<.001
Level-1 (r_{ij})	1.19	1.09		

Note. All predictors were mean-centered. State shame entered the model at level 1. Trait social anxiety symptom severity entered at level 2. Italics indicate the effect of trait social anxiety symptom severity on state shame slope.

Evaluation of Temporal Relations

Three lagged analyses predicting social interaction quantity, positive social interaction quality, and negative social interaction quality were conducted to identify the effects of state shame on next-timepoint social interaction quantity and quality as moderated by trait social anxiety symptom severity. It was hypothesized that, at low levels of trait social anxiety symptom severity, low state shame would predict next-timepoint (a) high social interaction quantity and positive social interaction quality and (b) low negative social interaction quality. Furthermore, it was hypothesized that, at high levels of trait social anxiety symptom severity, low state shame would predict next-timepoint (a) low social interaction quantity and positive quality, and (b) high negative quality.

Models included L1 one-timepoint lagged observations, computed as $n_{obs} - 1n_{obs}$. Within these models, values of variable Y (e.g., social interaction quantity) are predicted by within-person mean-centered state shame measured at the previous time point, while accounting for values of Y measured at the previous timepoint (Nezlek, 2011). L2 grand mean centered trait social anxiety symptom severity was included as a moderator of each modeled slope, such that:

Level 1: $Y_{ij} = \beta_{0j} + \beta_{1j}(\text{Y obs n-1}) + \beta_{2j}(\text{Shame obs n-1}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Social Anxiety}) + \mu_{0j}$

$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Social Anxiety}) + \mu_{1j}$

$\beta_{2j} = \gamma_{20} + \gamma_{21}(\text{Social Anxiety}) + \mu_{2j}$

In these models: β_{0j} estimates mean Y for individual *j*; β_{1j} represents the relation of one-timepoint lagged observation Y to present observation Y; and β_{2j} represents the relation of one-timepoint lagged observation state shame to present observation Y. At L2, these values become outcomes. In each case, γ_{x0} represents the effect for an individual who is at mean level trait social anxiety symptom severity, and γ_{x1} represents the differential effect associated with a one-unit increase in trait social anxiety symptom severity.

Multilevel Lagged Analysis Model of Social Interaction Quantity

The model predicting L1 social interaction quantity utilized non-transformed variables due to no differences in results when using transformed variables. Model results are presented in Table 8. The L1 lagged state shame random error term was dropped due to insignificance ($p > .50$). The L1 lagged social interaction quantity random error term was retained ($p = .002$). L1 lagged social interaction quantity positively predicted L1 social interaction quantity at next-timepoint ($p = .002$). In addition, L2 trait social anxiety symptom severity was negatively related to L1 social interaction quantity ($p = .04$). L1 lagged state shame was not a significant predictor

of L1 social interaction quantity at next-timepoint (p = .42) and L2 trait social anxiety symptom severity did not significantly moderate the L1 relation of lagged state shame and social interaction quantity at next-timepoint (p = .39).

Table 8

Multilevel Lagged Analysis Model of Social Interaction Quantity

Fixed effects parameter	*B*	*SE*	*t*-ratio	*df*	*p*
Intercept (γ_{00})	5.24	0.53	9.87	64	<.001
Trait Social Anxiety (γ_{01})	-0.06	0.03	-2.09	64	.04
Lagged SI Quantity (γ_{10})	0.10	0.03	3.21	64	.002
x *Trait Social Anxiety (γ_{11})*	0.0003	0.001	0.20	64	.84
Lagged State Shame (γ_{20})	0.07	0.07	0.92	1899	.36
x *Trait Social Anxiety (γ_{21})*	0.002	0.002	0.75	1899	.46
Random effects parameter	*B*	*SD*	χ^2	*df*	*p*
Intercept (μ_{0j})	16.26	4.03	367.78	64	<.001
Lagged SI Quantity (μ_{1j})	0.01	0.11	101.71	64	.002
Level-1 (r_{ij})	32.68	5.72			

Note. SI = Social interaction. Lagged variables were computed as $n_{obs} - 1n_{obs.}$ All predictors except lagged quantity were mean-centered. Trait social anxiety symptom severity was entered into the model at level 2. All other variables were entered at level 1. Italics indicate the effect of trait social anxiety symptom severity on level 1 slopes.

Multilevel Lagged Analysis Model of Positive Social Interaction Quality

The model predicting L1 positive social interaction quality utilized transformed variables due to differing results relative to use of non-transformed variables. Model results are presented in Table 9. The L1 log-transformed lagged state shame random error term was dropped due to insignificance (p = .27), and the L1 log-transformed lagged positive social interaction quality random error term was retained (p = .001). In this model, L1 log-transformed lagged state shame was not a significant predictor of L1 log-transformed positive social interaction quality at next-timepoint (p = .13). L2 trait social anxiety symptom severity was not related to L1 log-

transformed positive social interaction quality (p = .22) and did not moderate the L1 relation of log-transformed lagged state shame and log-transformed positive social interaction quality at next-timepoint (p = .37). L1 log-transformed lagged positive social interaction quality positively predicted L1 log-transformed positive social interaction quality at next-timepoint (p = .002). This relation was moderated by L2 trait social anxiety symptom severity, such that a one-unit change in trait social anxiety symptom severity resulted in a 0.003 unit decrease in the L1 slope of log-transformed lagged positive social interaction quality and log-transformed positive social interaction quality at next-timepoint (p = 0.02).

Table 9

Multilevel Lagged Analysis Model of Positive Social Interaction Quality

Fixed effects parameter	*B*	*SE*	*t*-ratio	*df*	*p*
Intercept (γ_{00})	0.29	0.02	14.66	64	<.001
Trait Social Anxiety (γ_{01})	0.001	0.001	1.25	64	.22
Lagged Positive SI Quality (γ_{10})	0.11	0.03	3.24	64	.002
x Trait Social Anxiety (γ_{11})	-0.003	0.001	-2.45	64	.02
Lagged State Shame (γ_{20})	0.08	0.05	1.52	1761	.13
x Trait Social Anxiety (γ_{21})	-0.002	0.003	-0.91	1761	.37
Random effects parameter	*B*	*SD*	χ^2	*df*	*p*
Intercept (μ_{0j})	0.02	0.14	292.69	62	<.001
Lagged Positive SI Quality (μ_{1j})	0.03	0.16	102.66	62	.001
Level-1 (r_{ij})	0.06	0.24			

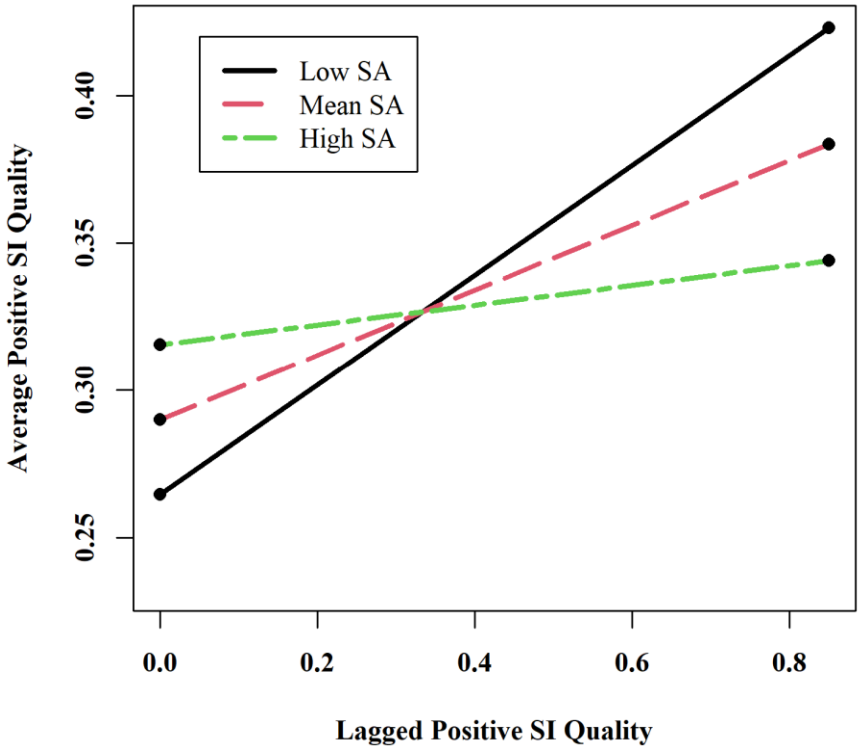
Note. SI = Social interaction. Positive social interaction quality and state shame variables were log-transformed. Lagged variables were computed as $n_{obs} - 1n_{obs.}$ All predictors except lagged positive social interaction quality were mean-centered. Trait social anxiety symptom severity was entered into the model at level 2. All other variables were entered at level 1. Italics indicate the effect of trait social anxiety symptom severity on level 1 slopes.

Cross-level conditional effects are presented in Figure 2. The conditional effect of the moderator was significant at mean levels of trait social anxiety symptom severity, β = 0.11, t(64)

= 3.67, p = .001, and at low (M – 1SD) levels of trait social anxiety symptom severity, β = 0.19, t(64) = 4.35, p < .001. At high (M + 1SD) levels of trait social anxiety symptom severity, the effect was nonsignificant, β = 0.03, t(64) = 0.95, p = .35.

Figure 2

Conditional Effects of Trait Social Anxiety on Relation of Lagged & Present Positive SI Quality



Note. SI = Social interaction. SA = Trait social anxiety symptom severity. Positive SI quality was log-transformed. Lagged positive SI quality was computed as $n_{obs} - 1n_{obs.}$ SA was grand-mean centered and entered into the model at level 2. Lagged positive SI quality was entered at level 1. Low and High values of SA were +/- 1 *SD* from the mean. Effects were significant (p's < .01) at Low and Mean levels of SA.

Multilevel Lagged Analysis Model of Negative Social Interaction Quality

Results of the model predicting L1 negative social interaction quality did not differ when using transformed variables, thus non-transformed variables were used. Model results are

presented in Table 10. All L1 random error terms were retained (p's < .15). L1 lagged negative social interaction quality positively predicted L1 negative social interaction quality at next-timepoint (p = 0.01). L1 lagged state shame was not a significant predictor of next-timepoint L1 negative social interaction quality (p = .93). L2 trait social anxiety symptom severity was not related to L1 negative social interaction quality (p = .15) and did not moderate the L1 relation of lagged state shame and negative social interaction quality at next-timepoint (p = .64). In sum, Hypothesis 6 was not supported by the results of any model.

Table 10

Multilevel Lagged Analysis Model of Negative Social Interaction Quality

Fixed effects parameter	*B*	*SE*	*t*(64)	*p*
Intercept (γ_{00})	1.54	0.09	17.07	<.001
Trait Social Anxiety (γ_{01})	0.005	0.004	1.47	.15
Lagged Negative SI Quality (γ_{10})	0.09	0.03	2.54	.01
x *Trait Social Anxiety (γ_{11})*	-0.002	0.002	-1.28	.21
Lagged State Shame (γ_{20})	0.002	0.03	0.09	.93
x *Trait Social Anxiety (γ_{21})*	-0.0005	0.001	-0.47	.64
Random effects parameter	*B*	*SD*	χ^2(56)	*p*
Intercept (μ_{0j})	0.36	0.60	135.42	<.001
Lagged Negative SI Quality (μ_{1j})	0.03	0.03	88.32	<.001
Lagged State Shame (μ_{2j})	0.01	0.01	122.09	.004
Level-1 (r_{ij})	1.57	1.57		

Note. SI = Social interaction. Lagged variables were computed as n_{obs-}- $1n_{obs.}$ All predictors except lagged negative social interaction quality were mean-centered. Trait social anxiety symptom severity was entered into the model at level 2. All other variables were entered at level 1. Italics indicate the effect of trait social anxiety symptom severity on level 1 slopes**.**

Multilevel Lagged Analysis Model of State Shame

One model was used to evaluate within-person mean-centered social interaction quantity, positive social interaction quality, and negative social interaction quality as predictors of next-

timepoint state shame. It was hypothesized that at low levels of trait social anxiety symptom severity, high social interaction quantity, high positive social interaction quality, and low negative social interaction quality would predict low next-timepoint state shame. In addition, it was hypothesized that these effects would be attenuated at high levels of trait social anxiety symptom severity. The model included one-timepoint lagged observations of each predictor, as described above, as well as a coefficient accounting for previous observation state shame, as displayed below:

Level 1: $Y_{ij} = \beta_{0j} + \beta_{1j}(\text{Shame obs n-1}) + \beta_{2j}(X_1 \text{ obs n-1}) + \beta_{3j}(X_2 \text{ obs n-1}) + \beta_{4j}(X_3 \text{ obs n-1}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Social Anxiety}) + \mu_{0j}$

$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Social Anxiety}) + \mu_{1j}$

$\beta_{2j} = \gamma_{20} + \gamma_{21}(\text{Social Anxiety}) + \mu_{2j}$

$\beta_{3j} = \gamma_{30} + \gamma_{31}(\text{Social Anxiety}) + \mu_{3j}$

$\beta_{4j} = \gamma_{40} + \gamma_{41}(\text{Social Anxiety}) + \mu_{4j}$

In these models: β_{0j} estimates mean Y for individual *j*; β_{1j} represents the relation of one-timepoint lagged state shame to present observation shame; and $\beta_{2\text{-}4j}$ represents the relation of one-timepoint lagged $X_{1\text{-}3}$ to present observation state shame. At Level 2, each γ_{x0} represents the effect for an individual who is at the mean level of trait social anxiety symptom severity, while controlling for all other L1 variables in the model, and γ_{x1} represents the differential effect associated with a one-unit increase in trait social anxiety symptom severity.

Use of transformed variables produced different results, thus the model utilized transformed variables. Model results are presented in Table 11. L1 random error terms for log-transformed lagged state shame, log-transformed lagged social interaction quantity, and log-

transformed lagged negative social interaction quality were dropped due to insignificance (p's > .15). The L1 log-transformed lagged positive social interaction random error term was retained (p = .08). L1 log-transformed lagged state shame positively predicted L1 log-transformed state shame at next-timepoint (p = .002). L1 log-transformed lagged negative social interaction quality negatively predicted L1 state shame at next-timepoint (p = .02). L1 log-transformed lagged social interaction quantity and L1 log-transformed lagged positive social interaction quality were non-significant predictors (p's >.05). L2 trait social anxiety symptom severity did not moderate L1 relations of state shame and lagged positive or negative social interaction quality (p*'s* = .32 and .92, respectively).

Though the slope of L1 log-transformed lagged social interaction quantity did not significantly differ from zero, it is acceptable to examine cross-level conditional effects (Nezlek, 2011). Indeed, L2 trait social anxiety symptom severity moderated the relation of L1 log-transformed lagged social interaction quantity and L1 log-transformed state shame at next-timepoint (p = .01), such that a one-unit change in L2 trait social anxiety symptom severity resulted in a 0.001 unit increase in the L1 slope of log-transformed lagged social interaction quantity and log-transformed state shame at next-timepoint. Cross-level conditional effects are presented in Figure 3. The conditional effect of the moderator was significant and positive at high (M + 1SD) levels of trait social anxiety symptom severity, β = 0.04, t(1757) = 2.46, p = .01. Conditional effects were not significant at mean levels of trait social anxiety symptom severity, β = 0.01, t(1757) = 1.11, p = .27, or low (M – 1SD) levels of trait social anxiety symptom severity, β = -0.02, t(1757) = -1.83, p = .07. Therefore, Hypothesis 7 was partially supported.

Table 11

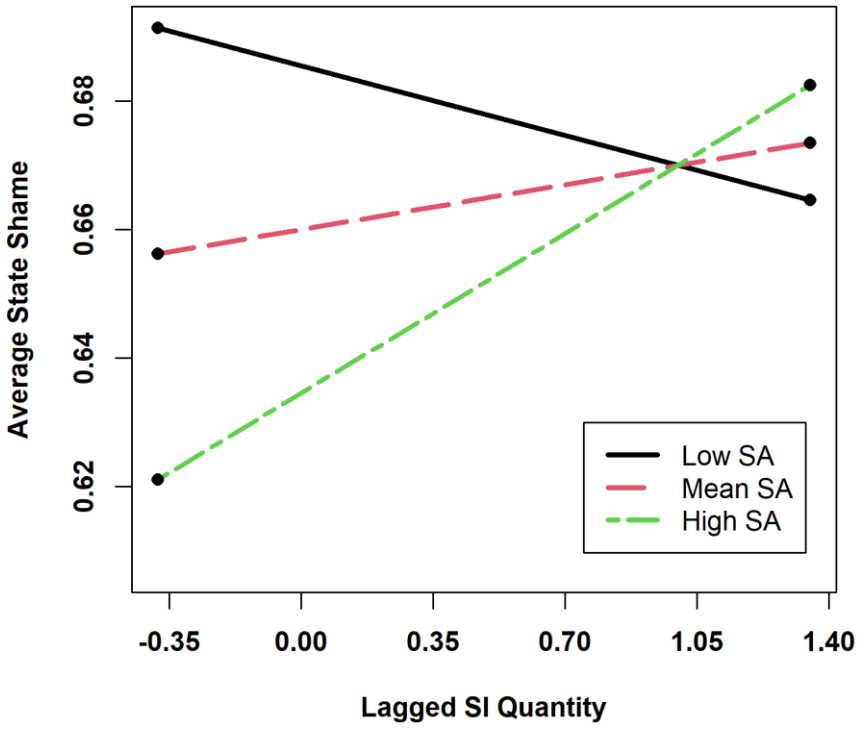
Multilevel Lagged Analysis Model of Shame

Fixed effects parameter	*B*	*SE*	*t*-ratio	*df*	*p*
Intercept (γ_{00})	0.66	0.03	24.58	64	<.001
Trait Social Anxiety (γ_{01})	-0.001	0.001	-0.85	64	.40
Lagged State Shame (γ_{10})	0.11	0.04	3.03	1757	.002
x *Trait Social Anxiety (γ_{11})*	0.002	0.002	1.20	1757	.23
Lagged SI Quantity (γ_{20})	0.01	0.009	1.55	1757	.12
x *Trait Social Anxiety (γ_{21})*	0.001	0.0003	2.58	1757	.01
Lagged Positive SI Quality (γ_{30})	-0.02	0.01	-1.79	64	.08
x *Trait Social Anxiety (γ_{31})*	-0.0004	0.0004	-1.00	64	.32
Lagged Negative SI Quality (γ_{40})	-0.02	0.01	-2.41	1757	.02
x *Trait Social Anxiety (γ_{40})*	0.00005	0.0005	0.10	1757	.92
Random effects parameter	*B*	*SD*	χ^2	*df*	*p*
Intercept (μ_{0j})	0.001	0.03	261.903	62	<.001
Lagged Positive SI Quality (μ_{2j})	0.001	0.03	78.22	62	0.08
Level-1 (r_{ij})	0.01	0.10			

Note. SI = Social interaction. All variables except trait social anxiety symptom severity were log-transformed. Lagged variables were computed as $n_{obs–}$- $1n_{obs.}$ All predictors except lagged state shame were mean-centered. State social anxiety symptom severity was entered into the model at level 2. All other variables were entered at level 1. Italics indicate the effect of trait social anxiety symptom severity on level 1 slopes.

Figure 3

Conditional Effects of Trait Social Anxiety on Relation of Lagged SI Quantity & Present Shame



Note. SI = Social interaction. SA = Trait social anxiety symptom severity. Positive SI quality was log-transformed. Lagged SI Quantity was computed as n_{obs-}- $1n_{obs.}$ SA was grand-mean centered and entered into the model at level 2. Lagged positive SI quality was entered at level 1. Low and high values of SA were +/- 1 *SD* from the mean. The effect was significant High levels of SA only (p = .01).

Discussion

Frequent engagement in high-quality social interactions is necessary for the effective functioning and wellbeing of college students. Such behavior is associated with a wide range of benefits in this population (e.g., M. Richardson et al., 2012; Schenenfelder et al., 2020), whereas insufficient quantity and quality of social interactions is associated with a variety of negative outcomes (e.g., Altermatt, 2019; Kuczynski et al., 2019; Nelson, 2013). Identification of factors

that influence social interaction quantity and quality may inform development of interventions appropriate for modifying maladaptive social behavior. Shame is one variable associated with short- and long-term interpersonal impairment in college students (Covert et al., 2003; Leith & Baumesiter, 1998). However, the effect of shame on social behavior is not fully understood, as results are mixed on whether shame predicts adaptive engagement in social behavior or maladaptive social avoidance (e.g., Chao et al., 2011; de Hooge et al., 2018; Leith & Baumesiter, 1998). Social anxiety, which is associated with shame and impairments in social interaction (e.g., Lutwak & Ferrari, 1997), may partially explain these discrepant findings. The present study aimed to clarify such relations through use of an ESM design.

Overall, support for the seven study hypotheses was mixed. State shame was negatively associated with positive social interaction quality and positively associated with social interaction quantity, negative social interaction quality, and trait social anxiety symptom severity. In addition, trait social anxiety symptom severity was positively associated with quantity, but not quality, of social interactions and was a significant moderator of the state shame-quantity relation only. State shame did not predict subsequent social interaction outcomes and trait social anxiety symptom severity did not moderate these relations. Yet, negative social interaction quality predicted state shame at next-timepoint, and trait social anxiety symptom severity was a significant moderator of the relation of social interaction quantity and next-timepoint state shame. Results are reviewed in detail below.

Associations of Study Variables

Contrary to prediction, state shame was positively, rather than inversely, associated with social interaction quantity. This relation conflicts with previous research that indicated individuals with vertical individualist cultural orientations, which are common to individuals in

the United States, tend to withdraw from social interactions when experiencing shame given values of individualism and competitive social hierarchies (Young et al., 2021). There are a few potential explanations for this discrepancy. Though the present sample was collected from a university in the United States, demographic information regarding country of origin and international student status were not collected and cultural orientation was not measured. As such, it is unclear if the cultural context of the present sample differed from expectation. Yet, participants were primarily white and female, which provides some evidence that the present sample was consistent with the United States collegiate population (de Brey et al., 2019). In addition, the ESM design of the present study may more accurately reflect true behavior relative to imagined responses to hypothetical scenarios, as was utilized in the comparison study. Future ESM research may benefit from the collection of additional demographic variables and measurement of cultural orientation to clarify relations of shame, social behavior, and cultural factors.

Though the positive association of state shame and social interaction quantity was unexpected given the anticipated cultural context of the population, results are congruent with extant research supporting the social approach theory of shame. Indeed, shame is associated with desired, imagined, and observed engagement in prosocial interactions (de Hooge et al., 2008, 2018; Roseman et al., 1994; Tangney et al., 1996), especially in the immediate aftermath of shame induction (de Hooge et al., 2011). Thus, experiences of heightened shame may temporarily increase the saliency of social reinforcement and result in greater approach behavior. However, conclusions about the causative effect of shame on social interaction quantity are unclear. Social interactions of greater frequency may simply facilitate more opportunities for shameful experiences, and it is unclear when a shame-inducing interaction occurred within the

observation period. For example, an individual who reported engagement in 10 interactions since the last assessment would have had 10 opportunities to experience shame during a social interaction, whereas an individual who engaged in two social interactions would have had only two opportunities. Moreover, the first individual may have had nine interactions devoid of shame but experienced heightened shame during their 10^{th} interaction, which may explain little regarding the influence of shame on social approach or avoidance behavior. While this limitation was partially addressed via lagged effects analyses (see Temporal Effects, below), future research will benefit from clear delineation of the timeline of all emotional and behavioral events.

Regardless of the effect of shame on social interaction quantity, the present results indicate social interaction quality is impaired during occasions of elevated shame. As hypothesized, state shame was inversely associated with positive social interaction quality and positively associated with negative social interaction quality. Although this study is the first to explicitly examine associations of shame and social interaction quality, review of existing research reveals potential avenues of explanation for these relations. For instance, extant ESM research indicates that behaving consistently with one's sense of self and experiencing feelings of competence during a social interaction are predictive of high social interaction quality (Downie et al., 2008). Shame often arises following engagement in behavior that threatens one's self-perception and is associated with heightened self-awareness and decreased efficacy during social interactions (e.g., Covert et al., 2003; H. Lewis, 1971; Sabini & Silver, 1997). As such, shame may negatively impact social interaction quality by way of subjective perceptual changes and objective behavioral impairments. Alternatively, a poor-quality social interaction could induce shame in the first place, as shame frequently occurs following perceived social

transgressions (e.g., Keltner & Buswell, 1996). The present cross-sectional analyses and dearth of extant research examining shame and social interaction quality limits understanding of the nature of this relation. Development of additional research programs utilizing diverse methodologies and contexts appears warranted.

The relation of state shame and trait social anxiety symptom severity was positive, consistent with hypotheses. This result is congruent with at least 35 published studies that report positive correlations of shame and social anxiety (see Swee et al., 2021). Regarding state shame and trait social anxiety symptom severity specifically, this result replicates associations reported in samples of Romanian undergraduates (Cândea & Szentágotai-Tătar, 2016), Israeli undergraduates (Lazarus & Sahar, 2018), American undergraduate women (Levinson et al., 2016), Canadian adolescent girls (Lanteigne et al., 2014), and a clinical sample of Israeli adults (Haberman et al., 2018). As such, it is well established across contexts that individuals with elevated levels of social anxiety symptom severity are likely to experience high levels of state shame relative to individuals low in social anxiety symptom severity.

Support for hypotheses regarding associations of trait social anxiety symptom behavior and social interaction quantity and quality was mixed. Consistent with hypotheses, trait social anxiety symptom severity was inversely associated with social interaction quantity. The present study is the first to demonstrate that individuals who report high (versus low) social anxiety symptom severity engage in a lower quantity of social interactions in daily life. Notably, persistent avoidance of social interaction is a defining feature of social anxiety and has been observed in a variety of contexts (e.g., APA, 2013; Henricks et al., 2023; Rudaz et al., 2017). Yet, trait social anxiety symptom severity was not associated with positive or negative social interaction quality in the present study. These results contrast with hypotheses and extant

research demonstrating negative relations of social anxiety and social interaction quality (Cuming & Rapee, 2010; Rodebaugh, 2009: Rodebaugh et al., 2014, 2015). Possible explanations for these differences are reviewed below.

Discrepancies between present and extant results may be partially due to differences in measurement timeframe. With the exception of one study that used a laboratory-based design (Rodebaugh et al., 2014), previous research examining social anxiety and subjective social interaction quality asked participants to report on social interaction quality in the last six months (Rodebaugh et al., 2015) or did not specify a distinct reporting timeframe (Cuming & Rapee, 2010; Rodebaugh et al., 2009). This contrasts with present study procedures, which elicited responses from participants within a few hours of social interaction occurrence.

Not only does ESM reduce retrospective response biases by eliciting responses closer in time to experienced events (Lucas, 2000; Scollon et al., 2009), but some evidence indicates that judgements related to social stimuli may vary depending upon how much time has passed for socially anxious individuals. For example, extant research suggests individuals without social anxiety disorder make immediate, positively valanced interpretations when presented with ambiguous social information, whereas individuals with social anxiety disorder do not make any immediate judgements (Hirsch & Matthews, 2000). In addition, individuals high in social anxiety symptoms are likely to interpret social stimuli more negatively (and less positively) relative to individuals low in social anxiety two days following a social interaction (Brendle & Wenzel, 2004). Thus, the brief and discrete retrospective reporting windows in the present study may account for the insignificant relations of social anxiety and social interaction quality, as participants may have not yet formed strong judgments of interaction quality. Indeed, retrospective negative cognitive biases may strengthen over time among individuals with

elevated social anxiety symptomology, suggesting that an extended measurement window may lead to alternative conclusions regarding the association of social anxiety and social interaction quality. Examining changes in quality ratings of a social interaction across time within individual's natural environment may clarify the existence of this effect in future research.

Another explanation for the divergence of the present result from prior research may be effects associated with relationship type. Previously published associations of social anxiety and social interaction quality were specific to romantic (e.g., Cuming & Rapee, 2010) and friendship relationships (e.g., Rodebaugh, 2009; Rodgebaugh et al., 2014, 2015). Yet, no known research has examined relations of social anxiety and social interaction quality of other relationship types. In the present study, participants interacted with a wide range of interaction partners. Almost half of the most impactful interactions reported by participants in the present study indicated a family member, colleague, roommate, professor, acquaintance, or other individual was the primary interaction partner. Given the importance of romantic and friendship relationships to this population (Qualter et al., 2015), individuals may be especially sensitive to the quality of interactions with romantic partners and friends specifically, but not social interactions generally. As such, examination of social interaction quality within specific relationship contexts, especially those that are non-romantic and non-friend, may clarify associations with social anxiety symptom severity.

Extant evidence regarding longitudinal relations of friendship quality and social anxiety symptoms may further elucidate the lack of association between social interaction quality and trait social anxiety symptoms severity in daily life. Extant research indicates that friendship quality predicts social anxiety symptoms in clinical and undergraduate samples three and six months later, but not vice versa (Rapee et al., 2015; Rodebaugh et al., 2015). Thus, presence of

social anxiety symptoms may have minimal effects on interaction quality within pre-established relationships, but having low quality friendships now may affect symptom development and maintenance later. Consequently, social anxiety symptom severity may have little effect on day-to-day interaction quality within established relationships. Assessment of familiarity with interaction partners in future research will provide opportunity to determine if relationship closeness is a factor in relations of social anxiety and social interaction quality.

Concurrent Effects of Shame and Social Interaction in the Context of Social Anxiety

In partial concordance with hypotheses, trait social anxiety symptom severity significantly moderated the positive state shame-social interaction quantity relation. Specifically, at low and mean levels of social anxiety, state shame and social interaction quantity were positively related. At high levels of trait social anxiety symptom severity, no association was identified. Of note, the sample mean of trait social anxiety symptom severity was in the moderate severity range of the measure (Rytwinski et al., 2009). Thus, results indicate that when college students experience higher levels of shame than is typical for them, they engage in more frequent social interactions only if they have moderate or low levels of trait social anxiety symptom severity.

Present results suggest social anxiety attenuates the shame-interaction quantity relation in college students. Shame may function to increase one's engagement in social behavior so as to attain desirable relational consequences, such as emotional support and de-escalation of conflict (Gausel & Leach, 2011; P. Gilbert, 1997). Yet, as social anxiety symptom severity increases, this effect is weakened, indicating social anxiety may decrease the saliency of approach-related reinforcement contingencies, perhaps due to factors including elevated social threat sensitivity

and low distress tolerance (Bardeen et al., 2015; Clark & Wells, 1995; Heuer et al., 2007; Öhman, 1986, 2009; Roelofs et al., 2010).

However, contrary to hypotheses, there was no association of state shame and social interaction quantity at high levels of trait social anxiety symptoms severity. Rather, results indicate that individuals with elevated social anxiety symptom severity consistently engage in a low number of social interactions regardless of their level of shame. As such, trait social anxiety symptom severity may be a stronger predictor of social interaction quantity than state shame. In other words, high social anxiety may overshadow the influence of shame and be the dominant determinant of social interaction quantity, resulting in no apparent shame-quantity relation in the context of high social anxiety. Indeed, it is well-established that social anxiety is independently linked to social avoidance and shame (e.g., APA, 2013; Rapee & Heimberg, 1997; Swee et al., 2021), yet relations of state shame and social avoidance as reported in the literature have been equivocal (e.g., de Hooge et al., 2018; Leith & Baumeister, 1998; Tangney et al., 1996). The present results indicate social anxiety may be more influential than shame in determining social interaction frequency when social anxiety symptom severity is high. Use of dominance analysis (Budescu, 1993) within future datasets may lead to the specification of the relative importance of shame and social anxiety in the prediction of social interaction quantity.

Also contrary to hypotheses, trait social anxiety symptom severity did not moderate relations of state shame and positive or negative social interaction quality. No known research previously examined these constructs at once. Yet, extant twice-daily diary research indicated trait social anxiety symptom severity moderates relations of shame experienced during social interactions and self-criticism (Lazarus & Sahar, 2018), which is one indicator of social interaction quality (Zuroff et al., 1995). Utilizing large response windows (i.e., participants

responded at any point during the morning or afternoon and again before bedtime), Lazarus and colleagues (2018) determined that the positive association of shame and self-criticism is stronger at low trait social anxiety symptom severity relative to high symptom severity. However, the moderating relation changed across time. No effect of morning shame on evening self-criticism was detected at high levels of social anxiety, as highly anxious individuals reported high self-criticism regardless of level of shame experienced prior. These results coincide with extant research, discussed prior, suggesting negative judgements regarding social interactions among socially anxious individuals develop over time (Brendle & Wenzel, 2004; Hirsch & Matthews, 2000). As such, narrow response windows in the present study may have facilitated capture of initial perceptions of interaction quality prior to occurrence of maladaptive ruminative processes.

Yet, it is important to note that self-criticism is only one indicator of social interaction quality. Closeness, disclosure, support, intimacy, conflict, exclusion, and dominance are additional factors linked to social interaction quality (e.g., Foster, 2021; Pierce et al., 1991). As such, the effect of social anxiety symptom severity on relations of state shame and social interaction quality may be specific to certain predictive aspects of interaction quality. Investigating effects of shame and social anxiety as they relate to individual social interaction quality factors, capturing immediate perceptions of interaction quality and tracking changes in perception over time, and examining effects within specific relationship dynamics may clarify contextual factors associated with shame and social interaction quality across levels of social anxiety symptom severity.

Temporal Effects of Shame and Social Interaction in the Context of Social Anxiety

State shame did not predict social interaction quantity, positive social interaction quality, or negative social interaction quality at next-timepoint, as hypothesized. Furthermore, trait social

anxiety symptom severity did not moderate these relations. Results conflict with present cross-sectional relations and extant research indicating shame is associated with approach or avoidance of social interactions and impaired social interaction quality (e.g., Chao et al., 2011; de Hooge et al., 2018; Leith & Baumeister, 1998). However, the present study is the first to examine the effect of shame on social interaction quantity and quality at subsequent timepoints. The pattern of results suggests effects of shame on social behavior are short-lived and occur only within the context of an active experience of shame. Though it is unknown how long shame elevations persisted following social interaction in the present study, emotional states are brief, typically persisting for 10 to 20 minutes (Verduyn et al., 2009). Therefore, results suggest that state shame does not affect the frequency of social interactions or perceptions of interaction quality once the immediate experiences of shame dissipate.

The apparent time-limited function of shame on social behavior suggests shame may be a motivating operation. A motivating operation is defined as an event or stimulus condition that temporarily alters the value of consequences and modifies the probability of engagement in behaviors associated with such consequences (Michael 1982, 2007). As such, individuals experiencing shame may be more sensitive to social interaction contingencies and more likely to modify their social behavior to gain or avoid anticipated consequences relative to times of non-shame experiences. Increased sensitivity to contingencies and associated behavioral changes may decrease as shame decreases, such that shame increases engagement in social behavior during its active experience but does not have a persisting effect on future social behavior after it subsides. Future researchers may benefit from implementing functional analysis designs into research procedures to clarify if shame temporarily alters sensitivity to contingencies and produces behavioral change.

Of note, social interaction quantity, positive social interaction quality, and negative interaction quality were positively predicted by their respective lagged variables. Moreover, trait social anxiety symptom severity weakened the positive relation of lagged and next-timepoint social interaction quality, such that effects were strongest at low levels of social anxiety and insignificant at high levels of social anxiety. These results indicate that patterns of engagement in, and perceptions of quality of, social interactions persist across time for most individuals. However, previous experiences of high positive social interaction quality may not affect perceptions of positive quality in future social interactions for individuals high in social anxiety symptoms. This effect may be partially explained by differences in sensitivity to reinforcement and social expectations between individuals with and without social anxiety.

For example, individuals with social anxiety evidence low sensitivity to rewards and high sensitivity to threats (Goodman et al., 2021b; Gray & McNaughton, 2000; O'Connor et al., 2014). As such, prior reinforcement from positive quality social interactions may have little impact on future social behavior among highly socially anxious populations. Moreover, individuals who expect an interaction will go well engage in frequent prosocial behaviors (e.g., smiling, self-disclosure), which generally elicits reinforcement from the interaction partner (Montoya et al., 2018; M. Snyder et al., 1977; Stinson et al., 2009). In contrast, individuals who enter an interaction believing the other person will dislike them engage in fewer prosocial behaviors and report greater dissatisfaction with the interaction relative to individuals who believed they would be liked (Curtis & Miller, 1986). Given that social anxiety is associated with expectations that one will perform poorly and be disliked by others during social interaction (Maddux et al., 2011), individuals high in trait social anxiety symptom severity may be apt to approach new social interactions with the expectation that they will be disliked, regardless of

prior reinforcing experiences. They may then engage in fewer prosocial behaviors, receive limited reinforcement from their interaction partner, and ultimately perceive the interaction negatively. Indeed, low self-disclosing behavior mediates the inverse relation of social anxiety symptoms and romantic relationship quality (Cuming & Rapee, 2010). However, more research is needed to determine if impaired sensitivity to reinforcement and inflexible expectations about social interactions mediate relations of social interaction quality across time in populations with social anxiety.

The present results indicate social interaction quantity and quality predicted future state shame, but the nature of the relations differed from hypotheses. Past social interaction quantity predicted future state shame at high levels of trait social anxiety symptom severity only. Among individuals high in trait social anxiety symptom severity, high quantity of social interactions at time one predicted higher than average next-timepoint state shame. Extant research indicates the present finding may be a result of post-event rumination. As previously noted, evening ruminative self-criticism following morning social interaction is high among individuals high in social anxiety (Lazarus & Sahar, 2018). In addition, present—moment self-critical rumination is associated with high levels of shame immediately following stress-inducing activity (Milia et al., 2020). As such, socially anxious individuals involved in a high quantity of social interactions may engage in prolonged and distressing ruminative self-criticism. This criticism may result in harsher self-judgements and greater shame during new social interactions. More research is needed to confirm that self-critical rumination is the process responsible for the relation reported herein.

Results regarding positive and negative social interaction quality as predictors of subsequent shame were mixed. Positive social interaction quality did not predict next timepoint

state shame. This result is in contrast with hypotheses and auxiliary findings in the present study that demonstrated an inverse cross-sectional association of state shame and positive social interaction quantity. As such, associations may be limited to occasions of elevated shame. Also unexpected was that negative social interaction quality was a significant inverse predictor of state shame at the next-timepoint. In other words, individuals who reported high negative social interaction quality at one time point reported experiencing lower levels of shame than is typical for them at next time point. Though cross-sectional associations of negative social interaction quality and state shame were positive, these relations appeared to change over time.

The unexpected inverse temporal relation of negative social interaction quality and state shame may be the result of participant's efforts to reduce shame, social learning, or engagement in less threatening interactions. For example, individuals may have engaged in adaptive (e.g., reassurance seeking; deployment of emotion regulation strategies) or maladaptive (e.g., experiential avoidance) behaviors that facilitated shame reduction following interactions that were negative in quality (Cândea & Szentágotai-Tătar, 2020; Hayes et al., 1996; vanOyen-Witvliet et al., 2002). Similarly, individuals who were previously exposed to threatening or unpleasant social situations may learn to better predict social rewards and punishments and develop skills to optimize their social behavior relative to individuals without that learning history (Heerey, 2014; Joiner, 2000). Such skills may result in more effective social behavior, decreasing the likelihood of shame experiences in future interactions. Alternatively, individuals who recently experienced a poor quality, shame-inducing social interaction may avoid similar interactions and opt instead to engage in interactions that are less threatening or risky (de Hooge, 2013), and ultimately, less shame-inducing. As such, it is unclear if the time-lagged inverse relation of negative social interaction quality and state shame is suggestive of behavior that is

adaptive or maladaptive, approach- or avoidance-based, or some combination of each. Future researchers may measure shame regulation strategies and in the context of various relationships to clarify factors influencing this relation.

Taken together, results from temporal analyses suggest that relations of social interaction and state shame are unidirectional. State shame did not predict social interaction quantity, positive quality, or negative quality at subsequent timepoints, despite presence of within-timepoint associations. These results suggest the effects of state shame on social behavior are limited to the context of active shame experiences. Yet, some evidence indicates that social interaction quantity and quality may influence state shame in subsequent interactions. Indeed, negative social interaction quality predicted next timepoint state shame and social interaction quantity predicted subsequent state shame at high levels of trait social anxiety symptom severity. Though mechanisms underlying these relations are not clear, and study limitations attenuate the ability to draw firm causal conclusions, results provide initial evidence that social interaction quantity and quality may have unidirectional influence on future shame.

Clinical Implications

Taken together, results offer insights into working with college-aged clients presenting with concerns related to social interaction impairment, frequent unwanted experiences of shame, and social anxiety symptoms. Present results indicate unidirectional effects of social interaction quantity and quality on future shame experienced during social interactions. Clinicians may benefit from implementing intervention strategies targeting behavioral change rather than emotional control. Acceptance and Commitment Therapy (ACT; Hayes et al., 1999, 2012), which emphasizes values-based behavior change and flexible responding to unwanted thoughts and feelings, is one therapeutic modality that may be useful for individuals experiencing social

impairment and shame or anxiety. Using an ACT framework, clinicians may assist clients in developing willingness to experience unwanted internal experiences (e.g., shame, anxiety), increasing awareness of such experiences, and identifying and implementing value-guided actions (e.g., meeting a friend for coffee) without directly attempting to change or eliminate their thoughts and feelings. Indeed, ACT is an effective approach for treating shame-related problems (e.g., Gul & Aqeel, 2021; Khoramnia et al., 2020; Luoma et al., 2012), social anxiety disorder (e.g., Azadeh et al., 2016; Caletti et al., 2022; Khoramnia et al., 2020), and interpersonal problems (e.g., Azadeh et al., 2016; Norozi et al., 2017). Though additional research is necessary to clarify the processes underlying relations of shame, social anxiety, and social behavior, ACT may be a useful approach for such presenting concerns.

Strengths

There were a number of strengths of the current study. This study is the first to demonstrate associations of state shame and social interaction quality. These findings underscore the significance of clarifying the association of shame to approaching and/or avoiding social interactions, as well as its connection to subjective aspects of social engagement. In addition, the present study is the first to investigate relations of state shame, trait social anxiety symptom severity, and social interaction quantity and quality using an ESM design. Use of this method enabled detection of discrete fluctuations of emotion in the context of social behavior, reduced retrospective response biases, provided ecologically valid evidence for the present relations (or lack thereof), and facilitated the examination of temporal effects (Lucas, 2000; Scollon et al., 2009). Indeed, the present study is the first to provide evidence that social interaction quantity and quality may predict future shame. Moreover, examination of these effects using a college sample resulted in an improved understanding of shame, social anxiety, and social behavior in a

population known to experience elevated rates of social anxiety during a developmental period when the importance of interpersonal relationships is emphasized (e.g., Kessler et al., 2005; Leigh & Clark, 2018; Qualter et al., 2015). Yet, results must be considered in light of study limitations, described below.

Limitations and Future Directions

Some general limitations warrant mention, in addition to the specific limitations addressed above. Of note, use of a college student sample limits the generalizability of the present results. Indeed, relative to the United States population, the present sample appeared younger and less diverse (e.g., a high proportion of white and female individuals; U.S. Census Bureau, 2022). As such, results may not be applicable to individuals of different demographic groups. In addition, diagnostic criteria for SAD were not assessed and treatment-seeking individuals were not targeted for recruitment. It is therefore unclear if the results apply to clinical contexts. However, the present study aimed to evaluate shame and social behavior in the college context, and the sample characteristics were commensurate with the population of the University from which participants were recruited (USD, 2023). As such, the present results appear generalizable within the targeted population. Future researchers may benefit from evaluating study relations in community, diverse, and/or clinical populations to determine if the present results are consistent across populations.

In addition, the present study made use of self-report data that was largely cross-sectional. Though the ESM study design likely reduced the impact of retrospective response biases (Lucas, 2000; Scollon et al., 2009), participants nevertheless reported their experiences after the fact. Moreover, the cross-sectional nature of the data precludes testing of causative relations. Lagged analyses provided some indication of causal effects, but temporal precedence

of shame, social interaction quantity, and social interaction quality were not established within-timepoint. Moreover, examining these relations in daily life enhanced the ecological validity of the results at the cost of experimental control and manipulation (Bolger & Laurenceau, 2013). Thus, ability to make causative inferences was limited. Future researchers evaluating relations of shame and social behavior in daily life may benefit from evaluating differences in effects across varying timeframes to accurately understand the influence of retrospective reporting on study variables. Measuring shame independent of social interaction may also be of benefit in accurately establishing temporal precedence necessary for determining cause-and-effect.

Assessing shame independent of social interaction in future research may further address additional measurement limitations. Participants reported on state shame and social interaction quality within the context of impactful social interactions. Thus, values of each were not available on occasions when individuals reported engagement in zero social interactions, which restricted the range of social interaction quantity in cross-sectional analyses. Lagged analyses enabled assessment of relations of state shame across the full range of social interaction quantity (i.e., zero interactions included as predictor or consequent of state shame across timepoints), yet occurrence of state shame and interaction quality measurements remained dependent on engagement in social interaction. As such, the present relations of shame and social interaction quantity and quality may be limited to individuals who engage in some level of social interaction. Assessment of shame independently of social interaction may provide opportunity to address the present restricted range limitations and clarify relations of shame and social avoidance behavior for individuals who do not engage in frequent social interaction.

The omission of potentially relevant variables also warrants mention. For example, extant research indicates that the prevalence of social anxiety is higher among women relative to men

(e.g., APA, 2013; Asher et al., 2017), shame is more common in white women relative to white men and non-white women (Else-Quest et al., 2012), and the effect of shame on social approach behavior is dependent upon cultural factors (Young et al., 2021). However, gender and racial homogeneity of the present sample and lack of measurement of additional cultural variables prevented reliable examination of the influence of these characteristics on study results. In addition, effects of social relationship variables (e.g., type of relationship, duration of relationship history, and relationship closeness; Reis & Wheeler, 1991; Rodebaugh et al., 2015; Qualter et al., 2015) or underlying processes (e.g., emotion regulation abilities, experiential avoidance; Kashdan et al., 2013, 2014) on present relations were not examined, as previously noted. Future researchers may opt to include some or all of the aforementioned variables to clarify mechanisms underlying relations of shame and social behavior across contexts.

Conclusion

The present study (a) examined relations of state shame, trait social anxiety symptom severity, social interaction quantity, and social interaction quality in daily life; (b) investigated trait social anxiety symptom severity as a moderator of state shame and social interaction quantity and quality; and (c) examined temporal associations between state shame and social interaction quantity and quality. In line with the social approach theory of shame, state shame was associated with a greater quantity of social interactions in college students. This relation was attenuated by trait social anxiety symptom severity. Congruent with extant research, state shame was concurrently associated with greater negative and lower positive social interaction quality. Yet, contrary to expectation, trait social anxiety symptom severity did not moderate relations of state shame and positive or negative social interaction quality within or across timepoints,

perhaps due to lack of opportunity for post-event rumination or differential effects across relationship contexts.

Lagged analyses indicated social behavior may influence shame experienced during subsequent interactions but did not suggest a reciprocal relation. Indeed, effects of state shame on social interaction quantity and quality were not observed across timepoints, indicating that influences of state shame on social behavior may be time-limited. However, some aspects of social interaction quantity and quality were predictive of future shame. High social interaction quantity was associated with high subsequent state shame at high levels of trait social anxiety symptom severity only, perhaps due to carryover effects of post-event rumination from earlier interactions. High negative social interaction quality predicted subsequent low state shame, which was opposite expectation and cross-sectional findings. This may indicate deployment of shame regulation strategies following negative quality interactions, learned improvement in social skills and regulation strategies after exposure to unpleasant experiences, or proclivity to avoid threatening and approach non-threatening social situations following negative quality interactions. Finally, positive social interaction quality did not predict subsequent state shame, indicating negative experiences may be more relevant to shame across time. Though more research is needed to understand these relations, the present results provide preliminary evidence that social behavior impacts shame across time.

In sum, the findings highlight the complexity of the relations of shame, social interaction quantity and quality, and social anxiety symptom severity. Results broadly supported the social approach theory of shame, indicated trait social anxiety symptom severity is relevant to shame and interaction quantity but not quality, and suggested social interaction quantity and negative social interaction quality predicted subsequent shame but not vice versa. Yet, these relations

likely differ across time periods and contexts. As such, evaluation of associated constructs, such as emotion regulation or psychological flexibility, across contexts may clarify broadly applicable functions of shame. Such research may enable identification of therapeutic strategies for individuals experiencing high levels of shame, social anxiety, or social impairment.

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Appendix A

Demographics Questionnaire

What was your sex at birth?

0 = Male
1 = Female
2 = Intersex
3 = Other

What is your current gender identity? (Check all that apply)

1 = Man
2 = Woman
3 = Trans man
4 = Trans woman
5 = Genderqueer
6 = Gender fluid
7 = Agender
8 = Questioning or unsure
9 = Other

What is your age (in years)?

_____

What is your ethnic background?

1 = White
2 = American Indian/Alaska Native
3 = Black/African American
4 = Asian/Asian American
5 = Hispanic/Latino
6 = Native Hawaiian or Other Pacific Islander
7 = Middle Eastern/Northern African
8 = Other (including multi-ethnic, please specify): _____

How do you self-identify?

1 = Straight (Heterosexual)
2 = Gay
3 = Lesbian
4 = Bisexual
5 = Queer
6 = Questioning or unsure
7 = Asexual

8 = Same-Gender-Loving
9 = Pansexual
10 = Other

What is your current relationship status?

1 = Single, never married
2 = Widowed
3 = Married
4 = Separated
5 = Divorced
6 = Living with partner (but not legally married)
7 = Long-term committed relationship

What is the highest grade or degree you have completed?

1 = Eighth grade or less
2 = Some high school
3 = GED
4 = High school graduate
5 = Business or technical training beyond high school
6 = Some college
7 = College graduate
8 = Some graduate or professional school beyond college
9 = Master's degree
10 = Doctoral degree

Are you a student?
1 = Not a student
2 = Part-time student
3 = Full-time student

What is your employment status?
1 = Unemployed
2 = Employed part-time (working 1-30 hours a week)
3 = Employed full-time (working more than 30 hours a week)
4 = Home-maker
5 = Retired

What is your total household/family income?

1 = Less than $9.999
2 = $10,000 - 19,999
3 = $20,000 - 29,999
4 = $30,000 - 39,999
5 = $40,000 - 49,999

6 = $50,000 - 59,999
7 = $60,000 - 69,000
8 = $70,000 - 79,000
9 = $80,000 - 89,000
10 = $90,000 - 99,999
11 = $100,000 or more

Appendix B

Liebowitz Social Anxiety Scale

This measure assesses the way that social phobia plays a role in your life across a variety of situations. Read each situation carefully and answer two questions about that situation. The first question asks how anxious or fearful you feel in the situation. The second question asks how often you avoid the situation. If you come across a situation that you ordinarily do not experience, imagine "what if you were faced with that situation," and then, rate the degree to which you would fear this hypothetical situation and how often you would tend to avoid it. Please base your ratings on the way that the situations have affected you **in the last week**. Fill out the following scale with the most suitable answer provided below.

	Fear				Avoidance			
	None	Mild	Moderate	Severe	Never (0%)	Occasionally (1-33%)	Often (34-66%)	Usually (67-100%)
1. Telephoning in public.	○	○	○	○	○	○	○	○
2. Participating in small groups.	○	○	○	○	○	○	○	○
3. Eating in public places.	○	○	○	○	○	○	○	○
4. Drinking with others in public places.	○	○	○	○	○	○	○	○
5. Talking to people in authority.	○	○	○	○	○	○	○	○
6. Acting, performing or giving a talk in front of an audience.	○	○	○	○	○	○	○	○
7. Going to a party.	○	○	○	○	○	○	○	○
8. Working while being observed.	○	○	○	○	○	○	○	○
9. Writing while being observed.	○	○	○	○	○	○	○	○
10. Calling someone you don't know very well.	○	○	○	○	○	○	○	○
11. Talking with people you don't know very well.	○	○	○	○	○	○	○	○
12. Meeting strangers.	○	○	○	○	○	○	○	○
13. Urinating in a public bathroom.	○	○	○	○	○	○	○	○
14. Entering a room when others are already seated.	○	○	○	○	○	○	○	○
15. Being the center of attention.	○	○	○	○	○	○	○	○
16. Speaking up at a meeting.	○	○	○	○	○	○	○	○
17. Taking a test.	○	○	○	○	○	○	○	○
18. Expressing a disagreement or disapproval to people you don't know very well.	○	○	○	○	○	○	○	○
19. Looking at people you don't know very well in the eyes.	○	○	○	◉	○	○	○	○
20. Giving a report to a group.	○	○	○	○	○	○	○	○
21. Trying to pick up someone.	○	○	○	○	○	○	○	○
22. Returning goods to a store.	○	○	○	○	○	○	○	○
23. Giving a party.	○	○	○	○	○	○	○	○
24. Resisting a high pressure salesperson.	○	○	○	○	○	○	○	○

Appendix C

Social Interaction Quantity

1. Since the last assessment, how many social interactions have you had? A social interaction is defined as talking with someone in person, by phone, or online.

   _____

Appendix D

Social Interaction Quality

You indicated that you had at least one social interaction since the last assessment. During the next several questions, please consider your **most impactful** interaction since the last assessment.

1. How did this interaction take place?
    a. In-person
    b. By phone
    c. Online

2. How long did this interaction last? Please record your answer in minutes
    _____

3. Who was the primary person you interacted with?
    a. Romantic partner
    b. Parent
    c. Close relative
    d. Non-close relative
    e. Close friend
    f. Non-close friend
    g. Roommate
    h. Work or school colleague
    i. Teacher or professor
    j. Acquaintance
    k. Other (please specify):

4. Who else was present during the interaction (select all that apply)?
    a. No one else was present
    b. Romantic partner
    c. Parent
    d. Close relative
    e. Non-close relative
    f. Close friend
    g. Non-close friend
    h. Roommate
    i. Work or school colleague
    j. Teacher or professor
    k. Acquaintance
    l. Other (please specify):

5. Overall, how pleasant or positive was this interaction?

Not at all			Moderately			Extremely
1	2	3	4	5	6	7

6. Overall, how unpleasant or negative was this interaction?

Not at all			Moderately			Extremely
1	2	3	4	5	6	7

Appendix E

Zero Interaction Questionnaire

You indicated that you did not have any social interaction since the last assessment. The next several questions ask about your typical interactions.

1. Why do you think you did not interact with anyone since the last assessment?
   a. Too tired
   b. Preferred to be alone
   c. Avoided unpleasant interaction(s)
   d. Plans changed
   e. Too busy
   f. Too sick
   g. No one to talk to
   h. Other reason

2. How typical is it for you to not interact with anyone during the last few hours?

Not at all			Moderately			Extremely
1	2	3	4	5	6	7

3. How likely are you to interact with someone in the next 2 or 3 hours?

Not at all			Moderately			Extremely
1	2	3	4	5	6	7

Appendix F

State Shame Scale (SSGS-S)

The SSSG-S is a self-rating scale of in-the-moment (state) feelings of shame. Five items are rated on a 5-point scale Likert scale. The following are some statements which may or may not describe how you are feeling **right now**. Please rate each statement using the 5-point scale below. Remember to rate each statement based on how you are feeling **right at this moment**.

	Not feeling this way at all	Feeling this way somewhat	Feeling this way very strongly
1. I want to sink into the floor and disappear.	1 ------- 2 ------- 3 ------- 4 ------- 5		
2. I feel small.	1 ------- 2 ------- 3 ------- 4 ------- 5		
3. I feel like I am a bad person.	1 ------- 2 ------- 3 ------- 4 ------- 5		
4. I feel humiliated, disgraced.	1 ------- 2 ------- 3 ------- 4 ------- 5		
5. I feel worthless, powerless.	1 ------- 2 ------- 3 ------- 4 ------- 5		

Appendix G

State Shame Scale (SSGS-S-M)

The following are some statements which may or may not describe how you felt **during your most impactful interaction** since the last assessment. Please rate each statement using the 5-point scale below. Remember to rate each statement based on how you were feeling **during the interaction.**

	Did not feel this way at all	Felt this way somewhat	Felt this way very strongly
1. I wanted to sink into the floor and disappear.	1 ------- 2 ------- 3 ------- 4 ------- 5		
2. I felt small.	1 ------- 2 ------- 3 ------- 4 ------- 5		
3. I felt like I was a bad person.	1 ------- 2 ------- 3 ------- 4 ------- 5		
4. I felt humiliated, disgraced.	1 ------- 2 ------- 3 ------- 4 ------- 5		
5. I felt worthless, powerless.	1 ------- 2 ------- 3 ------- 4 ------- 5		