Pursuing Safety in Social Connection Regulates the Risk-Regulation, Social-Safety and Behavioral-Immune Systems

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Keywords: Relationships, Safety, Belonging, Risk, Disease, Rejection

Abstract

A new goal-systems model is proposed to help explain when individuals will protect themselves against the risks inherent to social connection. This model assumes that people satisfy the goal to feel included in *safe* social connections – connections where they are valued and protected rather than at risk of being harmed – by devaluing rejecting friends, trusting in expectancy-consistent relationships, and avoiding infectious strangers. In the hypothesized goal system, *frustrating* the fundamental goal to feel safe in social connection *sensitizes* regulatory systems that afford safety from the risk of being interpersonally rejected (i.e., the risk-regulation system), existentially uncertain (i.e., the social-safety system), or physically infected (i.e., the behavioral-immune system). Conversely, *fulfilling* the fundamental goal to feel safe in social connection desensitizes these self-protective systems. A 3-week experimental daily diary study (N=555) tested the model hypotheses. We intervened to fulfill the goal to feel safe in social connection by repeatedly conditioning experimental participants to associate their romantic partners with highly positive, approachable words and images. We then tracked how vigilantly experimental versus control participants protected themselves when they encountered social rejection, unexpected behavior, or contagious illness in everyday life. Multilevel analyses revealed that the intervention lessoned self-protective defenses against each of these risks for participants who ordinarily felt most vulnerable to them. The findings provide the first evidence that the fundamental goal to feel safe in social connection can co-opt the risk-regulation, social-safety, and behavioral-immune systems as independent means for its pursuit.

"Nature compels us to recognize the fact of mutual dependence, each life necessarily helping the other lives who are linked to it. In the very fibers of our being, we bear within ourselves the fact of the solidarity of life."

—*Albert Schweitzer*

There is no escaping the solidarity of life. From birth to death, people rely on one another to meet basic physiological and psychological needs (Balliet et al., 2016; Kenrick et al., 2010). Indeed, expecting or having strong social connections has a variety of seemingly unrelated benefits. Anticipating the support of a romantic partner, the goodwill of friends, the communality of neighbors, or the foresight of political leaders can facilitate personal goal pursuits (Feeney & Collins, 2015; Fitzsimons et al., 2015), alleviate death anxiety (Cox & Arndt, 2012; Plusnin et al., 2018), lessen government distrust (Goertzel, 1994; Holt-Lundstadt, 2018; Hudson, 2006; Murray, Lamarche et al., 2021), and benefit mental health (Proulx et al., 2007). Moreover, expecting or having such social connections can also strengthen immune responses (Cohen et al., 2015), attenuate physical pain (Master et al., 2009; Eisenberger et al., 2011; Wilson & Simpson, 2016; Yanagisawa et al., 2011), shrink the physical stature of foes (Fessler & Holbrook, 2013), and even delay mortality (Holt-Lundstadt et al., 2010; Robles et al., 2014).

Unfortunately, relying on the solidarity of others can also leave people vulnerable to being disappointed by the selfishness of romantic partners, the disloyalty of friends, the carelessness of neighbors, or the fecklessness of political leaders. People can be left uncertain who they are after a romantic breakup (Slotter et al., 2010), nursing a wounded ego after going to an unsupportive friend for advice (Leary et al. 1995), infected with a life-threatening virus after sharing an enjoyable coffee with a convivial neighbor (Bai et al., 2020), stressed and distraught over the results of a Presidential election (Blanton et al., 2012), or struggling financially after unexpected government cuts to valued social welfare programs (Hudson, 2006).

Recognizing this duality, Baumeister and Leary (1995) concluded that people are fundamentally motivated to belong – to be included in social connections where they are consistently cared for and protected, not hurt or exploited. In other words, people have a fundamental need for social connections that are *safe*. Reflecting the importance of this need for human survival, people appear to be equipped with multiple regulatory systems that can be recruited to help minimize the risks of forging social connections (Kenrick et al., 2010).

The *risk-regulation system* functions to ensure that people surround themselves with intimates who are not going to reject or exclude them. It fulfills this function by linking the experience of *social pain* to defensive inclinations to devalue and withdraw from romantic partners, friends, and family members when they behave rejectingly (Forest et al., 2015; Kane et al., 2012; Murray, Bellavia et al., 2003; Murray, Griffin et al., 2003; Murray & Holmes, 2009, 2017). For example, priming a rejecting significant other automatically activates thoughts of distancing oneself from that person, which blunts the pain of their rejection (Gillath et al., 2006; Murray et al., 2008). Similarly, people rely on judgmental intimates less over time, making their disapproval less hurtful and esteem-threatening (Overall & Fletcher, 2010). By functioning to make intimate social connections feel less socially painful, the risk-regulation system can be enlisted, as needed, to make social connection feel *interpersonally* safer.

The *social-safety* system functions to ensure that people maintain desired perceptions of foreseeability and meaning in the social connections they share with others. It fulfills this function by linking existential angst about *not* being able to foresee the behavior of others in one relational world to defensive inclinations to impose trustworthiness on an *alternate*, more perceptually pliable, relational world. For instance, when a romantic partner, friend, or child behaves unexpectedly, creating the existential anxiety that individuals might not understand

others as well as they thought, this system motivates individuals to instead trust in the collective relationships they share with members of their collective world. Conversely, when fellow community members, a Prime Minister, or Congress behaves unexpectedly, this system motivates individuals to trust the personal relationships they share with intimates (Murray et al., 2017, 2018; Murray, Lamarche et al., 2021; Murray, Seery et al., 2021; Williamson et al., 2021). By functioning to make depending on others more foreseeable and existentially-certain, the social-safety system can be enlisted, as needed, to make social connection feel *collectively* safer.

Finally, the *behavioral-immune* system functions to ensure people minimize their exposure to infectious diseases (Bressan, 2021; Miller & Maner, 2011, 2012; Murray & Schaller, 2006; Olivera-La Rosa et al., 2020). It fulfills this function by linking the *fear of contagion* to the inclination to avoid strangers in particular (Tybur et al. 2020). For example, people primed with infectious disease report being less gregarious and more socially discriminating, as compared to controls (Sacco et al., 2014). People primed with disease also avoid unfamiliar faces (Mortensen et al., 2010), forego romantic suitors (Sawada et., 2018), and distrust outgroups (Navarrete & Fessler, 2006). By functioning to make interacting with others less virally risky, the behavioral-immune system can be enlisted, as needed, to make social connection feel *physically* safer.

Understandably, prior research has examined these systems independently, with scholars focusing on the proximate (i.e., avoiding social pain or existential uncertainty) and ultimate (i.e., physical survival) goals these systems serve. However, this paper introduces a new goal-systems model of relational safety regulation that assumes that the risk-regulation, social-safety, and behavioral-immune systems also share an important commonality. By fulfilling their primary functions, they can all help serve the goal to feel safe in social connection.

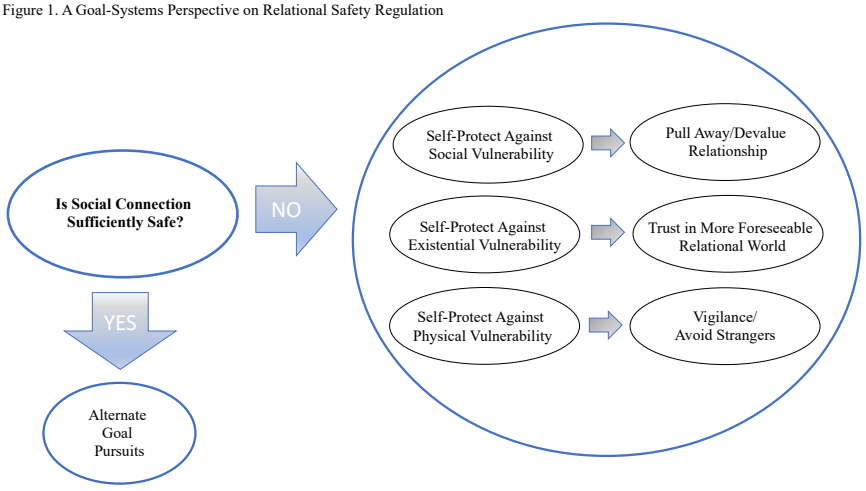
The goal-systems model advanced in this paper posits that the goal to feel *safe* in social connection can co-opt or commandeer the risk-regulation, social-safety, and behavior-immune systems as *means* for its pursuit, even though these systems may have different functions in an ultimate sense. Accordingly, *frustrating* the goal to feel safe in social connection in daily life should *sensitize* all three systems, whereas *fulfilling* this goal should *desensitize* them. Understanding how these three systems help fulfill the fundamental need to feel safe in social connection has important theoretical and practical implications. Indeed, some people are far too preoccupied with protecting themselves against the risks inherent to social connection. For instance, people who see rejection in the faintest frown, struggle with even the slightest uncertainty, or fear every circulating flu too often miss out on opportunities for connection, leaving them susceptible to the ill effects of frustrated belongingness needs (Baumeister & Leary, 1995). While such vulnerabilities are often seen as intractable, adopting a goal-systems perspective on the operation of these systems provides reason for optimism. Specifically, *intervening* to fulfill the need to feel *safe* in social connection through a foundational relationship bond – such as the connection to a romantic partner – should *desensitize* these systems, giving people who would otherwise be preoccupied with self-protection license to alternate goals. We make this point experimentally, by intervening in the daily lives of romantic couples as they coped with the heightened social pain, existential uncertainty, and infectious disease risks posed by the first four months of the COVID-19 pandemic (Devine et al., 2021; Sibley et al., 2020).

A Goal-Systems Framework for Understanding Relational Safety Regulation

Figure 1 presents our goal-systems model for understanding how three seemingly independent systems (risk-regulation, social-safety, and behavioral-immune) jointly help fulfill the fundamental need to feel *safe* in social connection. Goal systems are typically conceptualized

as hierarchically-structured mental networks, ones that help people navigate their lives from one situation to the next. In such a network, a motivationally-prioritized goal is thought to be linked to the means for its pursuit and embedded with other goals and their associated means. Importantly, these associated goals and means can complement or compete with the motivationally-prioritized goal pursuit (see Fishbach & Ferguson, 2007; Fitzsimons et al., 2015; Kruglanski et al., 2002; Kruglanski et al., 2015, for reviews). For instance, in the goal system of an aspiring dieter, the goal to be lose weight is linked to the means for its pursuit – the complementary goals to eat healthy foods and exercise daily – which share links to the means supporting their pursuit (e.g., stocking the fridge with produce, cooking for oneself, committing to early morning hikes), furthering the pursuit of the motivationally-prioritized goal to lose weight. However, for this aspiring dieter, the goal to lose weight is also linked to the competing goal to self-indulge, such as (1) going out eating and drinking with friends or (2) sleeping in after a night spent playing video games, threatening the pursuit of the motivationally-prioritized goal.

Figure 1. A Goal-Systems Perspective on Relational Safety Regulation



Accordingly, in such a goal-system, *frustrating* a motivationally prioritized goal activates or sensitizes associated goals and means that are compatible with the prioritized goal, while inhibiting associated goals and means that are incompatible with the prioritized goal. For an aspiring dieter, that is, feeling unfit after a weekend away from training should activate the complementary goals to eat healthy foods and exercise, but deactivate the competing goals and means to be self-indulgent. In contrast, fulfilling a motivationally prioritized goal deactivates or desensitizes the complementary goals and means that support its pursuit, allowing new goals to be pursued. Thus, for a now accomplished dieter, feeling fit after a week of training should inhibit the goals and means to eat healthy and exercise, allowing the goals and means to be self-indulgent and share a snack-infused Netflix binge with friends to take priority.

Regulating Vulnerability: Pursuing the Fundamental Goal to Feel Safe

The new goal-systems model of relational safety regulation presented in Figure 1 shares and broadens this goal-systems logic. This model is similarly rooted in the assumption that ongoing social situations often offer the opportunity to pursue more than one goal (Lassetter et al., 2021; Murray et al., 2006). For instance, happening upon a sneezing boss in the hallway might activate the goal to self-protect against physical infection by retreating into a nearby office as well as the goals to connect and offer solicitude to someone in need and the goal to secure status and impress this superior with one's fiscal acumen. Similarly, a friend rejecting repeated requests for coffee might activate the goal to self-protect against social pain by lashing out at the friend as well as the connectedness goals to forgive this friend or strengthen shared relationships within this social network. However, individuals are limited in the number of goals they can pursue, partly because self-regulatory resources are constrained, but also because acting on one goal often closes the door on acting on competing goals in that situation (Fishbach et al., 2003).

Recognizing such situational complexity, this new model posits the relative frustration versus fulfillment of the fundamental goal to feel *safe* in social connection acts as a situational arbiter. The "yes/no" decision point in Figure 1 captures this assumption, one that is also central to other theories of social connection, such as theories of attachment (Mikulincer & Shaver, 2003; Feeney & Collins, 2015) and interdependence (Murray et al., 2006; Murray & Holmes, 2009). That is, the relative frustration versus fulfillment of this fundamental goal controls how much daily affective, cognitive, and behavioral energy people devote to minimizing and protecting themselves against social risk – including the risks of being socially pained, existentially uncertain, or physically infected – as opposed to pursuing alternate goals that the situation might also afford, such as connection, status, or self-actualization.

The model then broadens the usual logic of a goal system by expanding the *means* for goal pursuit beyond specific goal-contingent behaviors to include entire *regulatory systems* that ordinarily serve unrelated goals. In other words, this new model conceptualizes the risk-regulation, social-safety, and behavioral-immune systems as *recruitable means* for fulfilling the fundamental goal to feel safe in social connection. Specifically, feeling *insufficiently* safe sensitizes or recruits (a) the risk-regulation system that protects against social pain by helping people pull away from rejecting relationships, (b) the social-safety system that protects against existential uncertainty by helping people trust in more seemingly foreseeable worlds, and (c) the behavioral-immune system that protects against physical infection by helping people be vigilant to signs of contagion. In contrast, feeling *sufficiently* safe in social connection (i.e., goal fulfillment) allows people to prioritize alternate goals, desensitizing the risk-regulation, social-safety, and behavioral-immune systems that are not currently needed to protect against harm.

Individual Differences in Goal Fulfillment

Of course, people do not enter into risky situations tabula rasa. Their past experiences and personalities dispose them to feel more or less safe in social connection in general, and more or less vulnerable to social pain, existential uncertainty, and/or physical infection in particular (Murray et al., 2006). Accordingly, the model conceptualizes people whose past experiences and personalities dispose them to feel *insufficiently* safe in social connection as *aspiring* safety-seekers. Just like aspiring dieters need to prioritize eating healthy and exercise goals over alternative pursuits to meet their dieting goals, *aspiring* safety-seekers need to prioritize protecting themselves against social risk to meet their desired goals to feel safer in social connection. In contrast, the model conceptualizes people whose past experiences and dispositions lead them to feel *sufficiently* safe in social connection as *accomplished* safety-seekers. Just like accomplished dieters can afford the occasional snack-infused Netflix binges with friends, *accomplished* safety-seekers can afford to pursue alternate goals, including connectedness goals, even when risky social opportunities present themselves.

If the goal to feel safe in social connection can indeed co-opt or commandeer the risk-regulation, social safety, and behavioral-immune systems, then people who likely feel *insufficiently* safe in social connection should be more likely to protect themselves against being socially-pained, existentially uncertain, or physically infected than people who feel *sufficiently* safe. In other words, *aspiring* safety-seekers should possess more highly *sensitized* risk-regulation, social-safety, and behavioral-immune systems than *accomplished* safety-seekers. Existing research provides indirect support for this logic.

For instance, people who are *less* certain they can trust their romantic partner likely feel *insufficiently* safe in social connection (Murray et al., 2006). As putative *aspiring* safety-seekers,

people who are *less* certain they can trust their romantic partner are also *more* likely to protect themselves against *social pain* (Murray, Bellavia et al., 2003) and *existential uncertainty* than people who are certain they can trust their romantic partner (Murray, Lamarche et al., 2021). Similarly, people who are *low* in self-esteem likely feel *insufficiently* safe in social connection because they tend to be less trusting of romantic partners, friends, family, and acquaintances than high self-esteem people (Leary et al., 1995; Murray et al., 2001, 2002, 2008). As putative *aspiring* safety-seekers, low self-esteem people are also more likely to protect themselves against *social pain* than high self-esteem people (Bellavia & Murray, 2003; Cameron & Granger, 2019; Murray et al., 1998, 2002). However, when low self-esteem people have reason to feel *sufficiently* safe in social connection, because they are high in relational self-construal (Baker & McNulty, 2013) or possess more positive automatic attitudes toward their partner (Murray et al., 2015), they, like *accomplished* safety-seekers, are *less* likely to self-protect.

And finally, people who are *more* sensitive to disgust (Aaroe et al., 2016; Kupfer & Tybur, 2017) and tend to feel *more* vulnerable to catching contagious diseases (Clay et al., 2012) are *less* trusting of strangers and collective institutions, suggesting they feel *insufficiently* safe in social connection (Neuberg et al., 2011). As putative *aspiring* safety-seekers, individuals who feel *more* physically vulnerable to contagious diseases are also *more* likely to protect themselves against potentially infectious acquaintances than individuals who feel *less* physically vulnerable (Mortensen et al., 2010; Neuberg et al., 2011). Moreover, when people feel *insufficiently safe* in social connection because they have *just* been hurt by someone they know, even people who usually feel invulnerable to infection behave more like aspiring safety-seekers and take concrete steps to protect themselves against the daily risk of contracting COVID-19 (Murray et al., 2022).

In sum, this indirect evidence suggests that people who have reason to feel *insufficiently*

safe in social connection are *more* likely to protect themselves against social pain, unexpected behavior, and physical infection than people who have reason to feel *sufficiently* safe in social connection. This suggests that *fulfilling* the fundamental goal to feel safe in social connection could conceivably make vulnerable people *less* likely to protect themselves against such social risks. Nevertheless, such indirect support does not address the proposed model's prediction that fulfilling the fundamental goal to feel safe can desensitize all three systems simultaneously.

Romantic Relationships: Satiating the Fundamental Goal to Feel Safe

All this brings us to the question: What kind of experiential intervention could turn aspiring safety-seekers into accomplished ones? The connection to a romantic partner is arguably the most important social connection made in adult life (Day, 2016). Romantic partners promise to be consistently available and caring, the requisite condition for feeling safe in social connection (Baumeister & Leary, 1995). They also afford concrete and symbolic protection against realistic threats to safety. People have long relied on romantic partners for protection from human and animal foes, food insecurity, and economic insecurity (Finkel et al., 2014), and even today, quality relationships are tied to better physical health (Robles et al., 2014). Moreover, in the past decades, people have come to rely on romantic partners to satisfy the self-actualization needs that lend meaning and stability to their lives (Finkel et al., 2014). With the even greater narrowing of social networks during the COVID-19 pandemic, the prepotent role romantic partners can play in affording safety has only increased (Kovaks et al., 2021).

However, the specific romantic partners that individuals possess may leave them feeling more or less safe. In ongoing relationships, individuals' spontaneous evaluative associations to their romantic partner (e.g., good/bad, approach/avoid) capture actual experiences of being more or less valued and protected. A history of being treated *responsively* conditions more *positive*

evaluative associations that signal the safety such responsive partners provide. In contrast, a history of being treated *unresponsively* conditions more *negative* evaluative associations that signal the vulnerability such unresponsive partners create (Hicks et al., 2016, 2018; Murray et al., 2010, 2013). This behavioral basis affords individuals with more positive automatic attitudes a pre-existing resource for feeling safe, one that allows them to risk trusting their romantic partner in situations where they might be hurt (Faure et al., 2018; Hicks et al., 2016, 2018, 2020; LeBel & Campbell, 2009; McNulty et al., 2013, 2017; Murray et al., 2011, 2013). In fact, automatic partner attitudes often better predict romantic relationship outcomes than consciously held attitudes toward the partner (McNulty et al., 2013; Righetti et al., 2022). This is because automatic attitudes are less susceptible to conscious dissembling, as can happen when someone high in self-esteem excuses an unreliable partner's transgressions or someone low in self-esteem questions the motives of a demonstrably caring partner (McNulty et al., under review).

We decided to target evaluative associations to romantic partners with the intervention, with the hope of filling the need to feel safe in social connection without arousing the defenses of vulnerable people. Specifically, we designed the intervention to *simulate* the experience of someone who spontaneously makes highly positive automatic associations to their romantic partner in daily interactions. We simulated such an experience for *experimental* participants by repeatedly conditioning them to associate their romantic partner with highly positive words and images. Thus, the intervention subtly nudged experimental participants to make safety-affording associations to their romantic partner (above and beyond whatever associations they normally made). Indeed, prior research suggests that conditioning participants to associate their romantic partner with safe and rewarding experiences in this way can gradually enhance positive evaluative associations to that same partner over time (McNulty et al., 2017).

Building on this research, we reasoned that intervening to repeatedly condition participants to associate their romantic partner with safe and rewarding experiences would have an even more general cumulative effect. Namely, we expected such a conditioning intervention to provide boosted individuals with greater reason to feel safe in social connection in general, as evidenced in heightened belief in the trustworthiness of others. Consistent with this logic, feelings of safety can transfer across relational worlds (Murray et al., 2018; Murray, Lamarche et al., 2021; Murray, Seery et al., 2021). People also misattribute positive reminders of connection, confusing one source of security for another (Chen et al., 2015; Fay & Maner, 2012; Forest et al., 2015; Williams & Bargh, 2008). In fact, over time, repeatedly conditioning people to associate their romantic partner with highly desirable words and images even reduced the general sense of social isolation and disconnection underlying suicidal ideation (McNulty et al., 2019).

Overview and Hypotheses

In the present intervention study (*N*=555), U.S. adults in live-in romantic relationships provided reports every-other-day for a total of 11 assessments in the summer of 2020, the first year of the COVID-19 pandemic, a time that heightened the risks and rewards of social connection (Devine et al., 2021; Sibley et al., 2020). In the experimental condition, we repeatedly evaluatively conditioned participants to associate their romantic partner with highly positive, highly approachable (Chen & Bargh, 1999) words and images. In the control condition, we repeatedly paired their romantic partner with neutral words and images. A longitudinal study of married couples effectively used this procedure to gradually foster more positive automatic associations to the partner and protect against declines in relationship satisfaction over time (McNulty et al., 2017). In the current study, we reasoned that conditioning positive evaluative associations to this foundational attachment figure would make others seem more trustworthy

and safer to depend on – thereby providing a non-reactive way to help fulfill the fundamental goal to feel safe in social connection and turn *aspiring* safety-seekers into *accomplished* ones.

In the *control* condition, we expected the relative fulfillment of the goal to feel safe in social connection to vary naturalistically. We reasoned *control* participants who were *high* in vulnerability to social pain, existential uncertainty, or infectious disease would feel *insufficiently* safe in social connection in situations that posed these respective threats, whereas *control* participants who were *low* in vulnerability to such threats would be more likely to feel *sufficiently* safe. Therefore, in the *control* condition, we expected *aspiring* safety-seekers to be *more* motivated to protect themselves against the risks of social connection than accomplished safety-seekers. That is, we expected: (1) *control* participants *high* in vulnerability to social pain to be *more* likely to self-protect by devaluing their relationships on days they experienced *more* rejection, as compared to controls *low* in vulnerability to social pain; (2) *control* participants *high* in vulnerability to existential uncertainty to be *more* likely to self-protect by trusting *more* in *alternate* relational worlds on days they experienced *more* unexpected behavior, as compared to controls *low* in vulnerability to existential uncertainty; and (3) control participants *high* in self-perceived vulnerability to infectious disease to be *more* likely to self-protect by physically distancing themselves from non-intimates on days they were *more* concerned about COVID-19 (a particularly salient disease threat at the time of data collection), as compared to controls *low* in self-perceived vulnerability to infectious disease.

In contrast, in the *experimental* condition, we expected the intervention to help fulfill the goal to feel safe in social connection, turning *aspiring* safety-seekers into *accomplished* ones. Therefore, in the *experimental* condition, we expected the risk-regulation, social-safety, and

behavioral-immune systems of *aspiring* safety-seekers to be comparatively *desensitized* to social risk, and thus, operate more similarly to the regulatory systems of *accomplished* safety-seekers.

In sum, the current research is the first to suggest that the fundamental goal to feel safe in social connection can co-opt the risk-regulation, social-safety, and behavioral-immune systems as *means* for its pursuit. It is also the first to position the safety romantic partners can afford as playing a central role in regulating how people respond to the risks of being socially pained, existentially uncertain, or physically infected in daily life. In proceeding, we first overview the sample and experimental intervention. We then treat each system as a separate mini-study, presenting the hypotheses, measures, analytic models and results for the risk-regulation, social-safety, and behavioral-immune systems, respectively, before integrating the findings across the three systems in the General Discussion.

Method Overview: Sample and Intervention

This research was approved by the Institutional Review Board. We describe the sample, general procedure, and intervention next. We describe the utilized measures when we report each system test. The Supplemental Online Materials (SOM) detail the procedure, unrelated measures, and prior use of data from this study in two publications and two submitted manuscripts.

Participants

We contracted Qualtrics to recruit at least 400 participants with 11 complete assessments, and thus, they oversampled, soliciting 716 participants. Eligible participants had to be U.S. citizens in monogamous, heterosexual live-in romantic relationships, native English speakers, and pass a research integrity check. Qualtrics did not recontact 161 participants who did not attempt the second assessment, leaving 555 participants completing 2-11 assessments (9.6/11 assessments on average, with 348 (63%) completing all 11. Participants (268 men) averaged 42.6

years old (SD=11.7) and 363 had children (M=2.1, SD=1.1). Relationships averaged 13.3 (SD=10.2) years in length (130 dating, 36 engaged, 389 married). Of the 392 employed participants, 25.3% described themselves as "essential"; 79.8% described themselves as working at home. U.S. participants lived across 41 states, with the largest subsets in California (15.3%), North Carolina (11.9%), Indiana (10.5%), Vermont (5.9%) and Hawaii (5.4%). Participants were recruited in two cohorts in May and June, 2020, while government-imposed lockdowns were still imposed to at least some extent throughout much of the U.S.

Procedure

Qualtrics issued the first survey link to participants at 5 p.m. local time, with subsequent surveys issued every-other-day for 20 days (11 assessments). Participants were asked to complete the survey before bed, but the link remained accessible until 6 a.m. the next day. On the first day, participants were randomly assigned to one of two experimental conditions and completed background assessments, including demographics, an evaluative priming task that captured their pre-existing automatic attitudes toward their romantic partner, and individual difference measures (see SOM). Next, participants in the *experimental* condition were exposed to 310 stimuli over 6-7 minutes to condition more positive evaluative associations to their romantic partner, with the 25 critical stimuli pairing their romantic partner's first name or role (e.g., wife, boyfriend) with highly positive, approachable unconditioned stimuli, such as a picture of a puppy or sunset or a word like "wonderful" or "fabulous" (McNulty et al., 2017). Control participants were exposed to 310 stimuli that included 25 critical pairings of their partner's first name or role with neutral unconditioned stimuli (pictures of gravel or words like "there").

In the next 9 assessments (2 through 10), which occurred every-other-day, participants first completed a version of their condition-specific evaluative conditioning session and then

completed the *daily* self-report measures assessing the goal-related *daily* dependent measures, among unrelated measures (see SOM). At assessment 6, participants also completed the evaluative priming task assessing automatic partner attitudes before they completed their condition-specific evaluative conditioning session and the *daily* goal-related dependent measures. At the final (11th) assessment, participants only completed the evaluative priming task assessing automatic partner attitudes and the *daily* goal-related dependent measures.

For readers accustomed to lab experiments, instituting evaluative conditioning at the end, rather than the beginning, of the day might seem backward. That is, it might seem to limit our capacity to argue that evaluative conditioning affected experiences that day (because it occurred after these experiences). That would be a limitation of the design *if* the effects of evaluative conditioning were quick and ephemeral. However, automatic partner attitudes appear to update rather slowly (Larson et al., 2022) and the effects of evaluative conditioning on such attitudes are known to be *gradual* and *cumulative* (McNulty et al., 2017). Therefore, we designed the protocol as we did because we expected prior exposure to the evaluative conditioning intervention to continue to affect participants on subsequent days. We return to this issue when we describe the intervention's effects on trust in others and automatic partner attitudes.

Transparency and Openness

Serving as a pseudo preregistration, we advanced the general prediction that the evaluative conditioning intervention would increase trust in collective social connections and protect vulnerable individuals in the grant proposal that supported this research. The data are available on OSF, https://osf.io/9vwxa/?view_only=756c95014e7f44afb6a34c5ba732558e; the grant proposal and all administered measures are also available in the SOM. The analytic program (MLWiN) used in the analyses operates through a windows-based interface that does

not supply syntax. Copies of the analysis output are available upon request from the first author.

Power

We used the program mpowsim (http://www.bristol.ac.uk/cmm/software/mlpowsim/), an add-on program to the MLwiN multi-level modeling software developed by Browne and Golalizadeh, to run simulation-based power analyses for our multi-level models. Parameters for this power analysis were drawn from the results of previously published research using similar multi-level models and similar outcome variables (e.g., Murray et al. 2022), with the added assumption that the conditioning intervention would have no main effect or two-way interactions, but would enter into three-way interactions between daily threat, individual differences in threat vulnerability, and condition with a small effect size of $d = .1$. The results of this simulation indicated that the proposed model would have an a-priori power to reject the null hypothesis of no effect for the three-way interaction of .85 with 500 individual participants measured over 10 time points, and .91 with 600 individual participants measured over 10 time points. Thus, our sample size of 555 individual participants is consistent with a power of approximately .90 to test the hypothesized 3-way interactions.

Mini-Study 1: The Risk-Regulation System

In this first model test, we examined whether helping to fulfill the fundamental goal to feel safe in social connection desensitized the risk-regulation systems of aspiring safety-seekers. We identified *aspiring* (vs. relatively *accomplished*) safety-seekers through the combination of self-esteem, attachment-anxiety, emotional instability, and trust in the romantic partner because these personal and relational dispositions known to make rejection more hurtful and socially painful (Cameron & Granger, 2019; Murray et al., 2006).

We indexed the *daily independent variable* – exposure to interpersonal rejection – by asking participants to indicate if "someone close to me criticized or insulted me", "someone close to me ignored/avoided me", or "someone close to me got upset or angry with me" (1=*yes*, 0=*no*) because such events reliably triggered risk-regulation dynamics in prior research (Murray et al., 2002; Bellavia & Murray, 2003). We expected days when participants more often reported being rejected by close others to heighten the activation of the risk-regulation system, relative to days people had fewer such experiences. We indexed the *daily dependent variable* – relationship valuing – by asking participants to describe the lovingness/supportiveness and overall quality of their relationship with their romantic partner, friends, and children (if they had children).

In the *control* condition, we expected to observe the normal sensitization of the risk-regulation system. That is, in the *control* condition, we expected the risk-regulation systems of people *high* in vulnerability to social pain to be *more* sensitive to daily rejection experiences than the risk-regulation systems of people *low* in vulnerability to social pain. In other words, we expected *control* participants *high* in vulnerability to social pain to be *more* likely to devalue their intimates on days when their intimates behaved *more* (vs. less) rejectingly, as compared to *control* participants *low* in vulnerability to social pain. In contrast, in the *experimental* condition, we expected the intervention to turn *aspiring* safety-seekers into *now accomplished* ones, thereby desensitizing their risk-regulation systems. Therefore, in the *experimental* condition, we expected the greater sensitivity of the risk-regulation systems of people *high* in vulnerability to social pain (relative to those *low* in vulnerability to social pain) to be reduced or eliminated.

Measuring the Between-Person Moderator of Risk-Regulation System

On the first assessment day, we indexed individual differences in sensitivity to social pain through a composite of self-esteem, attachment-related anxiety, emotional stability, and trust in

the romantic partner (α=.71). We transformed responses to each scale to a *z*-score and then reversed self-esteem, emotional stability, and trust in the romantic partner within the composite, such that higher scores captured greater sensitivity to social pain.

Self-esteem. The 10-item (α=.91) Rosenberg (1965) scale captured global self-esteem (e.g., "I feel I have a number of good qualities", 1=*strongly disagree*, 7=*strongly agree*).

Attachment-anxiety. Three items (α=.67) from the 14-item Carver (1997) measure captured attachment anxiety (i.e., "I often worry that my partner doesn't really love me"; "I often worry my partner will not want to stay with me"; "I don't worry about others abandoning me", reversed), 1=*I disagree with this statement a lot*, 4=*I agree with this statement a lot*.

Emotional stability. Two items (α=.68) from the Ten Item Personality Measure (Gosling et al., 2003) captured emotional stability (i.e., "I see myself as: anxious, easily upset"; "calm, emotionally stable"), 1=*disagree strongly*, 7=*agree strongly*.

Trust in the romantic partner. Three items (α=.92) captured trust in the romantic partner (i.e., "I can trust my romantic partner completely", "I can always count on my romantic partner to be responsive to my needs", "My romantic partner is always there for me", 0=*do not agree at all*, 8=*agree completely*, Murray, Lamarche et al., 2021).

Measuring the Daily Independent Variable

Daily exposure to interpersonal rejection. Participants indicated (0=*no*, 1=*yes*) whether "someone close to me criticized or insulted me", "someone close to me ignored/avoided me", or "someone close to me got upset or angry with me", summed to index daily rejection exposure.[1]

[1] We did not include the items "My romantic partner did something that hurt, irritated, or angered me" and "My child(ren) did something that upset or hurt me" in the daily rejection

Measuring the Daily Dependent Variables

We created a formative composite index of the daily value participants perceived in close relationship bonds by asking them to separately describe the (1) supportiveness and (2) quality of their interactions with their romantic partner, friends, and children (if applicable) each day. We *z*-scored and averaged the 2 items for each relationship type (average within-person r=.63) and then averaged across the three relationship types to index overall daily close relationship valuing. As intended, the 3 components of this formative index captured relatively distinct components of daily relationship valuing (average within-person r=.28).[2] The obtained effects did not significantly differ across relationship type, as we later describe.

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experiences composite because situations that do not involve rejection can also elicit such emotions (e.g., a child misbehaving, or a partner spending money frivolously). The 3-way interaction involving the 3-item measure of daily rejection we report in the results was marginally significant when we instead utilized a daily rejection index that also included these 2 ambiguous items, b=.0619, *SE*=.0326, z=1.90, p=.0574, *95%CI*(-.002, .126).

[2] In a reflective measurement model, the construct (e.g., self-esteem) causes the indicators (e.g., responses to self-esteem items). Therefore, indicators are expected to inter-correlate (i.e., people who score high on one indicator should also score high on all the other indicators). In a formative measurement model (Diamantopoulos et al., 2008; Diamantopoulos & Winklhofer, 2001; Edwards & Bagozzi, 2000), the indicators (e.g., specific relationships) instead define the construct (e.g., relationship valuing). Thus, people/days that score relatively high on one indicator are not necessarily expected to score high on the others because any one indicator is sufficient to index the construct (e.g., as is the case for indicators of socioeconomic status).

Interaction love/support. Each day participants separately rated how supported/loved their romantic partner, friends, and children (if applicable) made them feel (e.g., "How supported/loved did your romantic partner make you feel today", 0=*not at all supported/loved*, 6=*very supported/loved*.

Interaction quality. Each day participants separately rated the quality of their relationship with their romantic partner, friends, and children (if applicable) (e.g., "Overall, how would you describe your relationship with your romantic partner today", -3=*terrible*, 3=*terrific*).

Analytic Strategy and Results

Table 1 contains the descriptive information for each measure in all mini-studies. Table 2 includes the intercorrelations among the primary variables, presenting the intercorrelations among the daily within-person (centered) variables below the diagonal and intercorrelations among the daily between-person means above the diagonal.

Table 1. Descriptive Information.

Variable	***Mean***	***SD***	***Range***
Risk Regulation System			
Daily interpersonal rejection	0.30	0.69	0 – 3
Daily love/support in romantic relationship	4.58	1.57	0 – 6
Daily love/support in friendships	3.54	1.82	0 – 6
Daily love/support in parent-child relationship	5.08	1.25	0 – 6
Daily romantic relationship quality	1.72	1.39	-3 – 3
Daily friendship relationship quality	1.31	1.30	-3 – 3
Daily parent-child relationship quality	2.24	1.04	-3 – 3
Global self-esteem	5.42	1.11	1.4 – 7

Attachment-related anxiety	1.94	0.77	1 – 4
Emotional Stability	4.90	1.49	1 – 7
Trust in romantic partner	6.17	1.87	0 – 8
Social-Safety System			
Daily unexpected government behavior	0.39	0.49	0 – 1
Daily VIX	29.7	2.49	24.5 – 35.3
Daily Google trends Trump lies	56.9	40.8	0 – 100
Daily trust intimates	3.22	0.69	0 – 4
Daily trust government caregivers	2.06	0.70	0 – 4
Daily trust strangers	3.87	1.68	0 – 8
Need for cognitive closure	4.52	0.89	1-6
Behavioral Immune System			
Daily concern about COVID-19	2.48	1.25	0 – 4
Daily worries about health	1.75	1.03	0 – 4
Daily restricting activities given health concerns	0.80	1.07	0 – 4
Daily time spent social distancing/self-isolating	2.67	1.51	0 – 4
Daily effort/energy standing 6 feet apart	4.22	2.70	0 – 7
Daily effort/energy wearing a mask	3.68	2.95	0 – 7
Daily willingness to help strangers in need	0.98	1.15	0 – 6
Self-perceived infectability	2.51	1.06	1 – 6

Table 2. Intercorrelations among the primary variables.

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. Daily COVID-19 concern	--	.70	.51	.26	.09	.11	.03	.16	.12	.14	.06	.11
2. Daily health worries	.13	--	.57	.32	.10	.10	.08	.13	.12	.06	.06	.10
3. Daily behavioral distancing	.06	.15	--	.27	.03	.02	.09	.02	.03	-.01	-.08	.13
4. Self-perceived infectability	.00	.00	.00	--	.09	-.03	.21	-.04	.06	-.04	-.05	.08
5. Daily rejection exposure	-.00	-.01	.02	.00	--	-.31	.34	.13	.50	.01	-.22	.00
6. Daily relationship valuing	.04	.04	-.01	.00	-.27	--	-.51	.08	-.11	.16	.64	.06
7. Sensitivity to social pain	.00	-.00	.00	.22	.00	-.00	--	-.04	.19	-.16	-.41	.10
8. Daily unexpected collective	.05	.03	.04	.00	.06	-.04	.00	--	.21	.05	.07	-.05
9. Daily unexpected romantic	.00	-.03	-.01	.00	.22	-.08	.00	.01	--	-.07	-.13	.02
10. Daily trust in collective	.05	.05	.08	.00	-.03	.11	-.00	.04	-.01	--	.34	-.12
11. Daily trust in intimates	.05	.01	.02	-.00	-.11	.30	.00	-.01	-.06	.23	--	-.02
12. Need for cognitive closure	-.00	.00	.00	.08	-.00	.00	.09	-.00	-.00	.00	-.00	--

Note: The intercorrelations among the daily *within-person* (centered) variables are below the diagonal and intercorrelations among the daily between-person means above the diagonal.

We modeled the data as a two-level nested structure using the multilevel modeling program MLwiN (Goldstein et al., 1998) with time of assessment at Level 1 (within) and participant at Level 2 (between). We predicted the current day's outcome (i.e., relationship valuing) from the *main* effects of (1) the prior day's relationship valuing, a within-person variable centered on the person's daily mean, (2) the current day's rejection experiences, a within-person variable centered on the person's daily mean, (3) experimental condition, a between-person variable (1=experimental, 0=control), (4) vulnerability to social pain, a between-person variable centered on the sample mean, and (5) their 2-way and 3-way interactions. We modeled the within-person main effect of daily rejection exposure as random. We also included the (1) main effect of participants' average daily rejection exposure and its 2- and 3-way interactions with experimental condition and vulnerability to social pain to ensure that any daily-level effects were not confounded with between-person effects (Bolger & Laurenceau, 2013) and (2) the main effect of time to control for history and/or maturational changes in participants, which we modeled as random.[3]

[3] We fit random coefficient models to intercepts and focal independent variables (i.e., the within-person main effects of time and the specific daily threat, whether disease, rejection, or unexpected behavior threat, following recommendations supporting the use of maximally random models (Barr et al., 2013). However, in complex models with multiple predictors, specifying multiple random effects can result in models failing to converge, making fixed specification appropriate on a case-by-case basis (Bates et al., 2018).

Table 3. Predicting today's relationship valuing from daily rejection, experimental condition, and self-perceived vulnerability to social pain.

Predictor	***Daily Relationship-Valuing***		
	b (*SE*)	*z*	*95%CI*
Intercept	-.0269 (.0368)	-0.73	-.099, .045
Prior's day outcome variable	-.0363 (.0156)	-2.33*	-.067, -.006
Current day's rejection	*-.2233 (.0259)*	*-8.62***	*-.274, -.173*
Condition	.0281 (.0497)	0.57	-.069, .126
Social pain vulnerability	-.4411 (.0493)	-8.95***	-.538, -.344
Current day's rejection by condition	.0088 (.0377)	0.23	-.065, .083
Current day's rejection by social pain vulnerability	-.0656 (.0325)	-2.02*	-.129, -.002
Condition by social pain vulnerability	.0713 (.0685)	1.04	-.063, .206
Current day's rejection by condition by social pain vulnerability	.1050 (.0466)	2.25*	.014, .196
Mean daily rejection	-.2649 (.1007)	-2.63*	-.462, -.068
Mean daily rejection by condition	.0869 (.1326)	0.66	-.173, .347
Mean daily rejection by social pain vulnerability	.0789 (.1100)	0.72	-.137, .295
Mean daily rejection by condition by social pain vulnerability	-.0109 (.1466)	-0.07	-.298, .276
Time	*-.0017 (.0031)*	*-0.55*	*-.008, .004*

$^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. NB: Italicized coefficients specified as random.

Table 3 presents the terms and coefficients for the multilevel models. The expected 3-way today's interpersonal rejection exposure by vulnerability to social pain by experimental condition interaction was significant in predicting the index of relationship valuing. We then decomposed the 3-way to capture the sensitization versus desensitization of the risk-regulation system in each condition. Figure 2 presents the predicted slopes (and corresponding coefficients) linking today's rejection exposure to relationship valuing for *aspiring* (i.e., 1 *SD* above the mean on vulnerability to social pain) and *accomplished* safety-seekers (i.e., 1 *SD* below the mean on vulnerability to social pain) in the control and experimental conditions, respectively.

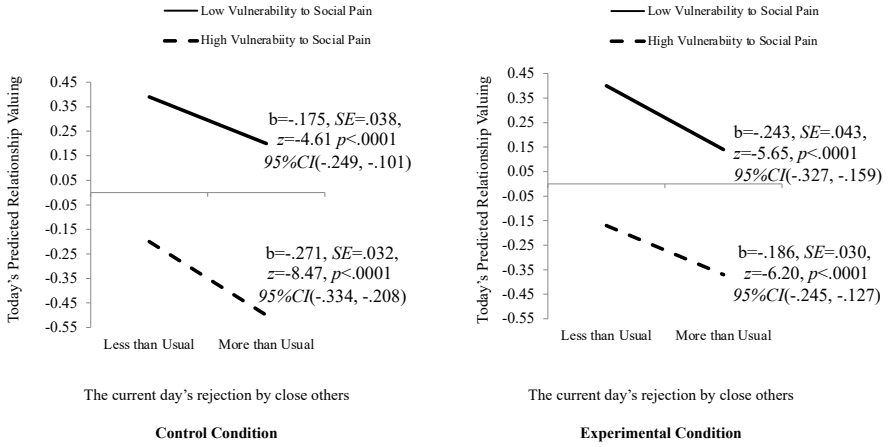

Figure 2. Today's Predicted Relationship-Valuing from the Current Day's Rejection by Close Others, Experimental Condition, and Vulnerability to Social Pain

The predicted simple slopes capture the relative sensitization (vs. desensitization) of the risk-regulation system. The greater sensitivity of the risk-regulation system is evidenced in stronger tendences to protect oneself against today's rejection experiences by defensively valuing one's relationships *less* (Murray et al., 2006). Therefore, stronger *negative within-person* associations between the day's rejection exposure and relationship valuing capture thinking *more*

self-protectively in response to *greater* daily rejection exposure, and thus, the greater *sensitization* of the risk-regulation system. In contrast, *weaker negative* (or even positive) within-person associations capture thinking *less* self-protectively in response to greater daily rejection exposure, and thus, the relative *desensitization* of the risk-regulation system.

As the coefficients for the predicted slopes illustrate, the operation of the risk-regulation system was evident for *aspiring* and *accomplished* safety seekers in each condition. All four predicted simple slopes were significantly negative: Participants generally found significantly *less* to value in their relationships on days they experienced *more* rejection than usual, as compared to days they experienced *less* rejection than usual. Nevertheless, the hypothesized *desensitizing* effects of the intervention were still evident for *aspiring* safety-seekers.

As expected, participants *high* in vulnerability to social pain were significantly *less* likely to protect themselves against daily rejection experiences in the *experimental* condition (where the need to feel safe in social connection was relatively fulfilled) than in the *control* condition (where the need to feel safe in social connection was relatively unfulfilled). That is, the conditional 2-way today's rejection exposure by condition interaction was significantly positive for participants *high* in vulnerability to social pain, b=.0856, *SE*=.0436, *z*=1.96, *p*=.049996, *95%CI*(.000, .171). In contrast, tendencies to self-protect against daily rejection experiences did *not* significantly differ across conditions for participants *low* in vulnerability to social pain, b=-.0680, *SE*=.0571, *z*=-1.19, *p*=.23, *95%CI*(-.180, .044).

Also, as expected, in the *control* condition, participants *high* in vulnerability to social pain were significantly *more* likely to self-protect than participants *low* in vulnerability. The conditional 2-way interaction between today's rejection exposure and vulnerability to social pain in predicting today's relationship valuing was significantly negative in the control condition, b=-

.0656, *SE*=.0325, *z*=-2.02, *p*=.0434, *95%CI*(-.129, -.002). However, in the *experimental* condition, participants *high* in vulnerability to social pain were no more likely to self-protect than participants low in vulnerability. The conditional 2-way interaction between today's rejection exposure and vulnerability to social pain in predicting today's relationship valuing was positive, but not significant, b=.0395, *SE*=.0334, *z*=1.18, *p*=.238, *95%CI*(-.026, .105).

Supplementary Analyses and Discussion

As expected, the intervention appeared to desensitize the risk-regulation systems of *aspiring* safety-seekers (i.e., participants *high* in vulnerability to social pain), but not *accomplished* safety-seekers (i.e., participants *low* in vulnerability to social pain). *Experimental* participants *high* in vulnerability to social pain were significantly (1) *less* likely to self-protect than *control* participants *high* in vulnerability to social pain and (2) no more likely to self-protect than experimental participants *low* in vulnerability to social pain. However, adult relationships with romantic partners and friends differ in myriad ways from adult relationships with children. Indeed, adult relationships are voluntary and involve bilateral dependence (with each party in the relationship being both care provider and care recipient), which is probably less true of the relationships that adults share with their children. Consequently, the more volitional and reciprocal nature of adult relationships might seem to give people greater license to self-protectively evaluate their relationships with friends and romantic partners than children. Given such potential differences in interdependence structure, we conducted multivariate multilevel models to see if the effects differed across relationships (see SOM). These analyses revealed that the intervention's *desensitizing* effects were evident across relationship types.

Mini-Study 2: The Social-Safety System

In this second model test, we examined whether helping to fulfill the fundamental goal to

feel safe in social connection desensitized the social-safety systems of *aspiring* safety-seekers. We identified *aspiring* (vs. relatively accomplished) safety-seekers through individual differences in need for cognitive closure, a personal disposition known to make uncertain or unexpected events more aversive and existentially-troubling (Acar-Burkay et al., 2014; Calogeno et al., 2009; Webster & Kruglanki, 1997).

The social-safety system involves two defenses against existential uncertainty: (1) *Personal-to-sociopolitical* (i.e., unexpected *personal* relationship events motivating trust in collective/*sociopolitical* relationships) and (2) *sociopolitical-to-personal* (i.e., unexpected collective/*sociopolitical* relationship events motivating trust in *personal* relationships). Therefore, we indexed two *daily independent variables* – (1) unexpected romantic relationship events and (2) unexpected *collective/sociopolitical* events (Murray, Lamarche et al., 2021). We expected days when participants experienced *more* unexpected events to heighten the activation of the social-safety system, relative to days they experienced *fewer* unexpected events.[4]

[4] In advancing this prediction, we assume that unexpected events can threaten perceptions of meaning and foreseeability regardless of whether they are positive, negative or neutral. Consistent with this logic, prior research suggests that unexpected positive and unexpected negative events both generate uncertainty (e.g., Lee & Qui, 2009; Quinn et al., 2020; van Djik & Zeelenberg, 2006; Wilson et al., 2005). In order to gather information about the nature of the unexpected events participants experienced in their relationships, we asked participants to rate the valence of the event, -3= *extremely negative*, 3=*extremely positive*, whenever they responded "yes" to any of the 4 items capturing unexpected relationship events (e.g., responding yes to "my romantic partner said/did something I did not expected today"). The valence ratings participants

To index the defensive affirmation of the trustworthiness of the *alternate* relational world, we also assessed two *daily dependent variables* – (1) trust in the collective relationships one shares with others, captured through (a) trust in government leaders and cultural institutions (e.g., the President, Congress, C.D.C., legal system) and (b) the willingness to trust pictures of strangers right from the start; and (2) trust in the personal relationships one shares with others, captured through professions of trust in one's spouse, friends, and children.

In the *control* condition, we expected to observe the normal sensitization of the social-safety system. That is, in the *control* condition, we expected the social-safety systems of people *high* in vulnerability to existential uncertainty (i.e., people who were *high* in the need for cognitive closure) to be *more* sensitive to daily unexpected events than the social-safety systems of people *low* in vulnerability to existential uncertainty (i.e., people *low* in the need for cognitive closure). In other words, we expected *control* participants who were *high* in the need for cognitive closure to be *more likely* to (1) trust fellow community members and government leaders and institutions *more* on days when their romantic partner behaved *more* (vs. less) unexpectedly, and (2) trust their family members and friends *more* on days when government leaders and institutions behaved *more* (vs. less) unexpectedly, as compared to *control* participants who were *low* in the need for cognitive closure. In contrast, in the *experimental* condition, we expected the intervention to turn *aspiring* safety-seekers into *now accomplished* ones, *desensitizing* the social-safety system. Therefore, we expected the greater sensitivity of the

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provided ranged from -3 to 3 and the *average* ratings ranged from -.76 to 1.43, suggesting that unexpected events are not simply negative events as the model tacitly assumes.

social-safety systems of people who were *high* in the need for cognitive closure (relative to those who were *low* in the need for cognitive closure) to be reduced or eliminated.

Measuring the Between-Person Moderator of Social-Safety System

To capture individual differences in the need for closure, and thus sensitivity to existential uncertainty, we included 6 items from the short form of the need for cognitive closure scale on the first day's assessment (e.g., "I don't like situations that are uncertain", "I dislike unpredictable situations", Webster & Kruglanski, 1994; Pierro & Kruglanski, 2005).

Measuring the Daily Independent Variable

We modeled the indices of unexpected behavior after prior research (Murray, Lamarche et al., 2021). We indexed unexpected behavior in *romantic relationships* through self-reports of being surprised by one's own or romantic partner's behavior. We indexed unexpected behavior in *sociopolitical or collective relationships* through a formative composite of: (1) self-reports that government officials had behaved unexpectedly and (2) objective evidence that government officials had behaved unexpectedly, indexed through increases in the VIX (aka fear) financial index, a marker of sociopolitical instability (Bloom, 2014). As intended, the subjective and objective indicators captured independent aspects of *unexpected government behavior*, average within-person r=.03. We found parallel significant effects when we separately used subjective and objective reports to index daily unexpected government behavior, as reported below.

Unexpected romantic relationship behavior. Each day participants indicated (1=*yes*, 0=*no*) whether their romantic partner had "said/did something I did not expect today", "said/did something out of the ordinary", "said/did something that made no sense to me", and whether they personally had "feelings/thoughts about my romantic partner that I did not expect to have". We summed these items to index unexpected romantic relationship behavior.

Unexpected government behavior, self-report. Each day participants indicated (1=*yes*, 0=*no*) whether "a government official did or said something that made no sense to me".

Unexpected government behavior, objective. We retrieved the daily VIX from the Chicago Board Options Exchange website (https://www.cboe.com/vix). We used its closing value because it fully accounts for the events transpiring throughout the day (Hilal et al., 2011). Derived from the behavior of financial traders, the VIX tracks sociopolitical uncertainty by forecasting greater volatility in the stock market over the next 30 days. Historically, the VIX spikes when the behavior of national and international agents and institutions of governance is harder to anticipate or foresee and abates when it is easier to foresee (Bloom, 2014).[5]

Measuring the Daily Dependent Variables

We created a formative index of daily trust in the personal relationships that participants shared with others through daily professions of trust in one's romantic partner, friends, and children (if applicable), average within-person r=.19. We also created a formative index of daily

[5] In the original version of this paper, we also included then-President Trump being caught in *fewer* lies in the objective composite capturing unexpected government behavior. We measured then-President Trump's daily lying indirectly measured through U.S. residents conducting *fewer* Google searches for the term "Trump lies". In including this measure in the original composite, we reasoned that then-President Trump telling *fewer* lies would be *unexpected* behavior for him. However, Presidents should not lie, which could conceivably also make telling *more* lies an unexpected behavior for then-President Trump. Given this ambiguity, we dropped the measure from the composite. However, retaining this measure in the composite of unexpected government behavior yielded generally parallel and significant results detailed in the SOM.

trust in the sociopolitical or collective relationships participants shared with others through a composite of trust in strangers and trust in government caregivers, average within-person r=.06.

Trust in significant others. We averaged ratings of how much trust/confidence participants had in their (1) spouse/romantic partner, (2) friends, and (3) children (if applicable) each day, 0=*no trust at all*, 4=*a great deal*, to capture trust in personal relationships.

Trust in government caregivers. We averaged participants' trust/confidence in 17 government and institutional entities (α=.89) each day (i.e., "The President", "The United States Congress", "the efficacy of social distancing", "the legal system", "the police force", "the church", "White House Coronavirus Task Force", "doctors/nurses", "The Centers for Disease Control", "Dr. Anthony Fauci, The Director of the National Institute of Allergies and Infectious Disease", "my state governor", "public health officials", "The U.S. population/my fellow citizens," banks/financial markets", "science/scientists", and the "media/press" and "epidemiologists") to capture daily trust in government and institutional caregivers.

Trust in strangers. We serially presented 8 headshots of strangers (varying daily), and for each image (α=.94), participants rated how much they would trust the person pictured "right from the start", 0=*not at all*, 8=*very much so*. We selected the headshots from the Chicago Face Database (CFD, Ma et al. 2015), constraining the 8 images presented each day so that participants saw new male and female faces representing four races (i.e., Black, White, Asian, Latino), roughly matched in age, attractiveness, threateningness, trustworthiness, and unusualness. We indexed trust in strangers each day by averaging responses to the 8 images.

Analytic Strategy and Results

Tables 1 and 2 again contain the descriptive information and intercorrelations. The social-safety system encompasses two functionally-equivalent defenses against

uncertainty—*personal-to-sociopolitical* and *sociopolitical-to-personal*. Therefore, we modeled these defenses simultaneously to allow us to test whether evaluative conditioning had parallel effects on both defenses. Specifically, we modeled the data as a 3-level nested structure with trust in personal relationships versus trust in collective relationships as separate multivariate outcomes at Level 1, day at Level 2, and participant at Level 3. This approach simultaneously models two multilevel equations, one predicting trust in *personal* relationships and one predicting trust in *collective* relationships from unexpected romantic and government events (and their respective interactions with need for cognitive closure and experimental condition).

We predicted the current day's multivariate outcomes (*z*-scored) from the *main* effects of (1) the prior day's outcome, a within-person variable centered on the person's daily mean, (2) the current day's unexpected romantic behavior and unexpected government behavior, separate z-scored within-person variables centered on the person's daily mean, (3) experimental condition, a between-person variable (1=experimental, 0=control), (4) need for cognitive closure, a between-person variable centered on the sample mean, and (5) the 2- and 3-way interactions between (a) unexpected romantic partner behavior, trust, and experimental condition and (b) unexpected government behavior, trust, and experimental condition. We modeled the focal within-person main effects of unexpected behavior as random. We also included (1) the main effects of average unexpected romantic partner and average unexpected government behavior and their 2- and 3-way interactions with experimental condition and individual differences in the need for cognitive closure (Bolger & Laurenceau, 2013) and (2) time, modeled as random.

$$Trust\ in\ \boldsymbol{collective}\ relationships = \mathbf{A}\ \text{unexpected romantic behavior} + \mathbf{B}\ \text{unexpected government behavior} +$$

$$\mathbf{M_1}\ \text{condition} + \mathbf{M_2}\ \text{need for cognitive closure} + \mathbf{M_3}\ \text{need for cognitive closure by condition}$$

$$Trust\ in\ \boldsymbol{personal}\ relationships = \mathbf{B'}\ \text{unexpected romantic behavior} + \mathbf{A'}\ \text{unexpected government behavior} +$$

$$\mathbf{M_1'}\ \text{condition} + \mathbf{M_2'}\ \text{need for cognitive closure} + \mathbf{M_3'}\ \text{need for cognitive closure by condition}$$

Figure 3. Illustrating the multivariate outcome constraint logic with simplified equations.

The illustrative, *simplified* equations in Figure 3 capture the logic of how we imposed equality constraints across the equations predicting each multivariate outcome to simultaneously model the social-safety system defenses, capturing the overall operation of the system. When left unconstrained or free to vary, coefficients A and A′ capture the individual social-safety system defenses – with coefficient A capturing the tendency for unexpected romantic relationship behavior to motivate trusting more in one's collective relational world and coefficient A′ capturing the tendency for unexpected government behavior to motivate trusting more in one's personal relational world. However, constraining coefficient A to be equal to coefficient A′ estimates the overall power unexpected behavior (whether romantic or collective) has to motivate trusting more in the *alternate* relational world, capturing the system as a whole

The unconstrained coefficients B and B′ capture the non-hypothesized tendency for unexpected behavior to bolster trust in that same relational world. Constraining coefficient B to be equal to coefficient B′ estimates the overall effect of unexpected behavior (whether romantic

or collective) on trust in the *same* relational world. The M coefficients capture the effects of the between-person moderators, condition (M_1), need for cognitive closure (M_2), and the condition by need for cognitive closure interaction (M_3). Constraining coefficients M_1 and M_1' to be equal indexes the overall effect of evaluative conditioning on trust across relational worlds.

Unlike the illustrative equations, the left-most column in Table 4 lists *all* the main effect and interaction terms included in the multivariate model. We first estimated this model leaving all coefficients free to vary. Using the logic illustrated in Figure 3, we then applied successive equality constraints to the coefficients that captured *corresponding* conceptual effects across the trust outcomes (i.e., those coefficients sharing the same alphanumeric label). For instance, we first compared the fit/deviance of a model that constrained the main effect of *unexpected romantic partner behavior on trust in collective relationships* (i.e., A) to be *equal to* the corresponding main effect of *unexpected government behavior on trust in personal relationships* (i.e., A′) to the fit of a model that allowed the A and A′ coefficients to differ across outcomes. This iterative process (applied to A, B and M terms and the appropriate interactions among these terms) produced the coefficients listed in Table 4. Corresponding coefficients that did not significantly differ across the daily trust outcomes (collective vs. personal) are pooled (a 1-*df* Chi-square test). The coefficients that capture the daily effects of unexpected behavior in one relational world on trust in the alternate world, are bolded and offset diagonally in the table.

Table 4. Predicting today's trust in the collective versus personal relational worlds from unexpected romantic and government behavior, experimental condition, and need for cognitive closure.

Predictor	***Daily Trust in the Collective Relational World***			***Daily Trust in the Personal Relational World***		
	b (*SE*)	*z*	*95%CI*	b (*SE*)	*z*	*95%CI*
Intercept	*-.0254 (.0405)*	*-0.63*	*-.105, .054*	*-.0254 (.0405)*	*-0.63*	*-.105, .054*
Prior's day outcome variable	-.0320 (.0147)	-2.18*	-.061, -.003	-.0830 (.0156)	-5.32***	-.114, -.052
Current day's unexpected romantic behavior	***.0069 (.0070)***	***0.99***	***-.007, .021***	*.0034 (.0049)*	*0.69*	*-.062, .130*
Current day's unexpected government behavior	*.0034 (.0049)*	*0.69*	-.062, .130	***.0069 (.0070)***	***0.99***	***-.007, .021***
Condition	.1846 (.0595)	3.10**	.068, .301	.0533 (.0662)	0.81	-.076, .183
Need for cognitive closure (NFC)	-.0783 (.0437)	-1.79^{+}	-.164, .007	.0151 (.0477)	0.32	-.078, .109
Current day's unexpected romantic behavior by condition	**-.0209 (.0096)**	**-2.18***	**-.404, -.014**	-.0031 (.0067)	-0.46	-.016, .010
Current day's unexpected government behavior by condition	-.0031 (.0067)	-0.46	-.016, .010	**-.0209 (.0096)**	**-2.18***	**-.404, -.014**

Predictor	***Daily Trust in the Collective Relational World***			***Daily Trust in the Personal Relational World***		
	b (*SE*)	*z*	*95%CI*	b (*SE*)	*z*	*95%CI*
Current day's unexpected romantic behavior by NFC	**.0081 (.0067)**	**1.21**	**-.005, .021**	-.0057 (.0050)	-1.14	-.016, .004
Current day's unexpected government behavior by NFC	-.0057 (.0050)	-1.14	-.016, .004	**.0081 (.0067)**	**1.21**	**-.005, .021**
Condition by NFC	-.0041 (.0554)	-0.07	-.113, .104	-.0041 (.0554)	-0.07	-.113, .104
Current day's unexpected romantic behavior by condition by NFC	**-.0275 (.0093)**	**-2.96****	**-.046, -.009**	.0005 (.0066)	0.08	-.012, .013
Current day's unexpected government behavior by condition by NFC	.0005 (.0066)	0.08	-.012, .013	**-.0275 (.0093)**	**-2.96****	**-.046, -.009**
Mean daily unexpected romantic behavior	.0132 (.0447)	0.30	-.074, .101	-.1896 (.0640)	-2.96**	-.315, -.064
Mean daily unexpected government behavior	.0385 (.0462)	0.83	-.052, .129	.0132 (.0447)	0.30	-.074, .101
Mean daily unexpected romantic behavior by condition	-.0731 (.0769)	-0.95	-.224, .078	-.0028 (.0607)	-0.05	-.122, .116

Predictor	***Daily Trust in the Collective Relational World***			***Daily Trust in the Personal Relational World***		
	b (*SE*)	*z*	*95%CI*	b (*SE*)	*z*	*95%CI*
Mean daily unexpected government behavior by condition	-.0028 (.0607)	-0.05	-.122, .116	.1857 (.0762)	2.44*	.036, .335
Mean daily unexpected romantic behavior by NFC	.0129 (.0449)	0.29	-.075, .101	.0155 (.0425)	0.36	-.068, .099
Mean daily unexpected government behavior by NFC	.0155 (.0425)	0.36	-.068, .099	.0129 (.0449)	0.29	-.075, .101
Mean daily unexpected romantic behavior by condition by NFC	-.0515 (.0615)	-0.84	-.172, .069	.0020 (.0591)	0.03	-.114, .118
Mean daily unexpected government behavior by condition by NFC	-.0028 (.0607)	-0.05	-.122, .116	-.0515 (.0615)	-0.84	-.172, .069
Time	*-.0094 (.0021)*	*-4.48****	*-.013, -.005*	*-.0016 (.0041)*	*-0.39*	*-.009, .006*

$^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Note: The coefficients capturing the daily effects of unexpected behavior in one relational world on daily trust in the alternate world, are bolded and offset diagonally. Italicized coefficients specified as random.

As expected, the pooled 3-way interaction between unexpected behavior, need for cognitive closure, and experimental condition in predicting trust in the *alternate* relational world was significant, b=-.0275, *SE*=.0093, *z*=-2.96, *p*=.0031, *95%CI*(-.046, -.009). This pooled 3-way interaction was also significant when we utilized the objective index of unexpected government behavior (i.e., the daily VIX) as the sole indicator of unexpected government behavior, b= -.0297, *SE*=.0093, *z*=-3.19, *p*=.0014, *95%CI*(-.048, -.011) and when we utilized self-reported unexpected government behavior as the sole indicator of unexpected government behavior, b= -.0204, *SE*=.0100, *z*=-2.04, *p*=.0414, *95%CI*(-.040, -.001). We also found parallel effects when we estimated *univariate* models separately predicting each composite dependent measure.[6]

We then decomposed the pooled 3-way interaction to capture the sensitization versus desensitization of the social-safety system in each condition. Illustrating this decomposition, Figure 4 presents the predicted slopes (and corresponding coefficients) linking today's unexpected behavior to trust in the alternate relational world for *aspiring* (1 *SD* above the mean

[6] The 3-way daily *unexpected government behavior* by experimental condition by need for cognitive closure interaction was significant in predicting trust in *personal relationships*, b= -.0400, *SE*=.0160, *z*=-2.56, *p*=.0052, *95%CI*(-.071, -.009). The 3-way daily unexpected *romantic behavior* by condition by need for cognitive closure interaction was significant in predicting the composite index of trust in *collective* relationships, b=-.0224, *SE*=.0111, *z*=-2.02, *p*=.0434, *95%CI*(-.044, -.001). In terms of the components of this composite, the 3-way daily unexpected *romantic partner* behavior by condition by need for cognitive closure interaction was significant in predicting trust in strangers, b=-.2552, *SE*=.1225, *z*=-2.08, *p*=.0375, *95%CI*(-.495, -.015), but not trust in government caregivers, b=-.0131, *SE*=.0147, *z*=-0.89, *p*=.373, *95%CI*(-.043, .015).

on need for cognitive closure) and accomplished safety-seekers (i.e., 1 *SD* below in the mean on need for cognitive closure) in the control and experimental conditions, respectively.

The predicted slopes capture the relative sensitization (vs. desensitization) of the social-safety system. The greater sensitivity of the social-safety system is evidenced in stronger tendencies to protect against unexpected behavior by defensively trusting *more* in an alternate relational world (Murray, Lamarche et al., 2021). Therefore, *stronger positive* within-person associations between the day's unexpected behavior and today's trust in the alternate relational world capture thinking *more* self-protectively in response to *greater* daily unexpected behavior, and thus, the greater *sensitization* of the social-safety system. In contrast, *weaker positive* (or even negative) within-person associations capture thinking *less* self-protectively in response to *greater* daily unexpected behavior, and thus, the relative *desensitization* of this system.

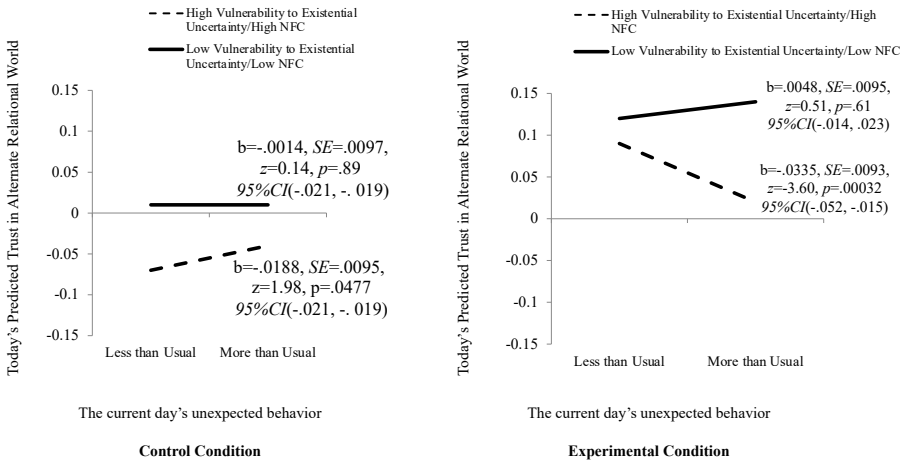

Figure 4. Today's Predicted Trust in the Alternate Relational World from the Current Unexpected Behavior, Experimental Condition, and Vulnerability to Existential Uncertainty/Need for Cognitive Closure (NFC)

As the coefficients for the predicted slopes illustrate, the operation of the social-safety system was only evident for *aspiring* safety-seekers in the *control* condition. In the *control*

condition, participants *high* in vulnerability to existential uncertainty (i.e., *high* in the need for cognitive closure) reported significantly *greater* trust in the *alternate* relational world on days they experienced *more* unexpected behavior, as compared to days they experienced *less* unexpected behavior. However, in the *experimental* condition, participants *high* in vulnerability to existential uncertainty (i.e., *high* in the need for cognitive closure) reported significantly *less* trust in the *alternate* relational world on days they experienced *more* unexpected behavior, as compared to days they experienced *less* unexpected behavior, indicating desensitization.

As expected, participants *high* in the need for cognitive closure were significantly *less* likely to protect themselves against daily unexpected behavior in the *experimental* condition (where the need to feel safe in social connection was relatively fulfilled) than in the *control* condition (where the need to feel safe in social connection was relatively unfulfilled). That is, the conditional 2-way today's unexpected behavior by condition interaction was significantly negative for participants *high* in the need for cognitive closure, b=-.0526, *SE*=.0133, *z*=-3.95, *p*=.000078, *95%CI*(-.079, -.027). In contrast, tendencies to self-protect against daily unexpected behavior did *not* significantly differ across conditions for participants *low* in the need for cognitive closure, b=.0066, *SE*=.0135, *z*=0.49, *p*=.624, *95%CI*(-.020, .033).

Also as expected, in the *control* condition, participants *high* in the need for cognitive closure were *more* likely to self-protect than participants *low* in the need for cognitive closure, but this difference was not significant. That is, the conditional 2-way today's unexpected behavior by need for cognitive closure interaction was positive as expected, but not significant in the control condition, b=.0081, *SE*=.0067, *z*=1.21, *p*=.226, *95%CI*(-.005, .023). However, this conditional 2-way was significant in the experimental condition. Experimental participants *high* in the need for cognitive closure were significantly *less* likely to self-protect against unexpected

behavior than experimental participants *low* in the need for cognitive closure, b=-.0192, *SE*=.0065, *z*=-2.95, *p*=.0032, *95%CI*(-.032, -.006).

Supplementary Analyses and Discussion

As expected, the intervention appeared to *desensitize* the social-safety systems of *aspiring* safety-seekers (i.e., participants *high* in the need for cognitive closure/*high* in vulnerability to existential uncertainty), but not *accomplished* safety-seekers (i.e., participants low in the need for cognitive closure/*low* in vulnerability to existential uncertainty). *Experimental* participants *high* in the need for cognitive closure were significantly (1) *less* likely to self-protect than *control* participants *high* in the need for cognitive closure and (2) *experimental* participants *low* in the need for cognitive closure.

However, we used trust in one's romantic partner to index vulnerability to existential uncertainty in our prior research on the social-safety system (Murray, Lamarche et al., 2021) because trusting in significant others generally protects against existential uncertainty (Cox & Arndt, 2012; Plusnin et al., 2018). For this reason, we also examined the moderating effects of trust in a new set of multilevel models. These new analyses also supported the hypotheses (see SOM). Specifically, experimental participants who were *less* certain they could trust their romantic partner (i.e., *high* in vulnerability to existential uncertainty) were *less* likely to self-protectively bolster trust in alternate relational worlds on days when they experienced *more* unexpected romantic/government behavior than control participants who were certain they could trust their romantic partner (i.e., *low* in vulnerability to existential uncertainty).

Mini-Study 3: The Behavioral-Immune System

In this third model test, we examined whether helping to fulfill the fundamental goal to feel safe in social connection (through conditioning) desensitized the behavioral-immune

systems of *aspiring* safety-seekers. We identified *aspiring* (versus relatively accomplished) safety-seekers through individual differences in self-perceived vulnerability to physical infection (Duncan et al., 2009), a personal trait known to make the possibility of contracting an infectious illness more physically-threatening (Duncan et al., 2009).

We indexed the *daily independent variable* – anxiety about contagious disease – through personal concerns about COVID-19. We expected days when participants reported being *more* concerned about this potentially lethal virus to heighten the activation of their behavioral-immune systems, relative to days participants reported being *less* personally concerned. We indexed *two daily dependent variables* capturing the motivation to protect oneself against the possibility of contracting COVID-19 from others. Namely, we assessed (1) *health-related vigilance* through worries about people's health and (2) *behaviorally distancing* oneself from social interactions with non-intimates through (a) engagement in social-distancing behaviors (i.e., self-isolating, standing 6 feet apart from others, and wearing a mask), (b) restricting one's work and social activities given health-concerns, and (c) reluctance to reach out to help strangers in need. We targeted behavioral distancing from non-intimates because disease threats typically motivate people to be more avoidant of non-intimates than intimates, as intimates can provide needed support against such threats (Navarette & Fessler, 2006; Tybur et al., 2020).[7]

[7] Because we conducted this study as government-imposed lockdowns were beginning to ease in the United States, we also assessed whether participants left their homes each day so that we could ensure they actually had real opportunities to distance themselves from non-intimates. We return to this issue in the supplementary analyses and discussion section.

In the *control* condition, we expected to observe the normal sensitization of the behavior-immune system. That is, in the control condition, we expected the behavioral-immune systems of people who reported being *highly* vulnerable to disease to be *more* sensitive to the daily disease threat posed by COVID-19 than the behavior-immune systems of people who reported being *less* vulnerable to disease. In other words, we expected *control* participants *high* in vulnerability to disease to be *more* worried about people's health and *more* likely to distance themselves from others on days when they perceived *greater* (vs. less) disease threat from COVID-19, as compared to *control* participants *low* in vulnerability to infectious disease. In contrast, in the *experimental* condition, we expected the intervention to turn *aspiring* safety-seekers into *now accomplished* ones, thereby desensitizing the behavioral-immune system. Therefore, in the *experimental* condition, we expected the greater sensitivity of the behavioral-immune systems of people who normally felt *highly* vulnerable to catching infectious diseases (relative to those who felt *less* vulnerable to catching infectious diseases) to be reduced or even eliminated.

Measuring the Between-Person Moderator of Behavioral-Immune System

In the background measures administered on the first assessment day, participants completed only the 6-item (α=.87) self-perceived infectability subscale of the Duncan et al. (2009) self-perceived vulnerability to disease scale (e.g., "In general, I am very susceptible to colds, flu, and other infectious diseases", "My immune system protects me from diseases most other people get", reversed, 1=*strongly disagree*, 6=*strongly agree*).

Measuring the Daily Risk of Physical Infection

Daily concerns about COVID-19. Participants rated their concern about "COVID-19/Coronavirus" each day, 0=*not at all concerned*, 4=*extremely concerned*.

Measuring Daily Worries about Health

Worries about health. Each day participants rated how worried they were about "their own physical health", "the physical health of my immediate family", "the physical health of my friends", and "the physical health of strangers" (α=.86), 0=*not at all worried*, 4=*very worried*.

Measuring Daily Behavioral Distancing in Non-Intimate Interactions

Engaging in one type of behavioral distancing behavior may limit the opportunity (or need) to engage in other types of behaviors. Therefore, to capture the variety of ways that people might engage in behavioral distancing on a daily basis, we averaged three *z*-scored scales – restricting one's social and work activities given health concerns, engaging in public-health-recommended social-distancing behaviors, and being reluctant to reach out to help strangers in need. As expected, these scales captured relatively independent aspects of distancing (average within-person *r*=.04), suggesting this formative index had its expected breadth, Epstein, 1984). As we later report, we found parallel results across the components of the composite .

Restricting activities given health concerns. Each day participants rated how much time worries about their health (1) "interfered with social activities" and (2) "made it difficult to perform work or other regular daily activities" (α=.89), 0=*none of the time*, 4=*all of the time*.

Social-distancing behavior. Each day participants rated how much time they spent "self-isolating/social-distancing," 0=*no time*, 4=*more than 7 hours* and how much effort/energy they spent "keeping physical distance (at least 6 feet/2 meters) between myself and another person in public" and "wearing a face mask", 0=*not at all*, 7=*a lot*. We *z*-scored and then averaged daily responses to these three items (α=.50), such that higher scores captured greater public-health-recommended social-distancing behavior.

Willingness to help strangers in need. Participants reported (1=*yes*, 0=*no*) each day whether they had "smiled at/said hello to a stranger", "let someone go ahead of me in line", "picked up a fallen object for someone", "donated money to a charity", or "held an elevator door for someone". Higher daily sums captured greater willingness to reach out to strangers, and so, we *z*-scored and then reversed this scale in the composite capturing behavioral distancing.[8]

Analytic Strategy and Results

Tables 1 and 2 again contain the descriptive information and intercorrelations. We modeled the data as a two-level nested structure with time of assessment at Level 1 (within) and participant at Level 2 (between). We predicted the current day's outcome (i.e., health worries or distancing from non-intimates) from the *main* effects of (1) the prior day's outcome, a within-person variable centered on the person's daily mean, (2) the current day's concern about COVID-19, a within-person variable centered on the person's daily mean, (3) experimental condition, a between-person variable (1=experimental, 0=control), (4) self-perceived infectability, a between-person variable centered on the sample mean, and (5) their 2-way and 3-way interactions. We also included the (1) main effect of participants' average daily concern about COVID-19 and its 2- and 3-way interactions with experimental condition and self-perceived infectability and (2) the main effect of time to control for history and/or maturational changes in participants, specified as random.

[8] On a given day, we had no expectation that participants who reported engaging in one type of helping behavior would necessarily also engage in other such behaviors. For this reason, we do not report internal consistencies for the behavior categories (McNulty & Russell, 2010).

Table 5. Predicting today's health worries and behavioral-distancing from non-intimates from daily concerns about COVID-19, experimental condition, and self-perceived infectability.

Predictor	***Daily Health Worries***			***Daily Distancing from Non-Intimates***		
	b (*SE*)	*z*	*95%CI*	b (*SE*)	*z*	*95%CI*
Intercept	1.749 (.0435)	40.21***	1.664, 1.834	.0182 (.0256)	0.71	-.032, .068
Prior's day outcome variable	-.1384 (.0156)	-8.87***	-.169, -.108	-.0746 (.0163)	-4.58***	-.107, -.043
Current day's COVID-19 concern	*.0790 (.0260)*	*3.04***	*.028, .130*	*.0331 (.0143)*	*2.31**	*.005, .061*
Condition	.1052 (.0576)	1.83^{+}	-.008, .218	.0619 (.0324)	1.91^{+}	-.002, .125
Self-perceived infectability	.1330 (.0391)	3.40***	.056, .210	.0504 (.0220)	2.29*	.007, .094
Current day's COVID-19 concern by condition	-.0169 (.0361)	-0.47	-.088, .054	-.0333 (.0202)	-1.65	-.073, .006
Current day's COVID-19 concern by self-perceived infectability	-.0031 (.0243)	-0.13	-.051, .045	.0319 (.0135)	2.36*	.005, .058
Condition by self-perceived infectability	-.0127 (.0555)	-0.23	-.121, .096	-.0049 (.0312)	-0.15	-.066, .056
Current day's COVID-19 concern by condition by self-perceived infectability	-.0831 (.0350)	-2.37*	-.152, -.015	-.0736 (.0198)	-3.72***	-.112, -.035

Predictor	***Daily Health Worries***			***Daily Distancing from Non-Intimates***		
	b (*SE*)	*z*	*95%CI*	b (*SE*)	*z*	*95%CI*
Mean daily COVID-19 concern	.4871 (.0358)	13.61***	.417, .557	.1700 (.0202)	8.42***	.130, .210
Mean daily COVID-19 concern by condition	.0876 (.0520)	1.69^{+}	-.014, .190	.0222 (.0292)	0.76	-.386, .358
Mean daily COVID-19 concern by self-perceived infectability	.0407 (.0327)	1.24	-.023, .105	.0312 (.0184)	1.70^{+}	-.005, .067
Mean daily COVID-19 concern by condition by self-perceived infectability	-.0702 (.0482)	-1.46	-.165, .042	-.0274 (.0271)	-1.01	-.081, .026
Time	*-.0133 (.0043)*	*-3.09***	*-.022, -.005*	*-.0118 (.0028)*	*-4.21****	*-.017, -.006*

$^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Italicized coefficients specified as random.

Table 5 presents the terms and coefficients for the multilevel models. The expected 3-way interactions between today's concern about COVID-19, experimental condition, and self-perceived infectability were significant predicting today's health worries and today's composite index of behavioral distancing. Parallel effects generally emerged when we redid the analyses and instead predicted the components of the behavioral distancing composite.[9, 10]

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[9] The 3-way today's COVID-19 concern by experimental condition by self-perceived infectability interaction was significant in predicting willingness to reach out to strangers in need, b=.1524, *SE*=.0514, *z*=2.96, *p*=.0033, *95%CI*(.052, .253), which we reversed in the composite index of behavioral distancing and parallel, but not significant, in predicting social-distancing behavior, b=-.0424, *SE*=.0283, *z*=1.50, *p*=.1336, *95%CI*(-.098, .013), and restricting social and work activities given health concerns, b=-.0513, *SE*=.0369, *z*=-1.39, *p*=.1645, *95%CI*(-.124, .021). We did not include the (reversed) items tapping how much time participants spent in "in a social gathering (5 or more people)" or "around strangers" in the scale capturing social-distancing behavior because doing so decreased its reliability (from α=.50 to α=.27). Nonetheless, the 3-way interaction predicting the 5-item social-distancing scale still approached significance, b=-.0341, *SE*=.0212, *z*=1.61, *p*=.11, *95%CI*(-.076, .007), and the 3-way interaction was still significant predicting the *composite* index of behavioral distancing from non-intimates when we included these additional items in the social-distancing scale, b=-.0699, *SE*=.0203, *z*=3.44, *p*=.0006, *95%CI*(-.110, -.030).

[10] Although donating to a charity and letting someone go ahead in line provides a means of metaphorically reaching out to strangers, participants might not need to actually risk much physical contact with strangers to do so. To ensure that the effects for reaching out to strangers

We then decomposed the 3-ways to capture the sensitization versus desensitization of the behavioral-immune system in each condition. Figures 5 and 6 present the predicted slopes (and corresponding coefficients) linking today's personal concerns about COVID-19 to today's health worries and behavioral distancing, respectively, for *aspiring* (i.e., 1 *SD* above the mean on self-perceived infectability) and *accomplished* safety-seekers (i.e., 1 *SD* below the mean on self-perceived infectability) in the control and experimental conditions, respectively.

The predicted simple slopes capture the relative sensitization (vs. desensitization) of the behavioral-immune system. The greater sensitivity of the behavioral-immune system is evidenced in stronger tendencies to protect oneself against potential disease threats through health-related vigilance and behaviorally distancing oneself from others. Therefore, stronger *positive within-person* associations between the day's COVID-19 concerns (*X*-axis in Figures 2 and 3) and worry about others' health (*Y*-axis in Figure 5) and distancing oneself from non-intimates (Y-axis in Figure 6) capture thinking and behaving *more* self-protectively in response to *greater* daily disease threat, and thus, the greater *sensitization* of the behavioral-immune-system. In contrast, *weaker positive* (or even negative) within-person associations capture

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captured *physically* reaching out, we redid the analyses omitting these two items from the daily index of reaching out. The 3-way today's COVID-19 concern by condition by self-perceived infectability interaction was still significant, b=.1195, *SE*=.0421, *z*=2.84, *p*=.0045, *95%CI*(.037, .202). The 3-way today's COVID-19 concern by condition by self-perceived infectability interaction was also still significant predicting a composite index of behavioral distancing from non-intimates that utilized the shortened measure of the willingness to reach out to strangers, b=-.0726, *SE*=.0202, *z*=-3.59, *p*=.0003, *95%CI*(-.112, -.033).

thinking and behaving *less* self-protectively in response to *greater* daily disease threat, and thus, the relative *desensitization* of the behavioral-immune system.

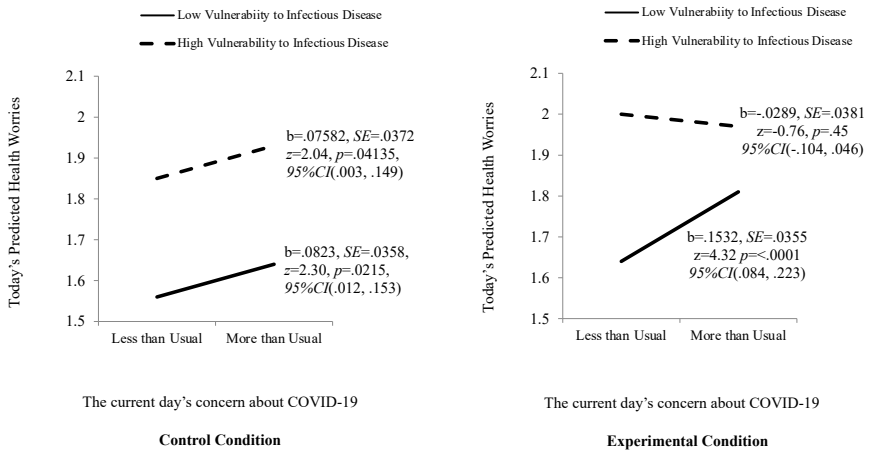

Figure 5. Today's Predicted Health Worries from the Current Day's COVID-19 Concern, Experimental Condition, and Self-Perceived Vulnerability to Disease

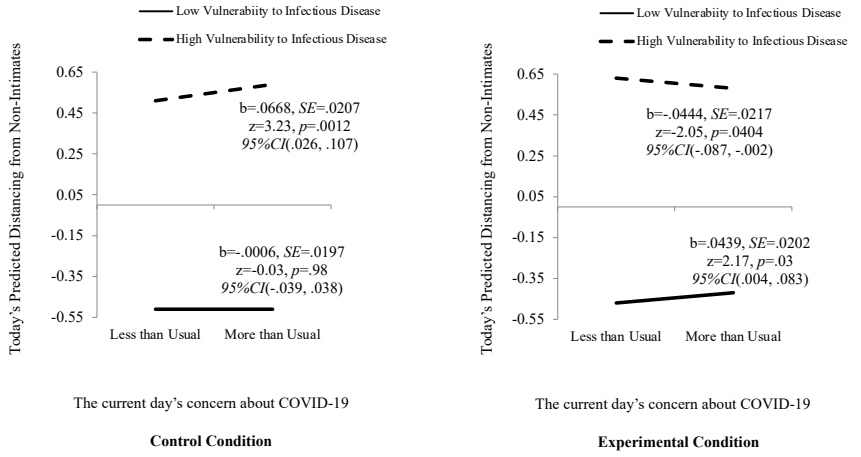

Figure 6. Today's Predicted Behavioral-Distancing from Non-Intimates from the Current Day's COVID-19 Concern, Experimental Condition, and Self-Perceived Vulnerability to Disease

As the coefficients for the predicted slopes illustrate, the operation of the behavioral-immune system was primarily evident for *aspiring* safety-seekers in the *control* condition. Control participants *low* and *high* on self-perceived infectability both reported significantly greater health-related worries on days they were *more* personally concerned about COVID-19 than usual, as compared to days they were *less* personally concerned. Control participants *high* on self-perceived infectability also engaged in significantly *more* behavioral-distancing on days they were *more* personally concerned about COVID-19 than usual, as compared to days they were *less* personally concerned. Nevertheless, the intervention still desensitized the behavioral-immune systems of *aspiring* safety-seekers (i.e., those *high* on self-perceived infectability).

As expected, participants *high* in self-perceived infectability were significantly *less* likely to protect themselves against daily disease threat in the *experimental* condition (where the need to feel safe in social connection was relatively fulfilled) than in the *control* condition (where the need to feel safe in social connection was relatively unfulfilled). For participants *high* in self-perceived infectability, the conditional 2-way today's disease threat by condition interaction was significantly negative in predicting health worries, b=-.1047, *SE*=.0531, *z*=-1.97, *p*=.0488, *95%CI*(-.209, -.001), and behavioral distancing from non-intimates, b=-.1112, *SE*=.0300, *z*=-3.71, *p*=.0002, *95%CI*(-.170, -.052), In contrast, tendencies to self-protect against daily disease threat did *not* significantly differ across conditions for participants *low* in self-perceived infectability. The conditional 2-way was not significant for either health worries, b=.0710, *SE*=.0502, *z*=1.41, *p*=.1585, *95%CI*(-.027, .169), or behavioral distancing, b=.0445, *SE*=.0282, *z*=1.58, *p*=.114, *95%CI*(-.011, .110). Thus, the tendency for participants *low* in self-perceived infectability to be *more* likely to self-protect in the *experimental* than control condition (evident in the simple slopes in Figure 5) was not significant.

Also, as expected, in the *control* condition, participants *high* in self-perceived infectability were significantly *more* likely to protect themselves against daily COVID-19 concerns than participants *low* in self-perceived infectability. That is, the conditional 2-way interaction between today's COVID-19 concern and self-perceived infectability predicting today's *behavioral distancing* was significantly positive in the *control* condition, b=.0319, *SE*=.0135, *z*=2.36, *p*=.0183, *95%CI*(.005, .058). Unexpectedly, though, this conditional 2-way interaction was not significant predicting today's health related worries, b=-.0031, *SE*=.0243, *z*=-0.13, *p*=.90, *95%CI*(-.051, .045). In contrast, in the *experimental* condition, participants *high* in self-perceived infectability were significantly *less* likely to protect themselves against daily COVID-19 concerns than those *low* in self-perceived infectability. In the experimental condition, that is, the conditional 2-way interaction between today's COVID-19 concern and self-perceived infectability was significantly negative predicting both today's worries about others' health, b=-.0864, *SE*=.0252, *z*=-3.43, *p*=.0006, *95%CI*(-.136, -.037), and today's social-distancing, b=-.0417, *SE*=.0145, *z*=-2.88, *p*=.004, *95%CI*(-.070, -.013).

Supplementary Analyses and Discussion

As expected, the intervention appeared to *desensitize* the behavioral immune systems of *aspiring* safety-seekers (i.e., participants *high* in self-perceived infectability), as compared to *accomplished* safety-seekers (i.e., participants low in self-perceived infectability). *Experimental* participants *high* in self-perceived infectability were significantly (1) *less* likely to self-protect against daily disease threat by distancing themselves from non-intimates than *control* participants *high* in self-perceived infectability and (2) significantly *less* likely to self-protectively worry about the health of others and distance themselves from non-intimates than experimental participants *low* in self-perceived infectability. However, there are at least two

potential questions about the meaning and generality of these effects to address.

First, we conducted the study in the initial months of the COVID-19 pandemic, which raises two possible issues related to the unprecedented context. One possibility is that, in this context, concern about COVID-19 (our daily IV) was indistinguishable from health worries (our daily DV), making our treatment of these variables as putative cause and effect suspect. However, the daily-level correlation between concerns about COVID-19 and health worries was minimal (r=.13). This suggests that participants could be concerned about COVID-19 on a given day without necessarily also worrying about their own or others' health. In fact, the 3-way interaction we obtained demonstrates the distinguishability of these constructs. The second possibility is that, in this unusual context, perhaps participants had limited opportunities for casual social interaction because government lockdowns only started to ease during data collection. If that were the case, it might make it difficult to believe participants were actually engaging in the distancing behaviors they reported or difficult to believe we would find comparable effects outside lockdown. Fortunately, we asked participants at each assessment whether they had left their homes that day ("I did not go out today", 1=*yes*, 0=*no*). On average, the majority of participants (66%) reported going out each day (despite lockdowns), suggesting most participants had daily opportunities to interact with non-intimates. Nevertheless, to further address this issue, we conducted supplementary analyses that included the main and moderating effects of whether participants had gone out each day in the models, as well as analyses examining whether being an essential worker (or not) moderated the effects (see SOM for both sets of moderation analyses). These analyses revealed that the 3-way interactions were strong and significant on days participants *had* gone out, and thus, had realistic opportunities to choose to approach vs. avoid non-intimate social interaction. The 3-way interactions were also robust

across participants who were (and were not) essential workers.

Second, because we included worries about one's own health and worries about the health of family, friends, and strangers in the health worries measure, it is possible that the effects only reflected concerns about one's own health. Accordingly, we separately examined concerns about one's own health and the health of others (averaging across friends, family, and strangers). The reported 3-way interaction was only significant for worries about the health of others, suggesting that the findings did capture concerns about the illness threat others posed.[11] Moreover, because we only examined behavioral distancing in the context of non-intimate social interactions, we might have found the same effects in intimate interactions. However, further analyses also revealed that the effects on distancing oneself from others were specific to non-intimate social interactions – that is, risky, but avoidable social interactions. Daily concerns about COVID-19 had no significant main or interaction effects predicting the time participants spent interacting with *close* others who are less readily avoided on a given day or their willingness to help them (see SOM), which is not surprising because disease threats usually motivate people to be more avoidant of strangers than intimates (Navarette & Fessler, 2006).

Assessing the Effect of the Intervention on the Experience of Safety in Social Connection

The findings suggest that evaluatively conditioning participants to associate their partner

[11] The 3-way today's COVID-19 concern by experimental condition by self-perceived infectability interaction was significant in predicting worries about others' health (averaging across family, friends, and strangers), b=-.0859, *SE*=.0362, *z*=-2.37, *p*=.0179, *95%CI*(-.157, -.015), and it was parallel, but not significant in predicting worries about one's own health, b=-.0694, *SE*=.0467, *z*=-1.49, *p*=.1362, *95%CI*(-.161, .022).

with highly positive, approachable stimuli desensitized the risk-regulation, social-safety, and behavioral-immune systems. Although the robust effects of the intervention across the systems speaks to its effectiveness (Sigall & Mills, 1998), we have not yet shown that the intervention helped to fulfil the need for safety in social connection. If the intervention had such an effect, it should be evident in the associations participants make to their relational worlds – as measured (1) indirectly by their automatic attitudes toward their partner (Hicks et al., 2016, 2018; Murray et al., 2010, 2011) and, most importantly, (2) directly by their trust in the individuals and institutions populating their personal and collective/sociopolitical worlds (which captures how safe people feel counting on others, Hudson, 2006; Murray et al., 2006; Simpson, 2007).

Because it may be preferable to administer implicit measures in the highly controlled context of the laboratory, rather than online as we did here, we tentatively expected *experimental* participants to evidence *increasingly positive* automatic attitudes toward their romantic partner *over time* as compared to *control* participants, replicating McNulty et al (2017). However, we firmly expected *experimental* participants to report *increasingly greater* trust in the individuals and institutions constituting their *personal* (i.e., romantic partners, friends, and children) and *collective* (i.e., government leaders and institutions and strangers) relational worlds *over time* as compared to *controls*. We tested these hypotheses utilizing the (1) the measures of automatic partner attitudes we obtained at the pre-intervention, sixth, and last post-intervention assessment and (2) *daily* measures of trust in *personal* and *collective* relationships we obtained in all 10 post-intervention assessments.

Measures

Automatic partner attitudes. At the beginning of Assessments 1, 6, and 11, participants completed the most recent version of the Partner Evaluative Priming Task (PEPT), an implicit

task designed to capture gut-level, automatic feelings towards one's partner (see McNulty et al., 2019). The task consists of five blocks of trials in which participants are asked to categorize positive words (e.g., amazing, wonderful, excellent) and negative words (e.g., terrible, irritating, repulsive) as quickly as possible. In four experimental blocks, these words were preceded by one of four target primes appearing for 300 milliseconds. These target primes included self, romantic partner, close others, and people in general. Because activated feelings facilitate congruent responding, the speed with which people categorize the positive and negative words indicates the degree of positive and negative feelings activated by the primes. Participants' reaction times to categorize the words were recorded and averaged to indicate evaluations activated by the four different categories of targets. We operationalized automatic partner attitudes as the extent to which the partner primes *facilitated* responses to the target words by calculating the difference between RTs to the neutral control primes and RTs to partner primes (see Fazio et al., 1995). Such a difference can be conceptualized as a change in RT from the control to the critical prime, otherwise referred to as a facilitation score. Specifically, we formed the difference between RTs to positive words following control versus partner primes (RTs to positive, control - RTs to positive, partner) and subtracted from it the difference between RTs to negative words following control versus partner primes (RTs to negative, control - RTs to negative, partner) [i.e., (RT positive, control – RT positive, partner) – (RT negative, control – RT negative, partner)]; thus, higher scores indicate greater facilitation to positive words following partner primes. The EPT has been used to assess attitudes toward numerous social targets (outgroups, the self, politicians, etc.; see Fazio & Olson, 2003), and prior work using the PEPT to capture automatic partner attitudes has yielded important insights about relationships (Hicks et al., 2021).

Daily trust. The daily measures of trust in personal and collective relationships are the

exact measures we described in the methods for Mini-Study 2 on the social-safety system.

Analytic Strategy and Results

Prior research utilizing the evaluative conditioning intervention (McNulty et al., 2017), and prior research examining change in automatic partner attitudes (Larson et al., 2022) suggests that change in such attitudes is gradual and cumulative, but nevertheless, still responsive to abrupt shifts in circumstance. Therefore, for both outcomes, we estimated multilevel models that tested for the potential for *consistent* increases (or decreases) in positivity over time (i.e., linear change) and *inconsistent* increases (or decreases) in positivity over time (i.e., quadratic change, such as initially rapid increases in positivity coupled with slower subsequent increases).

Automatic partner attitudes. We modeled the data as a 2-level nested structure with facilitation scores in response to the romantic partner prime at each of the three assessments as the Level 1 outcome and condition as a Level 2 predictor. That is, we predicted facilitation scores in response to the romantic partner prime (*z*-scored) from: (1) a random intercept term, (2) the main effect of condition (1=*experimental*, 0=*control*), (2) the linear and quadratic effects of time (centered on the midpoint assessment), a within-person variable, and (3) the 2-way and 3-way interactions between experimental condition and the linear and quadratic effects of time. We also simultaneously controlled for *z*-scored facilitation scores in response to each of the other three primes – the self, close others, and people in general (centered around the person's mean) at each time point – to ensure that any effects were specific to the romantic partner.

Table 6. Predicting automatic partner attitudes at each assessment from time and condition.

Predictor	***Automatic Partner Attitudes at Time t***		
	b (*SE*)	*z*	*95%CI*
Intercept	-.0081 (.0530)	-0.15	-.112, .096
Facilitation scores in response to self	*.2718 (.0393)*	*6.92****	*.195, .349*
Facilitation scores in response to close others	*.2274 (.0395)*	*5.76****	*.150, .305*
Facilitation scores in response to people in general	*.2862 (.0366)*	*7.82****	*.214, .358*
Condition	.0700 (.0745)	0.94	-.076, .216
Time's linear effect	*-.0422 (.0327)*	*-1.29*	*-.106, .022*
Time's quadratic effect	.0423 (.0532)	0.80	-.062, .147
Condition by time's linear effect	.0597 (.0458)	1.30	-.030, .149
Condition by time's quadratic effect	-.1733 (.0746)	-2.32*	-.320, -.027

$^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Italicized coefficients specified as random.

Table 6 contains the terms and coefficients for the resulting multilevel model. The 3-way condition by quadratic time interaction was significant. Figure 7 presents the trajectory of change in automatic partner attitudes in each experimental condition. In the *control* condition, the quadratic effect of time was not significant, b=.0423, *SE*=.0532, *z*=0.80, *p*=.42, *95%CI*(-.062, .147). However, in the *experimental* condition, the quadratic effect of time was significantly negative, b=-.1310, *SE*=.0525, *z*=-2.50, *p*=.0124, *95%CI*(-.233, -.027). As Figure 7 reveals, relative to their own baseline, *experimental* participants evidenced increasing positive automatic partner attitudes over time that levelled off, such that the relative increase in positivity was most

evident at the first post-intervention assessment. For interested readers, the apparent difference between conditions in *pre-intervention* automatic partner attitudes was significant with all controls for responses to the other primes in the model, b=-.1630, *SE*=.0763, *z*=-2.14, *p*=.0324, *95%CI*(-.313, -.013), but not without these controls in the model, b=-.1027, *SE*=.0898, *z*=-1.14, *p*=.25, *95%CI*(-.297, .073). Importantly, however, the quadratic time by condition interaction predicting automatic partner attitudes was still significant in a further model that added pre-intervention automatic partner attitudes and its interaction with condition and the linear and quadratic effects of time to the predictors listed in Table 6, b=-.1387, *SE*=.0648, *z*=-2.14, *p*=.0324, *95%CI*(-.265, -.012). In combination with the fact that we randomly assigned participants to condition, this supplemental analysis suggested that the increasingly positive automatic partner attitudes we observed within the experimental, but not the control, condition cannot be attributed to differential floor/ceiling effects. The quadratic time by condition interaction predicting automatic partner attitudes was also significant when we omitted all controls from the model, b=-.2124, *SE*=.1077, *z*=-1.97, *p*=.0488, *95%CI*(-.423, -.001).

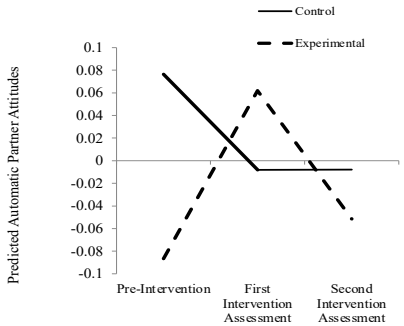

Figure 7. Predicted Automatic Partner Attitudes from the Linear and Quadratic Effects of Time and Experimental Condition

Trust in personal and collective relationships. We modeled the data as a 3-level nested structure with trust in personal relationships versus trust in collective relationships as separate multivariate outcomes at Level 1, day at Level 2, and participant at Level 3. This approach simultaneously models two multilevel equations, one predicting trust in *personal* and one predicting trust in *collective* relationships from (1) a random intercept, (2) experimental condition, (3) the linear and quadratic effects of time, a within-person variable and (4) the 2-way cross-level interactions between condition and the linear and quadratic effects of time.

Table 7. Predicting trust in the collective versus personal relational world at each assessment from time and condition.

Predictor	***Daily Trust in the Personal/Collective Relational World***		
	b (*SE*)	*z*	*95%CI*
Intercept	-.1086 (.0408)	-2.66*	-.186, -.029
Condition	.1648 (.0576)	2.86**	.052, .278
Time's linear effect	*-.0118 (.0027)*	*-4.37****	*-.017, -.007*
Time's quadratic effect	.0019 (.0007)	2.71**	.001, .003
Condition by time's linear effect	.0052 (.0038)	1.37	-.002, .013
Condition by time's quadratic effect	-.0027 (.0009)	-3.00**	-.004, -.001

$^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Italicized coefficients specified as random.

Table 7 contains the terms and coefficients for the multilevel model. The pooled 3-way condition by quadratic time interaction was significant. Figure 8 presents the trajectory of change in trust in personal and collective relationships in each experimental condition. In the *control*

condition, the quadratic effect of time was significantly positive, b=.0019, *SE*=.0007, *z*=2.71, *p*=.0067, *95%CI*(.001, .003). As Figure 8 reveals, *control* participants reported decreased trust in personal and collective relationships over time, but this decline was most marked initially. (We found this decline in trust in an integrative analysis of 3 daily diary samples (*N*=2239) conducted in the early days of the pandemic, suggesting this decline is robust and not due to anything usual about the control condition). However, conditioning experimental participants to associate their romantic partner with highly desirable, approachable stimuli comparably stabilized their trust in others over time. In the *experimental* condition, the quadratic effect of time was not significant, b=-.0008, *SE*=.0007, *z*=1.14, *p*=.25, *95%CI*(-.002, .001).

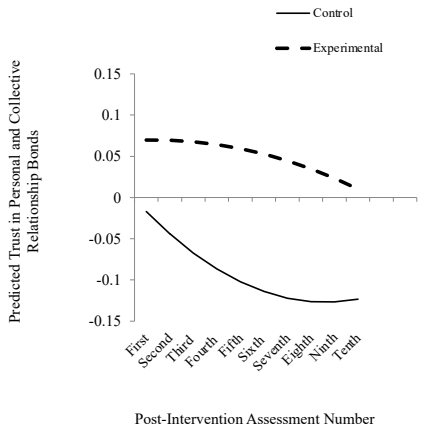

Figure 8. Predicted Trust in Personal and Collective Relationships from the Linear and Quadratic Effects of Time and Experimental Condition

Supplementary Analyses and Discussion

Although the simple quadratic effects of time revealed the protective effects of the intervention for both automatic partner attitudes and trust in personal and collective relationship bonds, the interactions differed in one respect. Experimental participants evidenced increasing

positive automatic attitudes over time relative to their own baseline, but not relative to the control participants. That is, the automatic partner attitudes of experimental and control participants did not significantly differ at the first *post-intervention* assessment, b=.0700, *SE*=.0745, *z*=0.94, *p*=.35, *95%CI*(-.076, .216), or at the final *post-intervention* assessment, b=-.0436, *SE*=.0744, *z*=-0.59, *p*=.56, 95%CI(-.189, .102).

Because difference scores combine effects of both component variables, weighted by their variances (Griffin et al., 1999), we also conducted a further multilevel analysis that did not rely on directly calculating the difference between the positive and negative attitude indices. In this analysis, we predicted *post-intervention* reaction times to positive words following partner primes and negative words following partner primes as multivariate outcomes at Level 1 from the main effects of assessment time (first vs. second post-intervention), condition, and the condition by assessment time interaction. This approach allowed us to more directly test whether the intervention differentially affected response times to positive vs. negative words following partner primes by constraining the effects of condition and the condition by partner interaction to be equal (vs. free to vary) across the two outcomes. This analysis revealed significantly more positive automatic partner attitudes on the part of experimental participants at the *first* post-intervention assessment. Specifically, the condition by assessment time interaction significantly predicted the difference between response times to positive versus negative words, χ^2=4.88, *p*=.027. At the *first* post-intervention assessment, experimental participants evidenced significantly greater difference between their reaction times to positive (630.6) versus negative (662.8) words following partner primes than control participants (636.4 vs. 652.6), χ^2=5.54, *p*=.0186. Condition did not significantly predict the difference in response times to positive versus negative words at the *second* post-intervention assessment, χ^2=0.37, *p*=.54.

The greater sensitivity of the over-time or within-condition simple effects as compared to the between-condition simple effects may also reflect the difficulty of assessing automatic partner attitudes in a remote, uncontrolled home environment during the stress of a pandemic. Nevertheless, we found direct evidence for the effectiveness of the intervention in increasing feelings of safety on participants' explicit reports of trust. As we expected when we designed the research, experimental participants consistently reported significantly greater trust in personal and collective relationships bonds than control participants across time. In sum, the intervention strengthened the positivity of the automatic partner attitudes of experimental participants, as in prior research using this intervention (McNulty et al., 2017), while also protecting them against the erosion of trust in others evident in the control participants during this pandemic time.

The nature of this established conditioning procedure does raise a potential alternate explanation for these effects. As in prior research (McNulty et al., 2017), the conditions contrast the effects of pairing the romantic partner with highly desirable and approachable compared to neutral images and words. Because the partner is primed in both conditions, mere partner priming cannot account for the effects of evaluative conditioning observed across conditions. However, it is possible that the effects of evaluative conditioning simply captured the effects of priming positive images and words (i.e., a mood effect). If that was the case, the effects we observed on automatic *partner* attitudes should extend to the other targets we assessed, a possibility we directly controlled in the analyses. We also conducted a further analysis predicting trust in personal and collective relationship bonds that controlled for explicit mood at each assessment point, and thus, likely accounted for any general effect of priming positive stimuli on self-reports. The condition by time's quadratic effect interaction predicting trust in personal and collective relationships was still significant in this analysis, b=-.0027, SE=.0009, z=-3.00,

p=.0027, *95%CI*(-.004, -.001).[12] These findings thus suggest that the evaluatively conditioning participants to associate their partner with highly desirable, approachable stimuli did indeed help to fill the need for connection despite the stresses of the ongoing COVID-19 pandemic.[13]

General Discussion

The present study provides the first evidence that romantic relationships can be effectively leveraged to satisfy the human need to feel safe in social connection, changing the ways in which vulnerable people respond to rejections threats from intimates, existential threats from family and sociopolitical figures, and even physical threats from disease.

Desensitizing the Risk-Regulation, Social-Safety, and Behavioral-Immune Systems

The *control* condition revealed the expected *sensitization* of the risk-regulation, social-safety, and behavioral-immune systems for *aspiring* as compared to *accomplished* safety seekers. First, *control* participants *high* in vulnerability to social pain were *more* likely to devalue their intimate relationships to protect against daily experiences of being rejected than participants *low* in vulnerability to social pain, conceptually replicating prior research on the risk-regulation

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[12] We assessed daily mood by averaging responses to feeling "good about myself", "uneasy", "optimistic/hopeful", "happy", "lonely", "depressed", "helpless", "anxious/tense", "afraid/fearful the worst will happen", "overwhelmed", and "angry", reverse-scoring negative mood items, 0=*not at all*, 4=*extremely*).

[13] Further analyses revealed that the effects of the intervention on trust were still significant in further analyses that separately controlled for automatic partner attitudes at Time 1, trust in the romantic partner at Time 1, or trust in other people at Time 1 and their interactions with condition and time (see SOM).

system (Cameron & Granger, 2019; Murray et al., 2006). Second, control participants *high* in vulnerability to existential uncertainty were *more* likely to trust in an alternate relational world to protect against daily experiences with unexpected events than participants *low* in vulnerability to existential uncertainty, conceptually replicating prior research on the social-safety system (Murray, Lamarche et al., 2021). And control participants *high* in self-perceived infectability were *more* likely to distance themselves from non-intimates to protect against daily anxieties about COVID-19 than participants *low* in self-perceived infectability, conceptually replicating prior research on the *behavioral-immune* system (Kenrick et al., 2010).

In contrast, the *experimental* condition revealed the expected *desensitization* of the risk-regulation, social safety, and behavioral-immune systems for *aspiring* as compared to accomplished safety-seekers. First, whereas *experimental* participants *high* in vulnerability to social pain still devalued their relationships on days they experienced *more* (vs. less) rejection, they were *no* more likely to do so than experimental participants *low* in vulnerability to social pain. Furthermore, relative to *control* participants *high* in vulnerability to social pain, *experimental* participants *high* in vulnerability to social pain were *less* likely to defensively devalue their relationships on days they experienced more rejection. Second, *experimental* participants *high* in vulnerability to existential uncertainty were *less* likely to trust in *alternate* relational worlds to protect against unexpected behavior than *experimental* participants *low* in vulnerability. Indeed, *experimental* participants *high* in vulnerability to existential uncertainty reported *less* trust in the alternate relational world on days they experienced *more* (vs. less) unexpected behavior – a response exactly opposite to the self-protective reactive evidenced by *control* participants *high* in vulnerability to existential uncertainty. And finally, *experimental* participants *high* in self-perceived infectability were *less* likely to worry about health and *less*

likely to distance themselves from non-intimates to protect against *heightened* daily anxieties about COVID-19 than *experimental* participants *low* in self-perceived infectability. In fact, experimental participants *high* in self-perceived infectability engaged in *less* distancing behavior on days they were *more* concerned about COVID-19 than usual, as compared to days they were *less* concerned – a response exactly opposite to the self-protective reaction evidenced by *control* participants *high* in self-perceived infectability.

Strengths and Limitations

The present findings have important strengths. First, we utilized non-overlapping measures to examine each system and daily independent and dependent variables that provided a close parallel to prior research. Second, we consistently conceptually replicated the results of prior research in the *control* condition, validating the measures we utilized to capture each system. Third, the evaluative conditioning intervention was minimalist in nature, taking about an hour of participants' time across a 3-week period, yet it nevertheless changed how vulnerable people responded to social risks. And it did so in the early days of the COVID-19 pandemic, a time when the risks of being socially rejected, taken aback from the behavior of others, or physically infected were likely to be especially threatening (Goodwin et al. 2020). Indeed, the fact that the subtle evaluative conditioning intervention we introduced had even small effects in such an environment speaks to the power of relationships generally and automatic partner attitudes specifically (see Prentice & Miller, 1992). Fourth, we provided suggestive evidence that the evaluative conditioning intervention helped fill the need for safety in social connection. Experimental participants were more likely to evidence increasingly positive automatic attitudes toward their romantic partner and better sustained their trust in personal and collective relationship connections over time as compared to control participants.

Fifth, we provided the first evidence that the fundamental goal to feel safe in social connection can even co-opt the behavioral-immune system as a *means* for its pursuit. From an evolutionary perspective, the behavioral-immune system functions as a *first* line of defense against infectious illness, one that works alongside the physiological immune-system (Miller & Maner, 2011). Because its primary purpose is to protect against physical infection, its operation is often thought to compete with the motivation to connect. For instance, in prior experimental research, people primed with contagious disease report *less* desire for social connection (Mortensen et al., 2010; Sacco et al., 2014). The present research adds greater nuance to this point in suggesting that the threat of contagious disease can also sensitize rather than desensitize people to their need for social connection. Consistent with this logic, recent research suggests that people who normally feel invulnerable to infectious disease take daily steps to physically protect themselves against COVID-19 when they have just been hurt by someone close to them, and thus, have reason to question the safety of social connection (Murray et al., 2022).

The present findings also do have some potential limitations. First, the study was conducted during the initial months of the COVID-19 pandemic in the United States, which raises the possibility that the effects might be limited to this highly unusual point in human history. However, in the *control* condition, we conceptually replicated the results of pre-pandemic research on the risk-regulation, social-safety, and behavioral-immune systems. We also conceptually replicated pre-pandemic research utilizing the evaluative conditioning manipulation, again showing its positive effects on automatic partner attitudes (McNulty et al., 2017). Thus, it does not seem likely that the pandemic itself is responsible for the effects. Second, the effects were small (see SOM), although small effects are to be expected given the subtlety of the experimental manipulation and the multiplicity of factors likely to control

responses to the physical and social risks of connection (Götz et al., 2021). Third, predicted effects were not significant across every measure constituting each composite, which can happen in the presence of a true effect (Lakens & Ets, 2017; Stanley & Spence, 2014). Nonetheless, the effects were robust enough to emerge despite these perturbations. Fourth, in the *control* condition, we did not find the expected interaction effect for health worries. Participants reported significantly greater worries about their health on days they were more (vs. less) concerned about COVID-19 regardless of self-perceived infectability. This is not surprising given the disease threat (i.e., a first-in-a-lifetime health pandemic) and the fact that even people low in sensitivity to disease need to attend to illness threats to survive (Tybur et al., 2020).

Finally, in the *experimental* condition, we found evidence for desensitization for all three systems. However, the nature of this desensitization differed subtly across the systems. In the *experimental* condition, *aspiring* safety-seekers were significantly *less* likely to protect themselves against daily unexpected behavior and significantly *less* likely to protect themselves against daily disease threat than *accomplished* safety seekers. However, *aspiring* safety-seekers in the experimental condition were no more likely to protect themselves against daily rejection than *accomplished* safety-seekers. Nevertheless, *aspiring* safety-seekers in the *experimental* condition *consistently* behaved significantly *less* self-protectively than *aspiring* safety-seekers in the control condition. Also, *accomplished* safety-seekers in the *experimental* condition never behaved significantly more or less self-protectively than accomplished safety-seekers in the control condition. All four conditional 2-way daily social risk by condition interactions were significant for *aspiring*, but not accomplished, safety-seekers.

Implications

The totality of the findings suggests that the fundamental goal to feel safe in social

connection can co-opt the risk-regulation, social-safety, and behavioral-immune systems as means for its pursuit. Indeed, these findings are the first to position the safety that romantic partners can afford as having a central role in regulating how people respond to the risks of being socially rejected, existentially uncertain, or physically infected in daily life. The fact that an intervention as subtle as pairing one's romantic partner with highly positive and approachable stimuli helped inoculate vulnerable people against social risk suggests that romantic relationships could be used as a leverage point to make the social world feel *less* threatening. While such a transformation could be disadvantageous if it resulted in vulnerable people discounting indisputable threats, feeling safer could also give vulnerable people needed wherewithal to respond more constructively to social situations that offer both risk and reward. In pandemic times, for instance, every social interaction involves a consideration of potential rewards (e.g., spending time with friends) over potential costs (e.g., contracting an illness) and individual well-being ultimately depends on people striking balances that favor connection in the long-term.

Nonetheless, we have not yet discussed two potentially important implications of the logic we have advanced. The first implication stems from our decision to use different individual difference measures to capture vulnerability to social pain, existential uncertainty, and physical infection, respectively. We did so because we reasoned that people who were *highly* sensitized to the individual risk of being socially pained, existentially uncertain, or physically infected would have reason to feel *insufficiently* safe in social connection in situations that highlighted the specific risk (i.e., social pain, existential uncertainty, or infection) that was of particular concern to them. However, if feeling *insufficiently* safe in social connection unites these three separable dispositional vulnerabilities, there might also be some cross-talk across the systems. Namely, being vulnerable to any of these social risks (individually or in combination) could potentially

sensitize people to *unrelated* social risks. For instance, perhaps someone who is highly sensitive to social pain and existential uncertainty, but not all that worried about infectious disease, might still be more likely to self-protect when they are more concerned about COVID-19 precisely because they already have *enough* reason to feel unsafe.

To examine this potential implication, we created a composite index to capture *general* vulnerability to social risk by averaging the individual difference measures of vulnerability to social pain, existential uncertainty, and infectious disease we employed in each mini-study. Then we redid the analyses described within each mini-system, substituting this composite index of general vulnerability to social risk for each of the risk-specific measures. The analyses utilizing this general index of vulnerability revealed effects just as strong as those reported using the risk-specific measures. In the *control* condition, *aspiring* safety-seekers (i.e., participants who were *highly* vulnerable to any combination of these risks) behaved significantly *more* self-protectively than *accomplished* safety-seekers (i.e., participants who were *less* vulnerable to these risks). However, in the *experimental* condition, where the intervention conceivably helped satiate *unfilled* goals to feel safe in social connection, *aspiring* safety-seekers were significantly *less* likely to protect themselves against any of the daily social risks than accomplished ones.

The second implication concerns the asymmetric effects of the intervention on aspiring versus accomplished safety-seekers. For participants who *already* felt *less* vulnerable to the risks of social connection, we expected the goal to feel safe in social connection to be closer to being fulfilled, giving the evaluative conditioning intervention less power to regulate self-protective behavior. This is what we found. Nevertheless, these presumably accomplished safety-seekers still protected themselves against greater daily rejection and disease risks. This suggests two possibilities. One is that fulfilling the goal to feel safe in social connection does not actually

desensitize the risk-regulation or behavioral-immune systems, which is inconsistent with the findings for people *high* in vulnerability to social pain and physical infection. The other possibility is that the goal to feel safe in social connection is more likely to command motivation when it is *farther* from being fulfilled, as it was for *aspiring* safety-seekers (i.e., those high in vulnerability to social pain or infection). The literature on responses to social risk supports this latter explanation, echoing the idea that bad is stronger than good (Baumeister et al., 2001).

Feeling *less* included is generally a more threatening experience than feeling *more* included is gratifying (Leary et al., 1998). The present findings imply that the experience of safety in social connection might be similarly asymmetric in its fulfillment. Specifically, movement *toward* the goal to feel safe in social connection may feel more satiating for aspiring than accomplished safety-seekers because making equivalent progress alleviates a more aversive prior state (of feeling unsafe) for people who are initially farther from the goal (i.e., those who are aspiring to feel safe) than it does for people who are initially closer to the goal (i.e., those who already feel safe, Bonezzi et al., 2011; Koo & Fishbach, 2012). Consistent with this logic, interventions also intended to foster a sense of safety in social connection, such as playing up the meaning of a romantic partner's compliment, do more to bolster connection for people *high* in sensitivity to social pain than those *low* in such sensitivity (Marigold et al., 2007, 2010). In the present study, the evaluative conditioning intervention might have done more to move *aspiring* participants who felt initially unsafe in social connection experientially closer to feeling completely safe than it did for *accomplished* participants who already felt relatively safe.

Future Directions

Building on this logic, future research might examine whether the interdependent operation of the risk-regulation, social-safety, or behavioral-immune systems shift across

romantic relationship development (Eastwick et al., 2018, 2019). Individuals in new or fledging romantic relationships are typically overwhelmed by the experience of safety in that connection, through the heady combination of frequent sex and an obsessive preoccupation with the romantic partner's apparent perfection (Brehm, 1988). In fact, even experiencing moments of uncertainty about a new flame's affection heightens feelings of romantic love (Eastwick et al., 2008). Conceivably, the emotional intensity of *new* relationships should foster the experience of making *substantial* progress toward the goal to feel safe in social connection, which could suppress the operation of the risk-regulation, social-safety, or behavioral-immune systems. However, as romantic relationships become more established, people become accustomed to their partner being available to them (Berscheid, 1983). The resulting emotional quiescence of *established* relationships should foster the experience of making *less* progress toward the goal to feel safe in social connection, which could heighten the operation of each regulatory system.

Future research should also examine further implications of the model that we could not adequately explore here. According to the logic of the goal systems model, feeling *insufficiently* safe in social connection activates the goal to self-protect, motivating people to reduce the risk of experiencing social pain, existential uncertainty, or physical infection. In contrast, feeling *sufficiently* safe in social connection deactivates the goal to self-protect, allowing people to pursue alternate goals, including those related to strengthening social connections.

In the present research, we tacitly equated the absence of self-protective goal pursuits (e.g., valuing rejecting friends, extending a hand to a stranger in need) with the presence of such alternate goal pursuits. However, future research should more directly examine whether turning aspiring into accomplished safety-seekers opens up new activities for goal pursuit in risky situations. Consistent with this logic, attachment theorists conceive of close relationships as

providing more than a safe haven from distress; they also provide a secure base for exploration (Feeney & Collins, 2006). Therefore, further research might examine whether fulfilling the fundamental goal to feel safe in social connection gives people license to pursue self-actualization or status rather than self-protection goals in the face of social risk.

Future research could also examine whether *non-romantic* relationship bonds have similar power to either sensitize or desensitize the risk-regulation, social-safety, and behavioral-immune systems. We focused on romantic relationship bonds in the current research because connection to a romantic partner is arguably the most important social connection made in adult life (Day, 2016). Indeed, romantic partners are unique in the diversity of ways in which they can afford experience of safety, both physical and psychological, including being a responsive sexual partner, listener, parent, conversationalist, and goal-supporter, etc. However, romantic relationship bonds are not the only bonds that can make social connection feel safer, nor is evaluative conditioning the only way to increase feelings of relational safety. Therefore, future research might examine whether other interventions, such as focusing individuals on their longest-lasting friendships or reminding them of especially happy childhood memories of their parents, can also desensitize the risk-regulation, social-safety, and behavioral-immune systems.

Finally, the regulatory systems that govern social life are not limited to the ones we examined here. Future research might examine whether the goal to feel included in safe social connections can co-opt other self-regulatory systems as means for its pursuit, such as ones that serve the needs for self-esteem, system justification, or group status. Consistent with this logic, priming the thought of a secure attachment – one where the need to feel safe in social connection is presumably fulfilled – can increase empathy for others, reduce prejudice, and increase prosocial behavior (Ai et al., 2020; Mikulincer & Shaver, 2020).

Conclusion

The present findings provide the first evidence that the fundamental goal to feel included in safe social connection can co-opt the risk-regulation, social-safety, and behavioral-immune systems as means for its pursuit. The fact that these systems are responsive to people's need to feel safe in social connection gives attachment bonds that can satiate this need the power to desensitize these systems in daily life. Consequently, safety-affording attachment bonds might allow vulnerable individuals who are normally overly sensitive to the risks of social connection to instead embrace it, potentially bettering their physical and psychological well-being.

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Authors' Note

The data are on OSF, https://osf.io/9vwxa/?view_only=756c95014e7f44afb6a34c5ba732558e; all administered measures are in the SOM. The research was supported by a grant from the

National Science Foundation (grant number blinded for review purposes).