BRIEF REPORTS

Logging on, Bouncing Back: An Experimental Investigation of Online Communication Following Social Exclusion

Elisheva F. Gross
University of California, Los Angeles

A majority of U.S. adolescents at least occasionally communicate on the Internet with unknown peers. This study tested the hypothesis that online communication with an unknown peer facilitates recovery from the acute aversive effects of social exclusion and examined whether this benefit may be greater for adolescents compared with young adults. A total of 72 young adults (mean age = 18.4 years) and 51 adolescents (mean age = 12.5 years) were randomly assigned to undergo a standardized laboratory induction of social inclusion or exclusion, followed by 12 min of either communication with an unfamiliar other-sex peer or solitary computer game play. Compared with solitary game play, instant messaging with an unfamiliar peer facilitated greater replenishment of self-esteem and perceived relational value among previously excluded adolescents and young adults. Online communication also resulted in greater reduction of negative affect among adolescents but not among young adults.

Keywords: social exclusion, rejection, adolescents, Internet use, belonging

Hopes and fears about the Internet's role in adolescent development have waxed and waned considerably during the past 10 years (Gross, 2004; Valkenburg & Peter, 2009), but one concern has endured: that young people's well-being is endangered by contact with unknown others. However, surprisingly little is known about the psychological consequences of online contact with unknown peers or why this behavior is especially common among adolescents experiencing social distress (Gross, Juvonen, & Gable, 2002; Wolak, Mitchell, & Finkelhor, 2003).

Why might adolescents communicate with unknown peers in the face of social distress? I begin with the assumption that adolescents, like all humans, have a fundamental need to belong (Baumeister & Leary, 1995). According to this perspective, belonging is regulated by a *sociometer,* a barometer-like drive system, similar to those that regulate our intake of food and sleep (e.g., Leary, 2001). The sociometer responds to deprivation states (i.e., social exclusion or rejection) by triggering declines in self-esteem and affect that alert the individual to restore belonging (e.g., Bourgeois & Leary, 2001; Buckley, Winkel, & Leary, 2004; Williams et al., 2002).

The restoration of threatened belonging requires not only the activation of affective and behavioral processes within the individual but also access to potentially accepting others. Yet the people closest at hand in the immediate aftermath of rejection are likely to be the sources of rejection. Moreover, access to peers unconnected to the circumstances or source of a distressing social experience may be especially difficult for adolescents, given the social constraints imposed by school-based cliques and crowds (Brown, 1999; Eder, 1995).

The Internet may be an ideal solution to the problem of access to potentially accepting others. It provides a seemingly limitless supply of novel interaction partners who are unaware of one's current social standing. The Internet is also convenient, private, and amenable to the constraints of adolescents' lives: how else but online can a 13-year-old easily encounter an unfamiliar peer while she's in her room, ostensibly finishing her homework, at 9 p.m. on a Tuesday?

Recent research provides suggestive evidence for the hypothesis that in the face of social distress, adolescents may specifically seek out unknown peers online to improve their mood and sense of belonging and to reduce feelings of isolation (Gould, Munfakh, Lubell, Kleinman, & Parker, 2002; Gross, 2004; Gross et al., 2002). However, the survey-based correlational designs on which most studies of adolescent online behavior rely are ill-suited to the study of such dynamic processes and limit causal inferences regarding effects (Shadish, Cook, & Campbell, 2002). Likewise, developmental investigations of children's and adolescents' responses to rejection have been largely nonexperimental (Juvonen & Gross, 2005). The current study therefore introduced a paradigm developed by social psychologists to examine the acute effects of an experimental inducement of social exclusion by two peers.

The present experiment sought to test, for the first time, the immediate psychological effects of online communication with an unknown peer following interpersonal rejection. Of primary inter-

est was whether the downturn in perceived acceptance, affect, and self-esteem typically observed following rejection is lessened by the opportunity to interact online with an unknown peer who is unrelated to the rejection (and also a naïve participant). This question was investigated by assessing the self-reports of participants at two time points: first, after they experience mild social exclusion by ostensible fellow participants in a computerized ball-tossing task (Williams et al., 2002) and, second, after they engage in a computer activity that involves either instant messaging with an unfamiliar peer or solitary game play. It was predicted that previously excluded participants would exhibit better recovery of their self-esteem, affect, and perceived acceptance following contact with an unknown peer versus after enjoyable but nonsocial game play.

Given the present objective—to experimentally test the effects of online social interaction with an unfamiliar peer on recovery from exclusion and how these effects may differ for adolescents and young adults—a number of comparison conditions were possible. A condition involving solitary online activity was selected from among alternatives for three reasons: First, a comparison between the effects of social and nonsocial online activity could help to identify whether it is the social nature of online communication that contributes to improved self-esteem, affect, and perceived acceptance following rejection. If this is the case, then a nonsocial and potentially distracting activity should produce less improvement than online communication. If, instead, time was responsible for recovery from exclusion, no differences should be observed between task conditions.

In addition, given the dearth of experimental research in this area, online activity was selected as the site of both conditions (as opposed to, e.g., comparing effects of online vs. offline activity) so as to add as much empirical data as possible to the literature that can address public concerns about various forms of adolescent online activity, including not only contact with strangers but also gaming (e.g., Colwell & Payne, 2000).

A solitary online activity was also chosen because it is a plausible alternative to online communication for the imagined 13-year-old sitting at her computer on a Tuesday night. In contrast, private, face-to-face contact with unfamiliar peers (outside of the context of parties, athletic events, or other local gatherings where familiar peers would also be present) may be a relatively impractical or unlikely occurrence in most teenagers' lives and would therefore be of less immediate public concern.

Given the dearth of data on age differences in affective responses to both experimentally induced exclusion and online communication, two age groups were sampled in the present study: a young adult sample of first-year college students, and an adolescent sample of youths ages 11 to 15 years. The inclusion of two age-based samples permitted the exploration of two contrasting predictions derived from developmental and social psychological research, respectively. On the basis of developmental evidence that adolescents show greater variability in self-esteem (Harter, 1998) and heightened concern with peer approval (Hartup, 1996), it is plausible that, compared with young adults, adolescents would display greater sensitivity to the exclusion manipulation. It has also been argued that a greater dependency on the social environment predisposes adolescents, as compared with young adults, to experience more reactivity to perceived social deficits (Schultz & Moore, 1988). However, no developmental trajectory has been

specified for the emergence or functioning of the sociometer; rather, both the need to belong and the means by which people maintain belonging are conceptualized by social psychologists as innate and fundamental across the life span (Baumeister & Leary, 1995; Reis, Collins, & Berscheid, 2000). It was therefore also possible that no age differences would be observed.

Method

Participants

Two separate samples were recruited to yield adolescent and young adult participants. A diverse sample of adolescent youths was recruited for participation from three summer camps held on or near the University of California, Los Angeles (UCLA) campus and two afterschool programs in urban Los Angeles between July 2004 and August 2005. The final sample of young adolescents included 50 youths, 27 (54%) of whom were female. Participants ranged in age from 11 to 15 years, with a mean age of 12.5 years ($SD = 1.2$). Of the participants, 54% were European American, 24% were African American, 6% were Latino, 6% were Asian American, and 10% were of mixed or unspecified heritage.

In recruiting young adults from the UCLA community, emphasis was placed on recruiting individuals 19 years of age or younger who had not enrolled in university-level psychology courses, in order to both reduce variability in participants' age and social environments and to minimize the likelihood of suspicion. The final sample of young adults was composed of 60 participants, 53% ($n = 32$) of whom were female. Participants ranged in age from 18 to 23 years, with a mean age of 18.4 years ($SD = 0.9$). Of the participants, 53% were Asian American, 25% were European American, 7% were Latino, and 15% were of mixed or unspecified heritage.

Procedure and Measures

At least 3 days prior to the experimental session, participants completed a questionnaire assessing several demographic and control variables: Internet usage and experience (Gross et al., 2002) and dispositional psychological adjustment (La Greca & Lopez, 1998; Rosenberg, 1979; Russell, 1996). During the experimental session, participants initially completed a one-item baseline measure of state self-esteem, "How are you feeling about yourself right now, from terrible (-7) to terrific (7)?"[1] The participants were then randomly assigned to play one of two versions of Cyberball, a standardized, brief laboratory induction of either social inclusion or exclusion (e.g., Williams et al., 2002). After playing Cyberball, participants responded to manipulation check items (e.g., estimation of how many throws they had received). the one-item state self-esteem measure, and the extent to which they currently felt each of 21 emotions, represented by single adjectives, on a 5-point scale (1 = not at all to 5 = extremely). Following previous research on social devaluation among young adults and adolescents (e.g., Dickerson, 2004; Leary et al., 2003; Nishina &

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[1] Such single-item measures have been shown to correlate strongly and share most of their variance with longer measures (e.g., Robins, Hendin, & Trzesniewski, 2001) and considerably reduced fatigue among pilot participants.

Juvonen, 2005), six subscales were created from the emotion adjectives: *perceived relational value* ("accepted," "respected," "valued"; α = .82); four specific indices of negative affect—*dysphoria* ("down," "upset," "depressed," "stupid"; α = .92), *shame* ("ashamed," "betrayed," "embarrassed"; α = .81), *anger* ("frustrated," "irritated," "hostile," "angry," "mad"; α = .91), and *anxiety* ("nervous," "stressed," "tense," "relaxed" [reverse coded]; α = .70)—and one additional subscale, *competence* ("smart," "confident"; α = .69), which was not hypothesized to fluctuate as a function of social inclusion or exclusion and was therefore included to further examine the specificity of the experimental effects.

Participants were then randomly assigned to 12 min of computer activity involving either a simple version of the computer puzzle game Tetris, or instant message communication with an unfamiliar same-age, other-sex peer.

All instant messaging interaction dyads were mixed sex. This pairing reflects both the predominance of mixed-sex interaction in research on interpersonal communication and acceptance and the fact that all instant messaging with unknown peers reported by adolescents in our previous diary study were mixed sex (Gross et al., 2002). Moreover, in a pilot study in which interaction preferences were assessed immediately following social exclusion or inclusion, 100% (*n* = 30) of participants requested an other-sex interaction partner. Participants were informed of the gender of their instant messaging partner, reminded that he or she had not been one of the players involved in the Cyberball task, and, for the adolescent sample, told that he or she was from a different camp or afterschool program. Participants were free to converse about any topic except the experiment itself and were asked not to share their names or other identifying information in order to preserve anonymity.

Following either the social or the nonsocial activity, participants completed a final assessment. All participants who had been excluded in the Cyberball game answered questions about their current self-esteem, affect, and experience in the second activity. Immediately following completion of this questionnaire, participants were thanked, debriefed, and paid.

Results

Efficacy of the Cyberball Task

A series of 2 (excluded vs. included) × 2 (adolescent vs. young adult) analyses of variance (ANOVAs) revealed that, as expected, the Cyberball manipulation was highly effective for both age groups (see Table 1). Compared with included participants, excluded participants reported lower perceived relational value and state self-esteem, as well as greater feelings of dysphoria, shame, and anger.[2] There were no significant effects of inclusionary status on anxiety or competence. Across inclusionary conditions, adolescents reported greater competence, greater perceived relational value, and marginally lower anxiety than did young adults, but age did not moderate Cyberball's effects on any of the dependent variables. Given the difference in ethnic composition of the two age group samples, additional ANOVAs were conducted to compare responses to Cyberball among the two largest ethnic groups within each sample. These analyses indicated that African American versus European American adolescents and Asian American

versus European American young adults did not significantly differ in their response to Cyberball. Furthermore, no interactions involving age, gender, or ethnicity were observed.

Recovery From Exclusion Through Social Versus Nonsocial Tasks

The central prediction of the present study was that participants who had experienced a brief episode of social exclusion would report greater improvements in self-esteem and perceived relational value and less negative affect following engagement in a social versus a solitary computer task. Measures of posttask self-esteem and affect unaccounted for by pretask levels were provided by residualized change scores used (Cohen, Cohen, West, & Aiken, 2003). Residualized change scores were computed by regressing posttask scores onto pretask scores. Unlike tests that represent change as a simple difference score (i.e., pretask level subtracted from posttask level), this approach does not lose information by confounding absolute levels with change. For positive indicators such as self-esteem, positive residualized change values indicate greater than expected recovery, whereas negative values indicate lower than expected recovery. For negative indicators such as shame, negative residualized change values indicate greater than expected recovery (i.e., less shame at Time 2 than would be predicted by Time 1 scores alone).

After initial regressions were conducted (as described above) to produce residualized change scores, hierarchical linear regressions were conducted to examine the independent and joint effects of the postexclusion social vs. nonsocial task (i.e., IM vs. Tetris), age, and gender on the five residualized dependent variables affected by the exclusion manipulation. In a first set of models, age group (dummy coded such that 0 = adolescent and 1 = young adult) and gender were entered in a first step, followed by task condition (dummy coded such that 0 = solitary and 1 = social) and the two- and three-way interactions involving age group, gender, and/or task condition. Gender did not emerge as a significant predictor in any of the models and was therefore excluded from the final models described below.[3]

Results of regression analyses are presented in Table 2. As predicted, task condition significantly predicted both residualized perceived relational value and residualized self-esteem. As illustrated in Figure 1, previously excluded participants who instant messaged with an unfamiliar peer were likely to report greater improvement in self-esteem and perceived relational value than previously excluded participants who played Tetris

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[2] To examine whether the Cyberball task effect was driven by exclusion, inclusion, or both (i.e., could inclusion have boosted participants' self-esteem?), a repeated measures analysis of variance comparing the pre-Cyberball and post-Cyberball self-esteem scores of included and excluded participants revealed a significant Time × Inclusionary Status interaction, $F(1, 109) = 5.61$, $p < .03$, partial eta squared = .05. Tests of simple effects confirmed that among excluded participants, the Cyberball game resulted in a significant reduction in self-esteem (mean difference = 1.03, $SE = 0.20$, $p < .001$), but it did not produce a significant increase in self-esteem among included participants (mean difference = 0.07, $SE = 0.30$, $p > .50$).

[3] Because of sample size restrictions, it was not possible to consider ethnicity in these analyses; it is therefore possible that any age group effects might reflect differences beyond developmental factors.

Table 1

Post-Cyberball Belonging Threat Variables: Means, Standard Deviations, Tests of Exclusion, and Age Effects

	Adolescents		Young adults			
Variable	Included M (SD)	Excluded M (SD)	Included M (SD)	Excluded M (SD)	Exclusion effect	Age effect
Perceived relational value ($\alpha = .85$, 3 items)	3.67 (0.8)	3.31 (1.2)	3.40 (0.6)	2.62 (0.8)	$F(1, 109) = 8.93^{**}$ $\eta^2 = .08$	$F(1, 109) = 6.24^{*}$ $\eta^2 = .06$
Self-esteem (1 item)	3.14 (2.2)	2.20 (3.8)	2.79 (2.5)	0.86 (3.1)	$F(1, 109) = 4.98^{*}$ $\eta^2 = .05$	$F(1, 109) = 1.72$ $\eta^2 = .02$
Negative affect						
Dysphoria ($\alpha = .89$, 4 items)	1.13 (0.4)	1.70 (1.0)	1.37 (0.5)	1.99 (1.0)	$F(1, 109) = 11.53^{**}$ $\eta^2 = .10$	$F(1, 109) = 2.23$ $\eta^2 = .02$
Shame ($\alpha = .70$, 3 items)	1.24 (0.4)	1.65 (0.8)	1.25 (0.3)	1.81 (0.9)	$F(1, 109) = 10.42^{**}$ $\eta^2 = .09$	$F(1, 109) = 0.35$ $\eta^2 = .003$
Anger ($\alpha = .89$, 5 items)	1.34 (0.4)	1.91 (1.0)	1.35 (0.5)	1.93 (1.0)	$F(1, 109) = 11.30^{**}$ $\eta^2 = .10$	$F(1, 109) < 0.01$ $\eta^2 < .001$
Anxiety ($\alpha = .72$, 4 items)	1.80 (0.6)	1.81 (0.8)	1.91 (0.7)	2.27 (0.8)	$F(1, 109) = 1.47$ $\eta^2 = .01$	$F(1, 109) = 3.27^{\dagger}$ $\eta^2 = .03$
Competence ($\alpha = .69$, 2 items)	3.82 (0.8)	3.58 (1.2)	3.23 (0.8)	2.78 (0.8)	$F(1, 109) = 1.68$ $\eta^2 = .02$	$F(1, 109) = 15.59^{***}$ $\eta^2 = .13$

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

alone. These task effects did not differ by age group, although age group was a significant predictor of self-esteem: Across tasks, adolescents reported greater self-esteem improvement than did young adults.

In contrast to perceived relational value and self-esteem, all three measures of residualized change in negative affect (dysphoria, anger, and shame) were predicted by the interaction of task

Table 2

Significant Results of Hierarchical Regression Analyses for Prediction of Recovery by Task Condition and Age Group

Step and outcome variable	β	R^2	ΔR^2	ΔF
Perceived relational value				
Age Group	−.14	.02	.02	1.21
Task	.27	.09	.07	4.83*
Age Group × Task	−.26	.12	.03	1.69
State self-esteem				
Age Group	−.33	.11	.11	7.57**
Task	.29	.19	.09	6.49*
Age Group × Task	−.16	.20	.009	0.68
Dysphoria				
Age Group	.00	.00	.00	0.00
Task	−.12	.014	.014	0.86
Age Group × Task	.41	.08	.063	4.01*
Shame				
Age Group	−.03	.001	.001	0.06
Task	−.04	.003	.002	0.12
Age Group × Task	.42	.07	.07	4.18*
Anger				
Age Group	−.10	.01	.01	0.45
Task	−.09	.02	.007	0.51
Age Group × Task	.44	.09	.07	4.69*

Note. All statistics for a given predictor were computed at the step at which the variable was entered into the equation. All outcome variables represent residualized change scores obtained by regressing posttask scores onto pretask scores prior to the analysis displayed above.
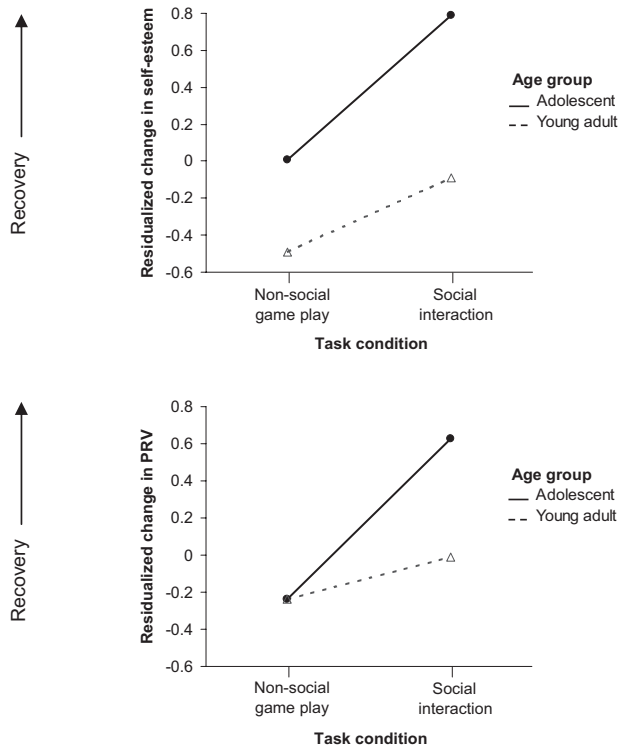* $p < .05$.   ** $p < .01$.

condition and age group (see Table 2). Interactions were plotted in Figure 2 and were further examined through simple effects tests, which revealed that previously excluded adolescents who engaged in the social versus nonsocial task reported greater reductions in dysphoria, $F(1, 68) = 4.37$, $p < .05$, partial eta-squared (η_p^2) = .07, and anger, $F(1, 68) = 4.10$, $p < .05$, $\eta_p^2 = .07$, and marginally greater reduction in shame, $F(1, 68) = 2.89$, $p < .10$, $\eta_p^2 = .05$; among young adults, however, none of the three measures of negative affect reliably differed between task conditions (all Fs < 1.5, ps > .2). Thus, social interaction was more effective than solitary game play in reducing adolescents' negative affect, but the two tasks did not differ in their impact on young adults' negative affect. Given this result, as well as the fact that in neither task condition did young adults' residualized change scores in negative affect exceed 0 (the value expected on the basis of Time 1 scores alone), it may be more fitting to describe young adults' experience of negative affect as persistence rather than recovery.[4]

Discussion

The present study was undertaken to test the hypothesis that online communication with an unknown peer helped adolescents and young adults recover from the acute aversive effects of social exclusion. Results largely supported the hypothesis: As compared with pleasant but solitary game play, instant messaging with an unfamiliar peer facilitated greater replenishment of self-esteem and perceived relational value among previously excluded adolescents and young

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[4] As an examination of the possible effects of dispositional measures on which the two age groups differed (social anxiety, loneliness, online experience, daily instant messaging, and daily online game play), the variables were centered and included as a first step in the regression analyses (Aiken & West, 1991). In all cases, standardized coefficients and proportion of variance explained by the Age Group × Task interaction remained the same or increased, suggesting that the moderating effect of age on task effects was not explained by confounding dispositional differences between the two age groups.

Figure 1. Differences in residualized change in self-esteem and perceived relational value (PRV) by age and task condition.

adults. Among adolescent participants, online communication also resulted in greater reduction of negative affect.

These findings provide support for a dynamic, state-based model of adolescents' online communication behavior. Whereas previous research has emphasized the compensatory function served by contact with unknown peers for dispositionally distressed youths (e.g., Wolak et al., 2003), the present findings establish that this behavior may also facilitate recovery from the more common temporary and mild threats to belonging that many adolescents experience in their everyday lives (e.g., Eder, 1995; Nishina & Juvonen, 2005). The fact that the benefits of online communication were observed when controlling for dispositional levels of loneliness, social anxiety, and self-esteem further underscores the generality of the present model.

An unexpected dissociation was observed in the effect of online communication on positive versus negative indicators of recovery in the young adult sample, such that young adults who instant messaged in comparison with those that played Tetris exhibited greater improvements in self-esteem and perceived relational value but not greater recovery from dysphoria, shame, or anger. Although the present study cannot conclusively answer why these differences were observed, several explanations are possible. One promising possibility is suggested by the age group difference in the volume of communication: Within the same 12-min time period allotted to participant pairs for instant messaging, both the number of conversational turns taken and the overall communication volume were twice as high, on average, among young adult than among adolescent instant messaging partners. The relative simplicity of adolescents' online communication in this study—

perhaps itself the result of their inexperience with computers and slower typing speed relative to that of young adults—may have facilitated recovery from social exclusion by "keeping it simple"; communication could not go far, but it may have been just enough to restore a basic sense of social connection. In future research, this possibility could be explored by extending the duration of online interactions and by comparing adolescents with young adults who have equivalent levels of experience with computers and the Internet.

Given that the effect of online communication was assessed relative to that of solitary game play, it is also possible that
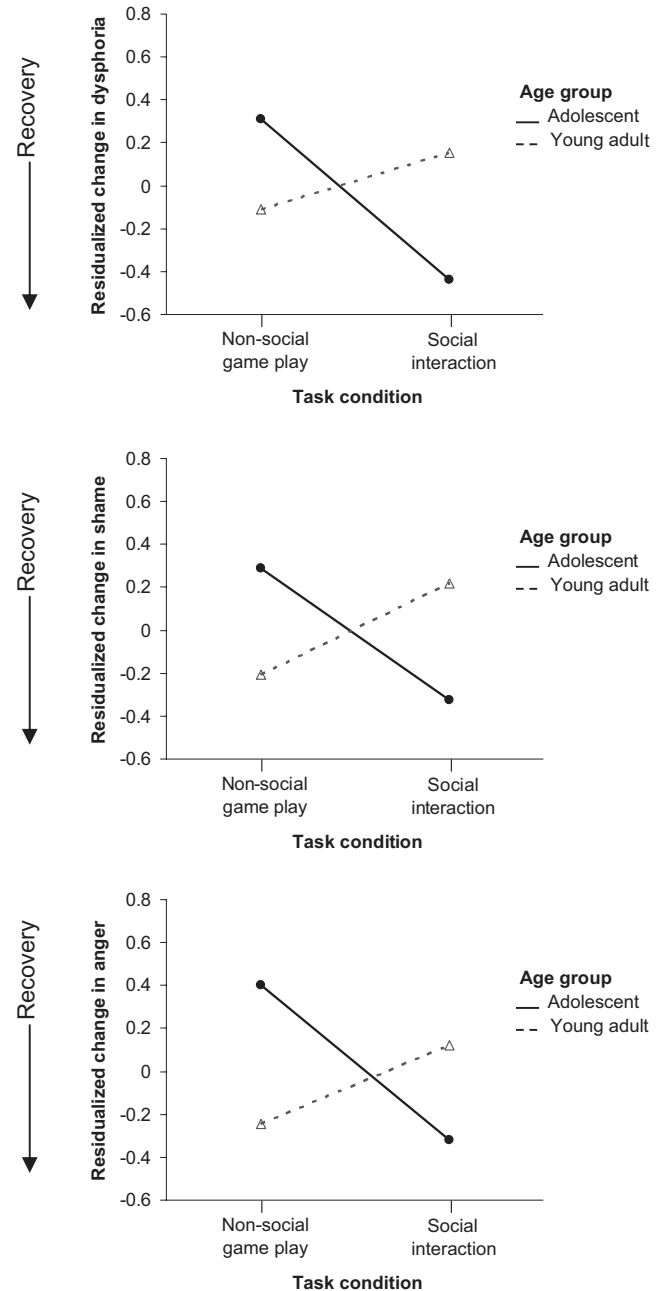

Figure 2. Differences in residualized change in dysphoria, shame, and anger by age and task condition.

differential responses to the solitary game by adolescents and young adults played a role in the observed pattern of results and/or that differences in ethnic composition between the two samples may have contributed to the age differences observed (although wherever possible, ethnic groups were compared and no differences were detected). For example, ethnic minority participants, who were more likely to be young adults, may have attributed their exclusion to discrimination. To reduce possible confounds and to increase generalizability, future research should vary the control condition and match age-based samples on a range of demographic indicators.

This study was the first, to my knowledge, to use the Cyberball task to manipulate exclusion with an early adolescent sample. Although the task may appear artificial, results of the current study, as well as past research, show its effects to be powerful. Results of both data analyses and thorough verbal debriefing with each participant confirmed that Cyberball was as effective for adolescents as prior research has shown it to be for young adults and that it produced similar effects on self-reported perceptions, self-esteem, and affect (e.g., Williams et al., 2002). Moreover, the experience simulated in Cyberball—exclusion from a group activity—is among the most common forms of rejection among youths (e.g., Coie, 1990).

Age was not a significant predictor of participants' reactivity to exclusion: Adolescents and young adults were equally distressed when they believed they had been left out of the game. These findings are consistent with theoretical perspectives that emphasize the importance of belongingness needs throughout the life span (e.g., Baumeister & Leary, 1995; Reis et al., 2000) and with the idea that developmental differences may be less pronounced when the social setting is carefully controlled, as it was in Cyberball (Leaper, 2000; Underwood, Scott, Galperin, Bjornstad, & Sexton, 2004).

Conclusions

The present findings provide preliminary support for the idea that even a fleeting, computer-mediated interaction with an unknown peer can soothe the sting of rejection by providing participants with an experience of social connection. These findings raise a number of questions for further research, including what processes underlie such belonging replenishment and how they may change across and beyond adolescence.

On a methodological note, this study introduced a novel application of experimental social psychological methods to the study of two timely issues in adolescence: interpersonal rejection and Internet use. In both research domains, experimental methods are infrequently used (Juvonen & Gross, 2005; Livingstone, 2003). It is hoped that the present study establishes the viability of using experimental methods both to induce social exclusion and to examine the effects of online communication among adolescents and, in so doing, that it may serve as a preliminary step toward additional experimental research aimed at understanding adolescents' motivation to contact unknown others online and, more generally, the variety of factors that may influence the degree and form of social belonging that online communication may facilitate.

Implications for Policy

In the face of increasingly restrictive policies regarding instant messaging (e.g., Children's Internet Protection Act, 2000; Microsoft, 2002), the present findings suggest that caution should be exercised in restricting adolescents' access to unfamiliar others, given that it may, under some circumstances, serve a positive function. Teens are clearly interested in meeting and interacting with same-age peers online—mostly other teens they already know, but also unfamiliar peers (Boyd, 2006; Gross et al., 2002; Pew Internet & American Life Project, 2001; Wolak, Mitchell, & Finkelhor, 2002). The current study suggests that such interactions may sometimes be adaptive. Alongside prevention and intervention efforts aimed at stopping adult solicitation of underage youths and teaching young people how to protect themselves online (Lenhart, 2005), policies are needed to promote the creation and maintenance of safe spaces for youth to interact online (Boyd, 2006). Moreover, regardless of whether adults seek to support safe online contact with unknown peers or prevent it altogether, additional research aimed at understanding the effects and, ultimately, the functions of such behavior for adolescents is vital.

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