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Journal

International Journal of Behavioral Development, 38(2)

ISSN

0165-0254

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Publication Date

2014-03-01

DOI

10.1177/0165025413515627

Peer reviewed

Published in final edited form as:

Int J Behav Dev. 2014 March 1; 38(2): 155–163. doi:10.1177/0165025413515627.

Will they like me? Adolescents' emotional responses to peer evaluation

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Abstract

Relative to children and adults, adolescents are highly focused on being evaluated by peers. This increased attention to peer evaluation has implications for emotion regulation in adolescence, but little is known about the characteristics of the evaluatee and evaluator that influence emotional reactions to evaluative outcomes. The present study used a computer-based social evaluation task to examine predictors of adolescents' emotional responses to feedback from unknown peers. Nine-to-seventeen-year-olds ($N = 36$) completed the "chatroom task" and indicated the degree to which each peer would be interested in interacting with them and how good they felt after receiving acceptance and rejection feedback from peers. We examined whether adolescents' age and gender impacted their emotional responses to being accepted or rejected by peers of different age groups (i.e., early or middle adolescence) and genders. We also tested whether expectations about peers' interest was associated with variability in adolescents' emotional responses to the evaluative outcome. Upon being accepted by middle adolescent male peers, females in the middle relative to early years of adolescence reported greater well-being, whereas males reported similar levels of well-being regardless of their own age. Following acceptance from middle adolescent female peers, females reported greater well-being than males. Adolescents with high expectations for being liked by peers felt better after being accepted versus rejected relative to those with low expectations. For adolescents with low expectations, acceptance and rejection were associated with similar levels of well-being. Adolescents' emotional responses to peer evaluation are influenced by specific individual characteristics and antecedent preparation for evaluation that may serve an emotion regulatory purpose.

Keywords

acceptance; emotion regulation; gender; rejection

Introduction

Adolescence is a period of development when interactions with peers are highly rewarding and influential for emotional well-being (Rubin, Bukowski, & Parker, 2006; Spear, 2010; Steinberg, 2008). Adolescents derive a sense of belonging and acceptance from their peers,

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feelings instrumental for maintaining emotional health. Heightened sensitivity to, and focus on, peers' opinions are normative, and adaptive in many regards. The development of affective disorders in adolescence, however, is thought to be driven in part by heightened emotionality in peer contexts, more abstract cognitive representations about peer experiences (Davey, Yucel, & Allen, 2008; Westenberg, Drewes, Goedhart, Siebelink, & Treffers, 2004) and greater differentiation of social fears in adolescence (Bokhorst, Westenberg, Oosterlaan, & Heyne, 2008). As such, it is key for adolescents to be able to successfully regulate emotions elicited during interactions with peers (Silvers et al., 2012).

Emotion regulation involves a range of processes through which individuals modify features of their emotional responses (e.g., type, timing, intensity) to fit environmental demands and accomplish one's goals (John & Gross, 2004; Thompson, 1994). Being adept at regulating one's emotions supports a range of other important cognitive, emotional, and social processes in various contexts, such as social information-processing, self-esteem, social flexibility, decision-making, and understanding relationships (Cole, Michel, & O'Donnell Teti, 1994; Gottman, Guralnick, Wilson, Swanson, & Murray, 1997; Nelson & Guyer, 2011). Across middle childhood and adolescence, both an increase in the ability to regulate emotions and greater differentiation of emotional displays occur, changes that are found to vary by the type of emotion, social context, and one's motives (Zeman, Cassano, Perry-Parrish, & Stegall, 2006; Zeman & Garber, 1996; Zeman & Shipman, 1997).

Experimentally based behavioral studies have shown that individual characteristics such as temperament, age, gender, and social motivation influence children's emotional responses to experimentally manipulated peer feedback. For example, highly shy boys reported greater sadness when a child with whom they wanted to play rejected them (Howarth, Guyer, & Perez-Edgar, 2013). Given the salience of social feedback during adolescence, it is important for adolescents to develop schemas for the kinds of peers with whom they could have rewarding relationships. For example, gender and age are two social categories that are tightly linked to one's schemas about peers (Fiske, 1988). These schemas may help adolescents determine who among their peers is likely to accept them, which behaviors, thoughts and feelings are accepted and desired by those around them, and how to respond to rejection or an unexpected bid for social interaction (Hamm, 2000; Pomerantz, Ruble, Frey, & Greulich, 1995). Indeed, children build and internalize their self-concept in part based on their perception of what others think of them, a concept known as reflected self-appraisal (Pfeifer & Peake, 2012). These appraisals are valuable given that adolescents become increasingly aware of being evaluated by others (Sebastian, Burnett, & Blakemore, 2008) and expend more time and energy thinking about their social status and how others perceive them (Blakemore, Burnett, & Dahl, 2010; Nelson, Leibenluft, McClure, & Pine, 2005; Steinberg, 2008).

Other work has shown how ecologically valid experimental manipulations of peer evaluation can alter youths' emotional responses to, and regulation strategies for, coping with negative feedback (Adrian, Zeman, & Veits, 2011). After receiving negative feedback, youths assigned to receive rejection versus those who were not rejected reported a worsening of mood. After a delay period, negative mood improved among those rejected youths who selected distraction (e.g., shifting attention from distress and focusing on

positive activities) instead of passive behavioral strategies to cope with the rejection (Reijntjes, Stegge, Terwogt, Kamphuis, & Telch, 2006). These results suggest that negative mood states induced by peer rejection can be improved if children seek active strategies to regulate their emotions. The post-feedback emotion regulation strategies described by Reijntjes et al. (2006), however, highlight a need to consider the influence of antecedent strategies that youth may use to manage their emotions in the period prior to receiving and reacting to peer evaluation.

Characterizing the mechanisms of adolescents' emotional responses to peer evaluation requires integrated assessment of biological, cognitive, and emotional domains of development using methodological approaches that can simultaneously capture these various yet inextricably linked pathways of influence. For example, by targeting the brain's responses to socially evaluative events, we can document the involvement of brain regions whose functions support emotion processing and regulation, and potentially detect differential response patterns that may emerge relative to observed behavior. Indeed, neurobiological mechanisms account in part for the links between emotional responses and peer evaluation based on evidence from functional neuroimaging studies conducted in adolescent groups. These studies implicate the involvement of subcortical and cortical circuitry critical to emotion processing, and demonstrate that the response of this circuitry is related to individuals' age, gender and expectations.

Studies using both biological and behavioral indices of emotion have examined the effects of age and/or gender on adolescents' responses to the receipt of social evaluation (Gunther Moor, van Leijenhorst, Rombouts, Crone, & Van der Molen, 2010; Guyer, Choate, Pine, & Nelson, 2012; Silk et al., 2012). For example, following peer rejection, brain activity was found to increase from pre-pubescence to young adulthood in regions that support affect regulation (e.g., striatum, prefrontal cortex, and orbitofrontal cortex) (Gunther Moor et al., 2010). Other work has shown that neural activity in regions involved in social-cognitive processes (e.g., temporal parietal junction, TPJ) increased with age among females and decreased with age among males when accepted by peers with whom adolescents had not wanted to interact (Guyer et al., 2012). Finally, in a study that paired eye-tracking with a socially-evaluative task, older versus younger youths showed greater pupillary dilation to acceptance from same-gender versus other-gender peers, and a greater tendency to gaze at their own photo after acceptance (Silk et al., 2012). Additionally, youths looked away from themselves following rejection feedback, which may be related to self-regulatory mechanisms. Taken together, these neurobiological studies highlight the influences of age and sex both of the evaluator and of the evaluatee on social-emotional responding during social evaluation. Yet further research is needed to account for the influence of both adolescents' and evaluating peers' characteristics on emotional responses to evaluation from different types of peers.

Neuroimaging work has also examined adolescents' neural responses when appraising their expectations for how peers might evaluate them. For example, typically developing adolescents showed increased neural activation in key areas implicated in affective processing (e.g., ventral striatum, hippocampus, and hypothalamus) that increased with age in older relative to younger females (9–17 years old), but showed no association with age in

males (Guyer, McClure-Tone, Shiffrin, Pine, & Nelson, 2009). These results suggest that heightened neurally-based emotional sensitivity associated with expectations for peers' interest may be more prominent at certain ages for females. Adolescents have also shown greater activation in brain regions involved in self-perception and social cognition (e.g., superior temporal gyrus and TPJ) than adults, suggesting that when adolescents think about what others think of them, they may incorporate those perspectives more strongly than adults (Pfeifer et al., 2009). Together, these studies report age and sex differences in biologically based indices of emotional responding to both positive and negative social events. These findings highlight the involvement of prefrontal regions in signaling to subcortical regions a need to update goals or adjust behavior, cognitions, and emotions. Nevertheless, whether expectations of peers' evaluations relate to their self-reported emotional well-being remains unknown and may be an important antecedent emotion regulatory process worthy of further examination.

Thus, in the present study we sought to examine adolescents' emotional response upon receiving evaluation from unknown peers using a paradigm called the "chatroom task" (Guyer et al., in press; Guyer et al., 2012; Guyer et al., 2008; Guyer et al., 2009; Lau et al., 2012). The chatroom was originally designed to increase the ecological validity of social-cognitive neuroimaging tasks used in research on children and adolescents by simulating youths' daily experiences with peers. The task design allows for integrated measurement of adolescents' response behaviors, self-reported cognitions and emotions, and associated neurophysiological responses that can be experimentally manipulated within the context of purported peer interaction. The task measures expectations about peer evaluation outcomes (e.g., "I don't really think he will like me") and emotional responses to being evaluated by peers (e.g., "I feel really happy that she likes me"), processes that are highly pertinent to adolescent emotional development.

The data reported here were collected with the chatroom task when the same set of adolescents underwent a neuroimaging scan (Guyer et al., 2012; Guyer et al., 2009). Analysis of these behavioral data collected in the context of scanning is important for confirming that the task measures cognitive and emotional phenomena as intended, and for testing whether these behavioral responses are sensitive to the influence of individual and peer characteristics, such as age and gender. Examination of a task's validity when used in a neuroimaging environment is important for assessing how the stimulus characteristics operate within the population of interest and for distinguishing behavioral nuances and sensitivities. This may be particularly important because the scanner creates a unique environment that may alter behavior. Exploring task validity can inform the creation of new task iterations necessary to address future research questions based on current findings. Thus, in the current study we used behavioral data from the chatroom task to examine adolescents' emotional responses as a function of both individual and peer characteristics, the valence of peer evaluation (positive/"accepting," or negative/"rejecting"), and participants' expectations about evaluation. By doing so in the context of a neuroimaging experience, we aimed to further confirm the sensitivity of the chatroom task to these influences.

The overarching goal of the present study was to identify factors that might modulate adolescents' emotional responses to positive and negative peer evaluation. Our first research question aimed to understand whether adolescents' age and/or gender predict variability in their emotional response to being evaluated positively or negatively by peers, and specifically in response to whether the evaluating peers are of a similar or different age and gender. Here, individual-level characteristics of the evaluator and the evaluatee may alter emotional responses to being socially evaluated and may operate differently based on the valence of the evaluation. Based on the results reported in Guyer et al. (2009), we expected that females in middle adolescence would express the most differentiated emotional response to peers, such that they would report more positive feelings about acceptance from females and males who were also in middle adolescence and report more negative feelings about rejection from all peers, regardless of the peer's age or gender. Furthermore, given that romantic interactions are an especially salient context for heightened emotionality in older adolescents (Fisher, 2006), we anticipated that older adolescents would feel better when accepted and worse when rejected by opposite-gender peers.

Our second research question focused on understanding whether an adolescent's expectation of interest from peers predicts variability in their emotional response to positive or negative types of peer evaluation. Expectations about how much peers wish to engage in interaction may serve as an antecedent mechanism by which adolescents regulate emotional response to the experience of being evaluated. Adolescents are thought to have a fully developed understanding of the likelihood of experiencing disappointment and regret (Guttentag & Ferrell, 2008). As such, they may anticipate disappointment in certain social situations and success in others. For situations in which they expect disappointment, they may dampen their expectations, engaging in an antecedent emotion regulation strategy referred to as "defensive pessimism" (Guttentag & Ferrell, 2008; Norem & Smith, 2006). A low expectation of interest from peers may serve to avoid disappointment. It may also relate to greater feelings of well-being when peer feedback is negative (being rejected) because the expectation is aligned with the outcome. Similarly, a low expectation of interest from peers may bolster feelings of well-being when peer feedback is positive (being accepted) because expectations are surpassed by the outcome. A high expectation of interest from peers may also facilitate feelings of well-being when peer feedback is positive (being accepted), given the match between expectation and outcome. However, a higher expectation of interest from peers may be associated with lower feelings of well-being when peer feedback is negative (being rejected) because expectations were not met by the outcome and might generate feelings of disappointment. Thus, the antecedent socially-based expectations one holds about others' intentions and desires may serve a regulatory function that differs based on the valence of the outcome.

Method

Participants

Participants were 36 adolescents (16 females; majority were of Caucasian descent) ranging from 8.6 to 17.5 years of age ($M = 13.5$, $SD = 2.4$) recruited from communities within the greater Washington, DC area via advertisements. Although all participants in the present

study have been included in published work (Guyer et al., 2012; Guyer et al., 2009), the current study was designed to address previously unexamined questions regarding the interaction of participant and peer characteristics. Participants were deemed physically and psychiatrically healthy following a physical exam conducted by a medical doctor and semi-structured psychiatric interview using the schedule for affective disorders for school-aged children – present and lifetime version (K-SADS-PL) (Kaufman et al., 1997) administered by a trained, clinical psychologist. A series of *t* tests confirmed no differences between males and females in age, full-scale intelligent quotient scores (Wechsler, 1999), parent education and annual income, and pubertal stage (Tanner, 1962).

Procedure

The institutional review board at the National Institute of Mental Health approved all study procedures. All participants provided written assent, and parents/legal guardians provided written informed consent for study participation. All participants and their parents were informed that the study included receiving misinformation during the course of one of their visits. All participants were debriefed at the end of the study and no adverse reactions to this information occurred. All participants were financially compensated for their time.

Participants completed the “chatroom task,” a paradigm designed to simulate adolescents’ experiences of peer evaluation across two phases. In phase one, participants were led to believe they were participating in a nationwide study of teenagers’ internet-based communication in chatrooms. They were told that at the end of the two phases, they would chat online with another teenager from a collaborating institution. Participants wrote online profiles about themselves and a photograph of the participant was taken. Participants were then told that the “peers” at these other institutions would evaluate and rate them based on their information and picture, just as the participants would do with their peers. Participants then viewed 40 individually-displayed photographs of peers (20 males) allegedly participating in the study, and rated their interest in interacting with each peer, from “0 = not interested” to “100 = very interested” (Figure 1). Of note, due to an alleged computer glitch, peer profiles were unavailable leaving participants to rate peers based solely on the picture. This strategy was used to assess participants’ immediate impressions of peers free from the influence of additional information. Having participants’ rate their interest in peers was designed to assess the salience of each peer to the participant, and constitutes participants’ *appraisals of peers*. Participants were told that later in the study they would view the ratings the “peers” had given them and would chat with a mutually high-interest “peer” based on their own profiles and ratings of peers. This approach was intended to increase task salience and followed Wendler’s (1996) recommendations for ethically permissible research involving minors and using deception.

Phase two occurred two weeks later when participants underwent a neuroimaging scan. First, participants were scanned while reviewing the rated photographs. As they viewed each photograph, participants were asked to indicate how interested they thought each depicted peer would be in interacting with them, from “0 = not interested” to “100 = very interested” (Figure 1). This cognitive task assessed participants’ anticipation about how peers (about whom they had made prior evaluations) would evaluate them in order to measure

participants' *expectations of interest from peers*. Second, participants were scanned while viewing each peer photograph again, but now with positive ("interested") or negative ("not interested") evaluative feedback superimposed underneath the picture. In response to the peer feedback, participants were asked to rate how it made them feel, from "0 = very bad" to "100 = very good" (Figure 1). These ratings provided an index of participants' *emotional responses to evaluation from peers*. E-prime software was used to present the stimuli and record participants' responses. Participants were debriefed after completing the task and told that no social evaluations were actually performed and no real interactions would occur. No adverse responses to the deception occurred, however, 8 of 44 participants were excluded because they reported that they did not believe they would actually interact with another "participant."

Measures

The chatroom task consisted of 40 face trials and eight fixation trials. The face trials varied from 7.6–9.6 s in duration and consisted of two components: 3–5 s during which the face was presented without the rating screen and 4.6 s during which participants made their ratings. Stimulus presentation was random. Task stimuli were from a validated face emotion dataset that included 40 digital head shots of 11–17-year-old actors (20 male) of varied ethnicities posing with happy expressions with direct gaze under the direction of an acting coach (Egger et al., 2011). Attractiveness of the actors was not controlled in order to maintain a stimulus set that reflected typical peers encountered by adolescents. Fixation crosses were displayed (4 s) randomly throughout the task to maintain attention to the screen. Interstimulus interval was 1 s.

Data analysis

Data were analyzed using IBM SPSS 21 (Chicago, IL). The main dependent measure analyzed in the present study was emotional response to peer evaluation. To examine participants' responses to different peer types, task stimuli were categorized based on the gender and age group of the depicted peers, which included early adolescent male and female peers (15 male; range: 10–13 years; mean = 11.94 years) and middle adolescent male and female peers (15 male; range 14–18; mean = 14.91).

Our first question aimed to test the main and interactive effects of participant age and participant gender on emotional response to evaluation from different peers. Hierarchical multiple regression analyses were selected to address this question over repeated measures analysis of variance (ANOVA) to increase our study's power given its small sample size. For each type of peer evaluation (i.e., acceptance and rejection), four models were tested to predict emotional response to evaluation from early adolescent males, early adolescent females, middle adolescent males, and middle adolescent females. Participant age was centered on the sample mean and then multiplied by participant gender to create an age \times gender interaction variable. Step 1 of these models included participant age (centered) and participant gender. Step 2 included the age \times gender interaction term. These models were repeated using pubertal stage in place of participant age; however, the models showed similar results with puberty due to the high correlation in this sample between age and

pubertal stage, and thus are not discussed further. Effect sizes for the multiple regression analyses are reported using Cohen's f^2 (Cohen, 1988; Soper, 2013).

Our second research question focused on understanding how participants' expectations of peers' interest in interacting with them was associated with their emotional response to peer evaluation. Because we were interested in examining comparisons between expectation levels and response to each type of evaluation, we conducted a 2×2 repeated measures ANOVA with expectation level (low, high) as the between-group factor and feedback type (acceptance, rejection) as the within-group factor. Effect size is reported for the ANOVA using Cohen's d . Significant effects were followed with least significant difference (LSD) multiple comparison tests.

Notably, although participants' interest in peers was assessed two weeks prior to assessment of expectations from peers and emotional responses, the correlation between interest in peers and expectations of peers' interest was high ($r = .81, p < .001$). Because of this high association and because expectations and affective response were assessed in the same testing session, we focus only on examining participants' expectations and emotional responses in this report. A two-tailed significance level (.05) was used for all statistical tests.

Results

Effects of age and gender on emotional response to peer evaluation

As shown in Table 1, significant effects were found on emotional response to acceptance from middle adolescent male peers and middle adolescent female peers, but not when it was delivered by early adolescent peers of either gender.

For middle adolescent male peers, step 1 explained 18% of the variance, such that participant age ($p = .01$), but not participant gender ($p = .73$), significantly predicted participants' emotional response to acceptance. Specifically, older participants reported higher levels of well-being. When the age \times gender interaction was added on step 2, it explained an additional 16% of the variance, such that gender moderated the association between participant age and emotional response ($p = .009$). Specifically, older relative to younger female participants reported higher levels of positive affect when accepted by middle adolescent male peers (Figure 2). Male participants reported similar levels of well-being across age.

For middle adolescent female peers, step 1 explained 22% of the variance, such that participant gender ($p = .03$), but not participant age ($p = .06$), significantly predicted participants' emotional response to acceptance. Female, compared to male, participants reported higher levels of well-being when accepted by middle adolescent female peers (Figure 3). The addition of the age \times gender interaction on step 2 was not significant.

There were no significant effects of age, gender or the age \times gender interaction on emotional response to rejection from any of the peers.

Effect of expectations of peers' interest on emotional response to peer evaluation

The main effects of feedback type and expectation level on emotional response were not significant. However, the interaction between feedback type and expectation level did show a significant effect on emotional response, $F(1, 32) = 6.02, p = .02, d = .87$ (Figure 4). Post-hoc tests indicated that participants with a high expectation for peer interest reported greater levels of well-being upon being accepted versus rejected by peers ($p = .001$). For participants with low expectation for peer interest, emotional well-being did not differ significantly as a function of the type of feedback they received ($p = .97$). In addition, when accepted by peers, participants reported feeling greater well-being if they held a high versus low expectation for peer interest ($p = .004$). When rejected by peers, participants' emotional response was not differentiated by their expectations for peers' interest in interacting with them ($p = .23$).

Discussion

The present study examined adolescents' emotional responses to evaluative feedback from peers. Our goal was to test hypotheses about how emotional responses to peer acceptance and rejection varied as a function of participants' gender or phase of adolescence and the gender and phase of adolescence of the peers, as well as participants' expectations for being evaluated. A second goal was to examine these relationships using adolescents' emotional responses to peer evaluation obtained during a neuroimaging scan in order to motivate future adaptations of the chatroom paradigm for use behaviorally, and in conjunction with, measuring psycho-physiological responses such as neural activation. By doing so, we can better understand which types of peers and feedback most prominently modulate adolescents' emotional reactions to positive and negative evaluation. In addition, by identifying stages of emotional processing during peer evaluation, such as antecedent expectations about the outcomes, we can pinpoint ways in which adolescents modulate their emotions and adjust their behavior with peers, thus improving our ability to support adolescents' emotional regulation skills within the peer context.

We first examined whether adolescents' age and gender impacted their emotional responses to being accepted or rejected by peers of different ages and genders. Upon being accepted by middle adolescent male peers, older relative to younger adolescent females reported greater well-being, whereas males reported similar levels of well-being regardless of their age. Following acceptance from middle adolescent female peers, females reported greater well-being than males. Age, gender, and their interaction were not significant factors in relation to adolescents' reported well-being in response to being accepted by early adolescent male or female peers, or to being rejected by any of the different types of peers.

The finding that older females reported more positive feelings than boys when accepted by middle adolescent males suggests a possible greater sensitivity or expectation of older females that same-aged adolescent males will be more interested in them, and this emerged in their emotional responses. It may be that for older adolescent females, being accepted by same-aged male peers facilitates attainment of a higher social status and thus improves feelings of well-being. Future work should examine adolescents' perceived social status and

their emotional reactions or regulatory strategies in response to manipulated lowering and raising of their social status.

Females were also generally more discriminant in reporting their emotional responses to acceptance, in particular, and when acceptance was granted specifically from middle adolescent males or middle adolescent females. During adolescence, females tend to be more sensitive to the state of their peer relationships, have higher concern for social evaluation, have a higher need for peer approval, and are more preoccupied with thoughts of peers than males (Richards, Crowe, Larson, & Swarr, 1998; Rose & Rudolph, 2006). Thus, it is possible that the type of socially-evaluative situation created by the chatroom task is more effective at probing emotional responses in female than male adolescents – a possibility corroborated by the neuroimaging findings from this task showing increased responding in affective regions of the brain in females, particularly older females, relative to males (Guyer et al., 2009). Overall, older adolescent females appeared to be more emotionally invested in the task and this investment depended on the type of peer providing positive, but not negative, evaluation.

We also tested whether expectations about peers' interest was associated with variability in adolescents' emotional responses to the evaluative outcome. Adolescents with high expectations for being liked by peers felt better after being accepted versus rejected relative to those with low expectations. For adolescents with low expectations, acceptance and rejection were associated with similar levels of well-being. Participants' gender and age were not associated with emotional responses when a low or high expectation for peer interest related to emotional response to negative and positive feedback. This result fits with our expectations, given that anticipatory emotional responding abilities tend to develop by middle childhood (Guttentag & Ferrell, 2008), and are not expected to change from early through middle adolescence. Adolescents' emotional responses to peer evaluation do appear to be influenced by antecedent preparation for evaluation that may be used for emotion regulation. These results indicated that adolescents may lower their expectations for being liked in order to suppress their emotional response in anticipation of a negative evaluation; this strategy may have also led them to inadvertently blunt their emotional response to a positive outcome. It is also possible that they had difficulty differentiating their emotional reactions to positive and negative evaluative outcomes. Having high expectations was associated with greater well-being when accepted than when rejected, suggesting that, expecting to be liked and receiving an outcome consistent with that expectation bolstered well-being. Overall, the need to regulate one's emotional reactions to positive and negative bids of peer evaluation is salient in adolescence, especially for girls, at a time when there may be a frequent need to down-regulate strong emotions elicited by relationships and social contexts (Silvers et al., 2012).

As the paradigm used in this study was designed for a neuroimaging environment, the implications of our findings for understanding the development of neural systems associated with social evaluation warrants discussion. Adolescents' expectations of interest from peers may be in part a reflection of how they believe those others will appraise them. Work documenting increased activity in the ventromedial prefrontal cortex (vmPFC), an area implicated in self-evaluation and mentalizing, during the anticipation of social feedback

across adolescence (Gunther Moor et al., 2010; Pfeifer et al., 2009) is consistent with our expectation that middle adolescents would tend to engage in more elaborate processing about who might be interested in them and why. Similarly, work has documented greater activity in specific affective brain regions among older relative to younger adolescent females when anticipating appraisals from peers (Guyer et al., 2009).

A general pattern that also emerged in the present study was that adolescent females' affective responses to evaluation were modulated by several factors (e.g., peer age, peer gender, participant's age) relative to males' responses. Although our findings involved greater well-being to positive feedback, our age and gender based findings align with evidence in adolescence of an age-related increase in avoidance and distress of interaction situations, and for girls specifically, situations of being observed by others (Sumter, Bokhorst, & Westenberg, 2009). Our results for females have some support in the neuroimaging literature as well. For example, a linear increase with age has been found for activation in the striatum and vmPFC to rejection feedback when it was expected to occur (Gunther Moor et al., 2010). Finally, our findings are consistent with work documenting adolescents' greater pupillary dilation in response to acceptance from a same-gender appraiser as opposed in response to an opposite-gender appraiser (Silk et al., 2012). Pupillary dilation and vmPFC activity are both linked with executive control and emotion regulation processes, which our participants likely employed when reacting to peer feedback from various peers.

The present study has some limitations. First, the relatively small sample size may have reduced the study's power to detect significant results. Nevertheless, our use of full-sample regression analyses and the repeated measures employed in our design support the reliability of our results despite the sample size. Second, there was a large age range of the participants and of the actors used for the stimuli. Future work will benefit from constraining those parameters to more precisely identify the role of age in these processes and from considering the role of pubertal stage. Third, our use of a median split to create the "low expectation" and "high expectation" groups may have resulted in an artificial dichotomy that does not reflect the true variance in expectations within each group. The findings of expectation-related effects in spite of this should allay concern over the grouping method employed. Fourth, the present study balanced the desire for naturalistic observation of complex real-world social interactions and the need for experimentally controlled assessment. For example, the expectation and feedback tasks were adapted for use in a scanner and thus the desired ecological validity may have been compromised when measuring adolescents' appraisals and emotions. Fifth, factors motivating participants' expectations from and emotional responses to peers (e.g., physical attraction, whether a peer seems like fun) may have influenced reactions to social evaluation in meaningful ways that were not assessed in this study. However, the relationship found between emotional responses to social evaluation suggests our manipulation did tap into distinct psychological properties inherent in the selection of peers for social interaction. Future work should include measures that assess various reasons why adolescents may express initial interest in peers, and factors that influence their expectations about being evaluated. A final limitation relates to our use of deception. Exclusion of participants who reported disbelief in the task may have biased the generalizability of the results. Nevertheless, participants who remained in the sample likely

expressed typical reactions to peer evaluation. Debriefing participants about the deception used in the task also constrains longitudinal study of social evaluation processing with this paradigm. Thus, examination of intraindividual change in social evaluation processing across multiple phases of adolescence and into adulthood is warranted with new paradigms.

Finally, there is emerging evidence that age and emotion regulation are important in social contexts. One study found that age affects adolescents' emotion regulatory strategies and affective responses to social stimuli, such that older, as compared to younger adolescents, were more successful at regulating their emotions when faced with negative social stimuli (Silvers et al., 2012). Younger adolescents' regulatory skills were more negatively impacted by the social images presented to them, as well as by their own rejection sensitivity. These findings suggest that the relationship between age and emotion regulatory skills may be important to examine in order to understand the factors that influence how adolescents anticipate and emotionally respond to peer evaluation. As such, variations of tasks like the chatroom could be paired with neuroimaging or eye-tracking methodology in future work to test new questions related to emotional regulation processes in the context of peer evaluation.

Adolescence is a transformative period in development, shaped strongly by neurobiological and pubertal changes, but also social context, as shown here in the form of bids of positive and negative evaluation from peers of either gender and in different phases of adolescence. Given the current study's findings, emotional responses and regulation of emotion have important implications for several domains of development linked with adolescent adjustment, including social cognition, gender identity development, and feelings of belongingness, as well as associated neural correlates underlying these processes. Future work could consider the use of exclusively same-gender peers in the chatroom task to examine behavioral and neural reactions to peer evaluation that may occur in a more typical social context. Future studies are also needed to test the role of emotion regulation in peer evaluations directly, a topic which has been understudied among adolescents (Adrian et al., 2011; Perry-Parrish & Zeman, 2011).

Acknowledgments

The authors also wish to acknowledge support from the Intramural Research Program of the National Institute of Mental Health.

Funding This work was supported by the National Institutes of Health grants to A. E. G. (R00-MH080076) and to J. D. C. (T32-MH020006).

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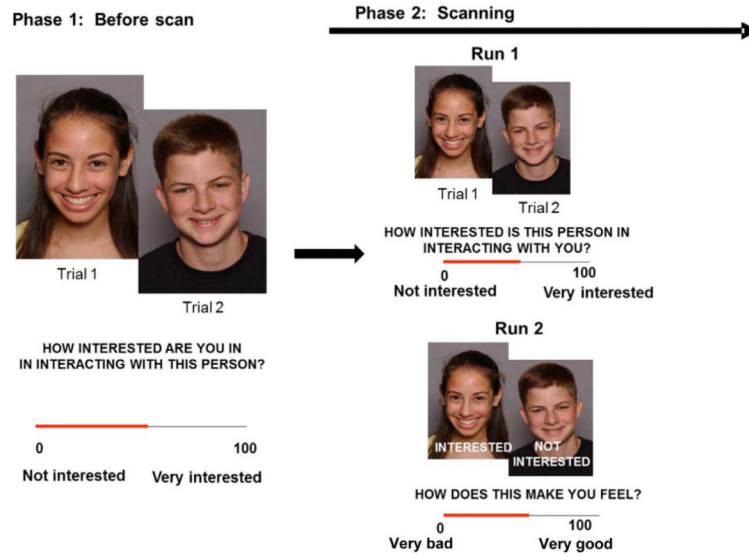


Figure 1.
Chatroom task paradigm.

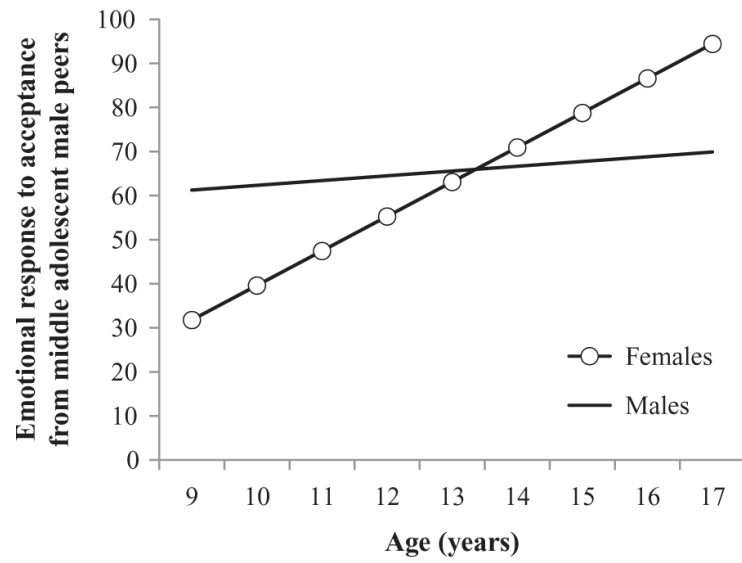


Figure 2. Interaction of participant age and gender on emotional response to acceptance from middle adolescent male peers. Higher responses indicate more positive feelings of well-being.

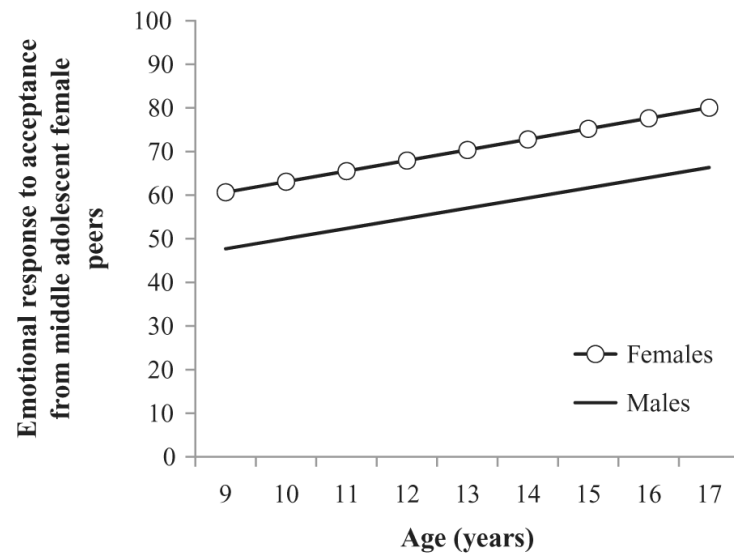


Figure 3. Main effect of participant gender on emotional response to acceptance from middle adolescent female peers. Higher responses indicate more positive feelings of well-being.

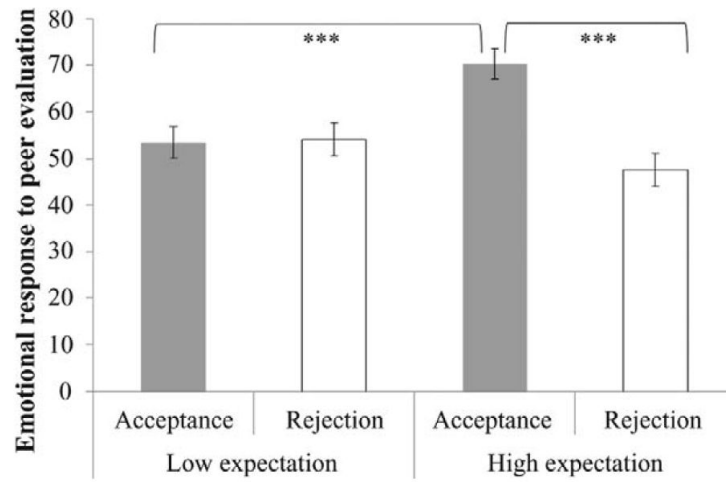


Figure 4. Interaction of participants' expectations of peers' interest in them and type of peer evaluation on emotional response to peer evaluation. Higher responses indicate more positive feelings of well-being.

Table 1

Standardized (S) and unstandardized (US) coefficients for hierarchical regression analyses predicting emotional response to acceptance from different peer types (N = 36).

Emotional response to acceptance		Step 1		Step 2			
		Age*	Gender	Age* × gender	R ²	F	Cohen's <i>f</i> ²
Early adolescent male peers							
Step 1 β	S/US	.04/.31	.06/2.24		.005	.08	.005
Step 2 β	S/US	.20/1.52	.06/2.33	-.19/-1.80	.01	.40	.01
Early adolescent female peers							
Step 1 β	S/US	.15/1.18	-.31/-12.51		.13	2.35	.15
Step 2 β	S/US	.17/1.36	-.31/-12.50	-.03/-26	.00	.008	NA
Middle adolescent male peers							
Step 1 β	S/US	.42/3.30	.05/2.13		.18	3.50*	.22
Step 2 β	S/US	.99/7.83	.06/2.46	-.70/-6.75	.16	7.74**	.19
Middle adolescent female peers							
Step 1 β	S/US	.30/2.36	-.35/-13.35		.22	4.68*	.28
Step 2 β	S/US	.31/2.42	-.35/-13.35	-.01/-10	.00	.001	NA

Note. Step 1: *df* = 2, 33; Step 2: *df* = 1, 32;

* *p* < .05;

** *p* < .01; age was mean centered at 13.54 years; NA = not applicable.