

Chapter 3

Proudly Moving Forward and Feeling Connected: Adolescents' Daily Temporal Comparisons Relate to a Desire for Growth and Sense of Relatedness

Adolescents often compare themselves favorably to others. Although such downward social comparisons make adolescents feel proud, they entail the risk of focusing adolescents on outperforming others rather than on improving themselves. This daily diary study ($N = 389$ adolescents, ages 11-15) tested the hypothesis that downward *temporal comparisons*—comparing one's present self favorably to one's past self, rather than to others—may elicit pride while encouraging adolescents to strive for self-improvement rather than superiority. Such a desire for self-improvement may, in turn, cultivate a sense of relatedness. Results show that daily downward and upward comparisons co-occurred with pride and shame, respectively, regardless of whether those comparisons were social or temporal. Importantly, daily downward temporal comparisons (unlike daily downward social comparisons) co-occurred with a desire for self-improvement over superiority as well as with a sense of relatedness. This desire for self-improvement over superiority partially mediated the association between downward temporal comparison and a sense of relatedness. Together, these findings underline the role of social and temporal comparisons in self-conscious emotions and goal pursuit and suggest that temporal comparisons—unlike social comparisons—may help adolescents strive for personal growth and build satisfying relationships.

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Adolescents often compare themselves to their peers. They do so in many domains, including grades, appearance, ability, personality, and social status (Cushman & Rogers, 2008). They do so even in contexts where social comparison information is not salient (Keil et al., 1990). Although social comparisons are informative (e.g., helping adolescents gauge their abilities), they can backfire, as they may contribute to a desire for superiority over others. We propose that *temporal comparisons*—comparing one’s present self to one’s past self, rather than to others—can encourage adolescents to strive for self-improvement rather than superiority, while giving them a sense of pride and relatedness with others. We tested these novel hypotheses in a daily-diary study in adolescence.

Social Comparisons

Social comparisons involve perceiving oneself as better off than others (downward social comparisons; Wills, 1981) or worse off than others (upward social comparison; Collins, 1996; Festinger, 1954). The inclination to make social comparisons arises early in development. From the ages of 4-5, children show interest in social comparison information (Ruble, Feldman et al., 1976), make spontaneous social comparisons (Mosatche & Bragonier, 1981), and use such comparisons to evaluate their performance (Butler, 1998). From primary school onward, children’s interest in social comparison information grows stronger and begins to influence their performance (Keil et al., 1990; Ruble, Parsons et al., 1976). Toward the end of primary-school years, children use social comparison information frequently, such as to choose their competitors (Ruble et al., 1980) and evaluate their ability (e.g., “I must be pretty good because I beat all the others”; Ruble et al., 1980, p. 112).

With the transition from primary to secondary school, young adolescents become highly concerned with evaluating their capabilities and social standing in their newly formed peer group (Midgley et al., 1995). Doing so, adolescents often focus on discovering in what ways they are better than their peers, as they believe that such superiority brings them social status (Anderson et al., 2012). Interviews with students demonstrate that boasting about one’s superiority is characteristic of early adolescence (Cushman & Rogers, 2008). Secondary school settings may satisfy this focus on social comparison. For example, unlike primary-school contexts, secondary school-contexts often provide adolescents with normative grades (Maehr & Midgley, 1996). Such emphasis on normative grades might encourage adolescents use social comparisons so as to evaluate themselves, goal theories suggest (Ames, 1992; Dweck, 1986; Nicholls, 1984). Perhaps as a result, adolescents begin to perceive school contexts as competitive, encouraging them to focus on surpassing their peers (Eccles & Midgley, 1989; Gonçalves et al., 2017; Midgley et al., 1995; Sakız, 2017; Urdan & Midgley, 2003). In fact, adolescents make frequent social comparisons, even in collaborative tasks (Keil et al., 1990).

Social comparisons impact how adolescents feel about themselves. These comparisons have been theorized to provide “a set of standards as a point of comparison” that underlie self-conscious emotions such as pride and shame (Tangney & Dearing, 2002, p. 140; also see Buechner et al., 2019; Lewis, 1995; van Osch et al., 2018). Pride and shame are commonly experienced by adolescents, especially in classroom settings (Buechner et al., 2018; Pekrun et al., 2002). Unlike basic emotions such as fear and anger, pride and shame involve self-awareness and self-representations (Lewis et al., 1989; Tangney & Dearing, 2002; Tracy &

Robins, 2004). Indeed, people experience pride and shame “only when they become aware that they have lived up to, or failed to live up to, some actual or ideal self-representation” (Tracy & Robins, 2004, p. 105). Such a self-representation can be based on social comparison (e.g., “I am better than Sam” or “I am worse than Tim”).

Consistent with this view, research shows that downward social comparisons trigger pride (Webster et al., 2003), whereas upward social comparisons trigger shame (Gibbons, 1986; Lim & Yang, 2015). When children or adolescents reflect on experiences of outperforming others or being outperformed by others, they feel proud and ashamed, respectively (Buechner et al., 2018; Gürel et al., 2020; Seidner et al., 1988). Similar findings have been obtained with adults. Adults often mention pride in connection with outperforming someone on a dimension relevant to them (Tesser & Collins, 1988). Adults who outperform others display pride (e.g., smile, chest expansion), whereas adults who are outperformed by others display shame (e.g., slumped shoulders, narrowed chest; Tracy & Matsumoto, 2008). On days when adults make downward social comparisons, they often feel proud; but on days when they make upward social comparisons, they often feel ashamed (Thøgersen-Ntoumani et al., 2018). Thus, downward social comparisons seem to co-occur with pride, and upward social comparisons with shame.

Despite the obvious advantage of social comparisons—helping adolescents gauge their abilities relative to others—they might entail risks. Social comparisons make people perceive discrepancies between themselves and others (Festinger, 1954; Higgins, 1987). When these discrepancies are unfavorable, people are motivated to reduce them (Festinger, 1954; Ruble, Parsons et al., 1976); and when they are favorable, people are motivated to maintain or even increase them (Sedikides & Gregg, 2008; Wills, 1981). In both cases, social comparisons may contribute to a desire for superiority—a desire to maintain or increase their normative standing (Tesser, 1988). Such superiority goals could lead adolescents to become increasingly competitive (Garcia et al., 2006). Although empirical evidence is scarce, evidence suggests that social comparisons can instill a competitive interpersonal orientation (Pemberton & Sedikides, 2001, Ruble, Parsons et al., 1976). For example, individuals holding a fixed mindset or adopting performance goals often make more frequent social comparisons, making them more likely to see others as competitors (Butler, 2000; Garcia et al., 2018; Nussbaum & Dweck, 2008). Such competitive orientation could potentially hamper adolescents’ desire for improving themselves (Ruble et al., 1992). For example, when adolescents hold a competitive interpersonal orientation, they may become more concerned with finding out their peers’ performance than with finding out strategies to improve themselves (Butler, 2000). Additionally, after making social comparisons, children and adolescents desire to be better than others, not necessarily to improve themselves (Gürel et al., 2020). Thus, when adolescents make more social comparisons, they may be more likely to desire for superiority than for self-improvement.

Such effects of social comparisons may be understood from the perspective of self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000), which posits that adolescents have basic psychological needs to feel competent, autonomous, and related to others. When these psychological needs are met, adolescents feel intrinsically motivated and experience

well-being (Ryan & Deci, 2000). Making downward social comparisons can satisfy adolescents' needs for competence; for example, when individuals outperform others, they perceive themselves as more competent (i.e., the feeling that they are good at the things at they do; Keil et al., 1990; Reeve & Deci, 1996). Similarly, making downward social comparisons may foster adolescents' need for autonomy. Because social comparisons are prevalent in adolescence, adolescents may come to believe that being better than others is important to them (Buunk et al., 2005; Midgley et al., 1995; Sakız, 2017). Consequently, making social comparisons may feel autonomous rather than controlled to them (Reeve & Deci, 1996). For example, some adolescents enjoy competitive classrooms (Byrne et al., 1986), with 25% of adolescents reporting that they desire to be better than their classmates (Mansfield, 2010). When asked why, one student explained: "I believe that competition is the biggest motivation" (Mansfield, 2010, p. 51). Consequently, when making downward social comparisons, these adolescents may feel truly autonomous—they may feel that they are engaging in something they find interesting and important (Ryan & Deci, 2000).

By contrast, downward social comparisons might not improve adolescents' need for relatedness (i.e., the feeling that they get along well with people they interact with; Deci & Ryan, 1985). Although this hypothesis has not been tested directly, it has been theorized that downward social comparisons can make adolescents look upon their peers with disdain (Smith, 2000), which could harm their sense of relatedness. There is some supportive evidence in adults. For example, adults who outperform others are more antagonistic (Muller et al., 2012); adults who are provided with ranking information withhold helpful information from others (Pemberton & Sedikides, 2001); and adults who focus on being better than others are less willing to collaborate (Poortvliet et al., 2009). Over time, individuals who make downward social comparisons could lose others' trust in them, as they make others feel bitter and envious (Dunn et al., 2012). Thus, although downward social comparisons might be related to feelings of competence and autonomy, they might not be related to feelings of relatedness.

Temporal Comparisons

How can adolescents gauge their abilities without experiencing a desire for superiority and suffering a lack of relatedness? We propose that they can do so by making temporal comparisons. *Temporal comparisons* refer to comparisons people make with their own self across time, rather than with others (Albert, 1977). Temporal comparisons entail perceiving one's present self as better (downward temporal comparisons) or worse (upward temporal comparisons) than one's past self (Albert, 1977; Wilson & Ross, 2000). Children begin to make temporal comparisons from about 5-6 years of age (Butler, 1998). As children move toward the end of primary school years and gain more certainty about their level of ability, they begin to use temporal comparison information more frequently than they use social comparison information for purposes of self-evaluation (Ruble & Flett, 1988).

Young adolescents may continue to use temporal comparisons frequently in secondary-school years. According to temporal comparison theory (Albert, 1977), individuals frequently make downward temporal comparisons at times of change (e.g., during school transitions), because such comparisons might remind them of their improvement trajectories, thereby alleviating their uncertainty. To date, temporal comparisons have rarely been studied

empirically, presumably because it is often assumed people make temporal comparisons only when social comparison information is unavailable (Wilson & Ross, 2000). However, there is emerging evidence that people tend to make more temporal than social comparisons, even when social comparison information is available (Summerville & Roese, 2008; Wilson & Ross, 2000).

Like social comparisons, temporal comparisons may impact adolescents' self-conscious feelings such as pride and shame. By making temporal comparisons, adolescents may become aware that they have lived up to, or failed to live up to, some actual or ideal self-representation (e.g., "I am better than I was yesterday" or "I am getting worse at this"). Such a self-focused inference is at the core of pride and shame (Tracy & Robins, 2004). Downward temporal comparisons may trigger pride, as they make adolescents notice the positive change within themselves over time (Buechner et al., 2018). By contrast, upward temporal comparisons may trigger shame, as it makes them notice their deterioration trajectories (Keltner & Buswell, 1996). Preliminary evidence is consistent with these suggestions. Children report that they feel proud when they have made progress over time (Buechner et al., 2018). Similarly, children and adolescents feel proud when they make downward temporal comparisons, whereas they feel ashamed when they make upward temporal comparisons (Gürel et al., 2020). Adults feel ashamed when they have failed to meet their internal standards (Keltner & Buswell, 1996). Thus, downward temporal comparisons seem to co-occur with pride, and upward temporal comparisons with shame.

Unlike social comparisons, downward temporal comparisons could make people feel proud while encouraging them to strive for self-improvement rather than superiority. Downward temporal comparisons enable people to gauge themselves against their own internal standards, as they involve comparisons with one's own self—not with others (Albert, 1977). By making people focus on their own internal standards, downward temporal comparisons could help counter a predominant focus on normative superiority that comes at the expense of a focus on self-improvement. In fact, experimental evidence shows that after making downward temporal comparisons, children and adolescents desire for self-improvement rather than superiority (Gürel et al., 2020). Indirect evidence concurs. Mastery feedback (e.g., "You seem to really be getting the hang of it!") increases children's intrinsic motivation more so than does downward-social-comparison feedback ("You seem to be better at this than most kids!"); Corpus et al., 2006; p. 338). Adolescents who perceive their classrooms as mastery-goal oriented prefer challenges and see effort as key to success more than those who perceive their classrooms as performance-goal oriented (Ames & Archer, 1988). Adolescents with a growth mindset (i.e., those holding a belief that their capabilities can change through effort and diligence) seek out challenges and display a mastery goal orientation rather than a performance goal orientation, especially in the face of setbacks (Blackwell et al., 2007; Dweck & Leggett, 1988). Because of their desire to grow their abilities, they often rely on temporal-comparison information, which makes their improvement trajectories more salient to them (Butler, 2000; Ruble & Flett, 1988). As individuals desire to maintain such improvement trajectories (Albert, 1977), making daily downward temporal comparisons might be linked to adolescents' predominant desire for self-improvement.

How might downward temporal comparisons be related to adolescents' daily psychological need satisfaction? Downward temporal comparisons may satisfy adolescents' needs for competence and autonomy (Nicholls, 1984). Downward temporal comparisons have been theorized to make people feel competent by giving them a sense of progress (Butler, 1987) and autonomous by conveying to them that they can achieve their goals through their own effort (Wang & Liu, 2007). We posit that downward temporal comparisons, unlike downward social comparisons, could be related to adolescents' sense of relatedness. If such comparisons contribute to a predominant desire for self-improvement, they may facilitate interpersonal relationships by making people exchange information with others and learn from others so as to meet their desire to grow their competencies (Poortvliet et al., 2007). People with such a self-improvement focus tend to help others when they need and congratulate them when they succeed (Kavussanu, 2006). Instead of alienating themselves from people who outperform them, they may be more willing to work with them (Park & Park, 2017). Thus, downward temporal comparisons could be linked to adolescents' feelings of competence and autonomy, as well as to their sense of relatedness.

Present Study

Social and temporal comparisons constitute a considerable portion of people's daily thoughts (Summerville & Roesse, 2008). Unfortunately, research typically conceptualizes comparisons as stable, trait-like individual differences (e.g., Gibbons & Buunk, 1999), which fails to capture the daily dynamics of social and temporal comparisons. To capture those dynamics, we conducted, for the first time, a daily diary study on social and temporal comparisons in the critical phase of adolescence.

Adolescents (ages 11-15) were invited to complete daily diaries for five consecutive school days. We hypothesized that downward and upward comparisons would co-occur with increased pride and shame, respectively, regardless of whether those comparisons were social or temporal. Importantly, we hypothesized that both downward social and downward temporal comparisons would co-occur with adolescents' perceived competence and autonomy, but that only downward temporal comparisons would co-occur with a desire for self-improvement over superiority and with feelings of relatedness. In addition, we explored whether the co-occurrence between downward temporal comparisons and adolescents' feelings of relatedness would be mediated by a desire for self-improvement over superiority.

Although our interest was on the within-person concurrent associations, we also explored whether the effects of social and temporal comparisons would last until the following day. We did so by examining within-person lagged associations. If the comparisons that adolescents make today predict how they feel and desire tomorrow (above and beyond the comparisons they make tomorrow), this would be preliminary evidence that comparisons can have effects that compound over time.

Method

Participants

All students from first, second, and third grade of a public secondary school (serving a middle-class neighborhood in the Netherlands) were eligible for participation. Of all adolescents who were approached, 58% received active parental consent. All procedures were approved by the Ethics Review Board of the Faculty of Social and Behavioral Sciences, University of Amsterdam (2016-CDE-7449). We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. Data were collected as part of a larger longitudinal project, the Adolescents' Social and Temporal Comparisons Study (Gürel et al., 2020b). The study materials, study protocol, variable codebook, and analysis scripts are available on OSF at osf.io/vqh6p. There are no published or submitted manuscripts using the same or an overlapping dataset.

On Monday, one week after the school year began, 389 adolescents (ages 11-15, $M = 12.69$, $SD = 0.97$; 41.1% girls; 99% of Dutch origin) were invited to complete a brief (< 10-minute) online survey after school hours for five consecutive days. Of those who were invited, 317 (ages 11-15 years, $M = 12.65$, $SD = 0.96$; 44.8% girls; 98.7% of Dutch origin) completed one or more daily assessments. Nonparticipating students did not differ from participating ones in grade level or age, $ps > .054$, but did differ in gender, $\chi^2(1) = 9.495$, $p = .002$. Girls were more likely to participate than boys (of all girls and boys, 88.7% and 76.4% participated, respectively). On average, per day, 61%-76% of participating students completed the assessment.

We analyzed our data using structural equation models. Because these models require a participants-to-parameter ratio of at least 5:1 (Bentler & Chou, 1987), and our models specified a maximum of 34 parameters, our target sample was 170 participants. Similar to a previous study (Yeager et al., 2016), final sample size was determined by the maximum number of parents who were willing to provide consent. Post-hoc power analyses (Kline, 2011; Preacher & Coffman, 2006) showed that we achieved sufficient power to reject an incorrect model at $\alpha = .05$ ($df = 30$ to 36 , null RMSEA = .05, alternative RMSEA = .08), with estimates ranging from .80 to .86.

Daily Measures

Daily-diary studies are demanding for participants (Nulty, 2008; Sladek et al., 2020), especially for adolescents (Anttila et al., 2017). To lower the burden on our participants and to increase the response rate, we opted to use one-item measures whenever possible. Such approach is a common and well-received practice in daily-diary research (Erreygers et al., 2019; Fisher & To, 2012; Sladek et al., 2020) and has been successfully applied in previous research (Bakker & Oerlemans, 2019; Neubauer et al., 2018).

Each daily measure began with the stem, "Today at school, ..." Responses were averaged across items (see Table S1 for descriptive statistics per day).

Social and temporal comparisons. We assessed social and temporal comparisons using one item for each comparison type: “I thought I was better than my classmates” (downward social comparison), “I thought I was worse than my classmates” (upward social comparison), “I thought I had become better (for example compared to a while ago)” (downward temporal comparison), and “I thought I had become worse (for example compared to a while ago)” (upward temporal comparison). Items were rated on four-point scales (1 = *never*, 4 = *very often*). These items build on earlier work in adults (Wilson & Ross, 2000), reflect the core of social and temporal comparisons (i.e., comparing oneself favorably or unfavorably to others or to oneself), and were phrased in age-appropriate ways.

Pride. We assessed pride using three items from the pride subscale of The State Shame and Guilt Scale (Marschall et al., 1994): “I felt worthwhile, valuable,” “I felt proud,” and “I felt good about myself.” Items were rated on four-point scales (1 = *not at all true*, 4 = *completely true*; Cronbach’s α across days = 0.77–0.85).

Shame. We assessed shame using three items from the shame subscale of The State Shame and Guilt Scale (Marschall et al., 1994): “I felt small,” “I felt humiliated, disgraced,” and “I felt worthless, powerless.” Items were rated on four-point scales (1 = *not at all true*, 4 = *completely true*; Cronbach’s α across days = 0.73–0.82).

Improvement over superiority goal orientation. We measured goal orientation using four items adapted from the Superiority and Improvement Goals Scale (Gürel et al., 2020). Two items assessed superiority goals: “I wanted to perform better than my classmates” and “I wanted to do things better than my classmates” (inter-item correlation range: 0.77–0.86). Two items assessed improvement goals: “I wanted to learn new things (improve myself)” and “I wanted to get better at the things I do” (inter-item correlation range: 0.69–0.87). Items were rated on four-point scales (1 = *not at all true*, 4 = *completely true*). Following standard procedures (Dweck, 2002; Gürel et al., 2020), we indexed children’s preference of improvement over superiority goals by dividing the score of improvement goals by the score of superiority goals. This measure was inspired by measures of mastery versus performance goals (Grant & Dweck, 2003; Midgley et al., 1993; Pintrich & DeGroot, 1990). Yet, unlike these measures, it does not focus specifically on the academic domain and focuses more precisely on the desire for self-improvement versus superiority.

Basic need satisfaction. We assessed basic need satisfaction using one item for each need (Thomaes et al., 2017): “I felt I was good at things that I did” (competence), “I felt I could do things that I find interesting or important” (autonomy), and “I felt I got along with the people I had contact with” (relatedness). Items were rated on four-point scales (1 = *not at all true*, 4 = *completely true*).

Statistical Approach

We analyzed the data using random intercept cross-lagged panel models (Hamaker et al., 2015), which take the multi-level structure of the data into account and separate within-person variability (state-like fluctuations within persons) from between-person variability (trait-like differences between persons).

We examined how each comparison type predicted self-conscious emotions, goals, and basic psychological needs as separate outcomes. We modeled them as separate outcomes for reasons of parsimony and because our theoretical model assumes that each has a unique underlying process (e.g., downward temporal comparisons may trigger pride because they make adolescents realize they exceeded a standard, whereas they may trigger improvement over superiority goals because they help adolescents realize that positive change is possible and enjoyable). We ran a total of 24 models, outlined in Table 3. Each model included (a) autoregressive paths for the comparison type as well as outcome; (b) cross-lagged paths from comparison type to outcome as well as from outcome to comparison type; and (c) within-person concurrent associations between comparison type and outcome.

We conducted the analyses in *R* v.3.6.2 (R Core Team, 2019), using the lavaan package (Rosseel, 2012). Little's (1988) Missing Completely at Random (MCAR) test indicated that the pattern of missing values could be considered random, $\chi^2(836) = 870.946, p = .195$. We used maximum likelihood estimator robust (MLR) and full information maximum likelihood (FIML) to account for nonnormal distributions and missing data, respectively (Muthén & Satorra, 1995). We tested our hypotheses using a series of nested models (Hamaker et al., 2015). We first fitted a parsimonious fully-constrained baseline model; all within-person autoregressive paths, within-person cross-lagged paths, and within-person concurrent associations were constrained to be equal across five days. We then released these constraints in a stepwise fashion. If the release of a constraint improved model fit, we retained the resulting unrestrained model; if it did not, we retained the restrained model.

To evaluate the comparative fit between nested models, we used the Satorra-Bentler scaled χ^2 difference test (Satorra & Bentler, 2010). To evaluate the goodness of fit of the model, we used Comparative Fit Index (CFI; Bentler, 1990), Standardized Root Mean Square Residual (SRMR; Kline, 2011), Root Mean Square Error of Approximation (RMSEA; Steiger, 1990). CFI values $\geq .95$, SRMR $< .08$, RMSEA values $\leq .05$ indicate good model fit, and CFI values $\geq .90$, SRMR $< .10$, RMSEA values $\leq .08$ indicate adequate model fit (Hu & Bentler, 1999; Kline, 2011). All statistical tests were two-sided at $\alpha = .05$.

In addition, we ran a within-person mediation model with downward temporal comparison as the predictor, self-improvement over superiority goal as the mediator, and relatedness as the outcome. We used the indirectMLM function with 100 bootstraps (Page-Gould, 2016), which makes use of boot package in *R* (Canty & Ripley, 2020). The model tested the direct effect of downward temporal comparison on self-improvement over superiority goal; the direct effect of self-improvement over superiority goal on relatedness, controlling for the effect of downward temporal comparison; and the direct effect of downward temporal comparison on relatedness, controlling for the effect of superiority goal on relatedness. The indirect effect refers to the effect of downward temporal comparison on relatedness via self-improvement over superiority goal; total-effect model refers to the sum of the direct and indirect effects (Hayes, 2013). If confidence interval of bootstrapped indirect effect does not include zero, this indicates that there is a statistically significant mediation effect (Page-Gould, 2016).

Results

Preliminary Analyses

There were considerable within-person fluctuations. Intra-class correlations showed that 48-61% of the total variance in daily comparisons, 41-51% of the total variance in pride and shame, 49% of the total variance in improvement-to-superiority goal orientation, and 54-64% of total variance in basic psychological needs was due to fluctuations within adolescents, rather than to differences between adolescents.

We present within- and between-person correlations in Table 1; within-person concurrent associations, between-person associations, as well as their 95% confidence intervals in Table 2; model specifications and final models in Table 3; and model fit indices in Table 4.

Concurrent Associations

Pride. Random-intercept cross-lagged panel models examined the link between each type of comparison and pride (models 1-4, Table 3). The final models for pride demonstrated good fit for all comparisons (Table 4). Downward social comparisons and downward temporal comparisons were both positively related to pride ($\beta_s = 0.169 - 0.206$, $ps < .001$, and $\beta_s = 0.310 - 0.359$, $ps < .001$, respectively), whereas upward social comparisons and upward temporal comparisons were unrelated to pride ($\beta_s = 0.014 - 0.016$, $ps = .791 - .792$, and $\beta_s = 0.082 - 0.096$, $ps = .087 - .091$, respectively). Thus, on days when adolescents made more downward comparisons, they experienced more pride, regardless of whether those comparisons were social or temporal.

Shame. Random-intercept cross-lagged panel models examined the link between each type of comparison and shame (models 5-8, Table 3). The final models for shame demonstrated good fit for all comparisons (Table 4). Upward social and upward temporal comparisons were both positively related to shame ($\beta_s = 0.189 - 0.237$, $ps = .006 - .037$, and $\beta_s = 0.144 - 0.194$, $ps = .013 - .019$, respectively), whereas downward social comparisons and downward temporal comparisons were unrelated to shame ($\beta_s = -0.052 - -0.041$, $ps = .422 - .433$, and $\beta_s = -0.052 - -0.048$, $ps = .201 - .248$, respectively). Thus, on days when adolescents made more upward comparisons, they felt more ashamed, regardless of whether those comparisons were social or temporal.

Improvement over superiority goal orientation. Random-intercept cross-lagged panel models examined the link between each type of comparison and improvement over superiority goal orientation (models 9-12, Table 3). The final models for improvement over superiority goal orientation demonstrated good fit for all comparisons (Table 4). Downward temporal comparisons were positively related to improvement over superiority goal orientation ($\beta_s = 0.108 - 0.139$, $ps = .023 - .029$). By contrast, downward social comparisons, upward social comparisons, and upward temporal comparisons were all unrelated to improvement over superiority goal orientation ($\beta_s = -0.033 - -0.026$, $ps = .532 - .541$, $\beta_s = 0.038 - 0.046$, $ps = .350 - .362$, and $\beta_s = 0.047 - -0.043$, $ps = .319 - .337$, respectively). Thus, on days when adolescents made more downward *temporal* comparisons (but not *social* comparisons), they desired for more improvement over superiority.

Basic psychological needs. Random-intercept cross-lagged panel models examined the link between each type of comparison and each basic psychological need (models 13-24, Table 3). The final models for each basic psychological need demonstrated good fit for all comparisons (Table 4). Downward social comparisons and downward temporal comparisons were both positively related to competence ($\beta = 0.128 - 0.175, ps < .001$, and $\beta = 0.225 - 0.336, ps < .001 - .006$, respectively, except for downward temporal comparisons at day 2, $\beta = 0.056, p = .604$). By contrast, upward social comparisons and upward temporal comparisons were unrelated to competence ($\beta = -0.112 - -0.068, ps = .134 - .152$, and $\beta = -0.052 - -0.037, ps = .492 - .509$, respectively). Downward social comparisons and downward temporal comparisons were both positively related to autonomy ($\beta = 0.203 - 0.242, ps < .001$, and $\beta = 0.240 - 0.268, ps < .001$, respectively). By contrast, upward social comparisons and upward temporal comparisons were unrelated to autonomy ($\beta = -0.066 - -0.054, ps = .275 - .292$, and $\beta = -0.081 - -0.076, ps = .076 - .092$, respectively).

Importantly, downward temporal comparisons were positively related to relatedness ($\beta = 0.191 - 0.232, ps = .001 - .018$, except at day 2, $\beta = -0.008, p = .926$). By contrast, downward social comparisons, upward social comparisons, and upward temporal comparisons were all unrelated to relatedness ($\beta = 0.041 - 0.047, ps = .280 - .302$, $\beta = 0.026 - 0.033, ps = .537 - .541$, and $\beta = -0.015 - -0.013, ps = .783 - .786$, respectively). Thus, on days when adolescents made more downward comparisons, they felt more competent and autonomous, regardless of whether those comparisons were social or temporal. However, on days when adolescents made more downward *temporal* comparisons (but not *social* comparisons), they felt more related to others.

Mediation Analyses

We examined, at the within-person level, whether the link between downward temporal comparisons and relatedness would be mediated by improvement over superiority goal orientation (Figure 1). Downward temporal comparisons were positively related to improvement over superiority goals and relatedness, $B = 0.078, 95\% \text{ CI } [0.028, 0.127]$ and $B = 0.107, 95\% \text{ CI } [0.059, 0.159]$, respectively. Additionally, improvement over superiority goals were positively related to relatedness, $B = 0.074, 95\% \text{ CI } [0.009, 0.132]$. Importantly, the indirect effect showed that improvement over superiority goals mediated the association between downward temporal comparison and relatedness, $B = 0.006, 95\% \text{ CI } [0.001, 0.014]$. Thus, on days when adolescents made more downward temporal comparisons, they desired for more improvement over superiority and, in turn, experienced stronger feelings of relatedness.

Exploratory Analyses

Although our hypotheses pertain to within-person concurrent associations, we explored whether there were within-person cross-lagged associations (see Table S2 and S3). We had no priori hypotheses for these associations. First, there were no consistent cross-lagged paths from comparisons to hypothesized outcomes (i.e., consistent from day 1 to day 5), except that (a) downward social comparisons positively predicted next-day pride, and (b) both downward and upward temporal comparisons positively predicted next-day shame. Second, there were no consistent cross-lagged paths from hypothesized outcomes to comparisons (i.e., consistent

from day 1 to day 5), except that (a) pride positively predicted next-day upward temporal comparisons, and (b) basic need satisfaction positively predicted next-day comparisons; specifically, competence and relatedness predicted next-day downward temporal comparisons, whereas autonomy predicted next-day downward social comparisons.

Discussion

Our study was the first to examine the daily dynamics of social and temporal comparisons in adolescence. On days when adolescents made more downward comparisons, they experienced more pride, more competence, and more autonomy, regardless of whether those comparisons were social or temporal. However, only on days when they made more daily downward *temporal* comparisons, they adopted improvement over superiority goals and, in turn, experienced more relatedness to others. These findings suggest that daily downward temporal comparisons, unlike daily downward social comparisons, can help adolescents strive for personal growth and embark on satisfying social relationships.

Theoretical Implications

Schools often offer opportunities for downward social comparisons to make adolescents feel proud of their achievements (Kohn, 1992). However, downward social comparisons may not be the only way to make adolescents feel proud. Our findings show that daily downward temporal comparisons are associated with pride, at least as much as daily downward social comparisons are. However, social and temporal comparisons may operate through distinct mechanisms. Daily downward temporal comparisons could make adolescents feel proud of their achievements by conveying to them that they have grown in competence (similar to *authentic pride*), whereas daily downward social comparisons could make adolescents feel proud by conveying to them that they are superior to others in competence (similar to *hubristic pride*; Tracy & Robins, 2007). People who experience authentic pride feel competent, accomplished, and worthy, which is positively linked to true self-esteem (also known as genuine or non-contingent self-esteem; Tracy et al., 2009; Tracy & Robins, 2007). People who experience hubristic pride, on the other hand, feel smug, arrogant, and superior to others, which is positively linked to contingent self-esteem and narcissism (Brummelman, Thomaes et al., 2016; Brummelman et al., 2018; Tracy et al., 2009; Tracy & Robins, 2007; Weidman & Tracy, 2013). Thus, daily downward social comparisons, unlike daily downward temporal comparisons, may contribute to a narcissistic sense of pride in adolescents.

Unlike downward social comparisons, downward temporal comparisons may help adolescents strive for self-improvement rather than superiority. Our findings show that on days when adolescents make more daily downward temporal comparisons (but not on days when they make more daily downward social comparisons), they desire for more improvement over superiority. By reflecting on how they have improved over time, adolescents may realize that improvement is both attainable and enjoyable, which could make adolescents desire to improve themselves even further, moving toward their ideal self (Albert, 1977; Ames, 1992). Thus, daily downward temporal comparisons, as opposed to daily downward social comparisons, may help adolescents focus on improving themselves rather than on surpassing others.

Social and temporal comparisons shape adolescents' emotional lives and their goal pursuit. Theories of emotion (Lewis, 1995; Tangney & Dearing, 2002) and achievement motivation (Brunstein & Heckhausen, 2008) have suggested that evaluation of oneself against certain standards is central to self-conscious emotions and goals. For example, it has been theorized that people strive to meet "standards of excellence" (McClelland et al., 1953, p. 110), judge their outcomes as successes or failures with regard to those standards, and experience pride or shame as a result (Lewis, 1995). Our findings suggest that the nature of those standards—whether they are defined relative to others or to one's past self—matters. Evaluating oneself against social and temporal standards are both linked to pride and shame in adolescents' daily life, but only the downward temporal comparisons are linked to a predominant desire for self-improvement.

Adolescents are sensitive to their rank among their peers, which can make them competitive (Midgley et al., 1995) and harm their sense of relatedness (Roseth et al., 2008). Our findings show that daily downward social comparisons do not relate to a sense of relatedness, perhaps because they encourage adolescents to see their peers as rivals—as threats to their rank (Garcia et al., 2006). People who see others as rivals refuse cooperation (Garcia & Tor, 2007), have little concern for others' emotions (Barnett et al., 1979), are perceived negatively by others (Pomerantz et al., 1995), and may become alienated (Tesser, 1988). We found daily downward temporal comparisons, unlike daily downward social comparisons, are positively linked to a sense of relatedness. This was mediated, in part, by adolescents' desire for self-improvement over superiority. When making temporal comparisons, adolescents are more likely to adopt an improvement over a superiority goal orientation and this desire is likely to make them more open to connecting with their peers. This finding concurs with goal theories (Butler, 1995), which suggests that a focus on mastery and growth can make children see their peers "as learning resources rather than as rivals, and may as a result help them learn and stay motivated and to have satisfying relationships with their peers" (p. 358). By encouraging temporal comparisons, adults might shift adolescents' mindset from superiority toward self-improvement (Gürel et al., 2020), and thus satisfy their need for relatedness.

Although our research focuses on private comparisons (which adolescents engage in privately, without necessarily sharing them with others), our findings concur with research on explicit, publicly stated comparisons. Downward social comparisons can be perceived by others as socially undesirable and arrogant (Pomerantz et al., 1995). Adults who make explicit downward social comparisons make others feel offended, as they portray others as inferior (Hoorens et al., 2012). Over time, they may become disliked and aggressed against (van Damme et al., 2017). By contrast, downward temporal comparisons can be perceived by others as socially desirable (Wilson & Ross, 2000). Adults who make explicit downward temporal comparisons do not make others feel offended, as they do not portray others as inferior. Instead, they elicit admiration and respect from others, as others see their improvement trajectories (Hoorens et al., 2012).

Our study shows that daily comparisons are related to adolescents' basic psychological need satisfaction. Self-determination theory (Deci & Ryan, 1985) asserts that need satisfaction is critically dependent on adolescents' social context. It has been theorized that when school

contexts convey messages about the importance of downward social comparisons, adolescents may come to believe that getting ahead of others is more important than getting along with others, as the former signals higher competence (Ames, 1992). In contrast, when school contexts convey messages about the importance of downward temporal comparisons, adolescents might come to believe that improving oneself is more important than surpassing others, as the former signals competence (Ames, 1992; Deci & Ryan, 1985; Nicholls, 1984). Our findings show that, in fact, both types of comparisons are linked to a sense of competence and autonomy, but only downward temporal comparisons are linked to a sense of relatedness. From an intervention perspective, then, schools might consider offering adolescents with more opportunities for temporal comparisons (e.g., displaying adolescents' learning curves over time).

Although our primary interest was in concurrent associations, our longitudinal analyses revealed two important patterns. First, although daily comparisons have consistent concurrent associations, they do not have consistent cross-lagged associations over time. Why might that be? Students spend most of their time in a school setting, where they may have little control over the messages they are exposed to (Deci & Ryan, 1985). Indeed, students' comparisons can fluctuate considerably due to their school context (Kaplan & Maehr, 2007). Thus, the type of comparison they make today may not affect their functioning tomorrow, above and beyond the comparisons they make tomorrow. Second, our exploratory analyses did reveal that both downward and upward temporal comparisons predict next-day shame. This points to one potential risk of a predominant focus on self-improvement; if adolescents strive for self-improvement relentlessly, they may feel as if their current selves are always falling short (Ng, 2018; Qu et al., 2016). From an applied perspective, these exploratory findings have important implications: If interventions are to encourage downward temporal comparisons in adolescents, (a) they should do so on a daily basis, so as to ensure sustained effects; and (b) they should teach adolescents that on the road to self-improvement, even small victories may be celebrated, so as to avoid the pitfalls of relentless self-improvement strivings.

Practical Implications

Our study has practical implications for educators. Stage-environment fit model (Eccles & Midgley, 1989) advocates that school contexts should be sensitive to developmental needs of students and suggests that one way to address adolescents' declining school motivation may be to reduce social comparison feedback, such as normative grading (Maehr & Midgley, 1996). However, it is virtually impossible to hide social comparison information from adolescents, especially at a developmental period where they desire such information (Keil et al. 1990). Rather than hiding social comparison information, it may be more effective to encourage adolescents to focus on their growth over time (Ames, 1992; Gürel et al., 2020). For example, teachers may discuss with their students how their skills have grown over time (e.g., displaying learning curves on report cards) or offer adolescents praise for self-improvement (e.g., "You're getting the hang of it!") rather than for superiority (e.g., "You're the top student"; Corpus et al., 2006). Our longitudinal analyses revealed that competence and relatedness predict next-day temporal comparisons. When adolescents feel competent and related to others, they shift their focus on developing their mastery (Diseth et al., 2012), which is best assessed using

temporal comparisons (Ames, 1992). By meeting adolescents' needs for competence and relatedness, teachers may encourage adolescents to focus on comparisons with themselves rather with others. Future experimental research should evaluate these strategies.

Strengths, Limitations, and Future Research Directions

Strengths of our study include its novel focus on temporal comparisons, its daily-diary design, and its focus on a critical developmental phase when social comparison information is especially alluring. Our study also has limitations. First, we assessed comparisons and basic psychological needs with single-item measures, so as to reduce the burden on our adolescent participants. Although they are widely used and well-received in daily diary studies (Lucas & Donnellan, 2012), single-item measures are sometimes criticized for providing little information about construct validity (Nunnally & Bernstein, 1994) and internal consistency (Wanous et al., 1997). Second, because our aim was to track adolescents' everyday lives rather than to intervene, our findings are correlational and prevent us from drawing causal conclusions. Future experimental research should examine causal effects of social versus temporal comparisons on adolescents' affective states and goal pursuits. Third, our study was conducted in the Netherlands, a prototypical Western country. Different patterns may be found in non-Western countries. Previous work showed that non-Western students tend to perceive downward social comparisons as facilitators for self-improvement (Watkins, 2007). Future research should examine if daily downward social comparisons are more likely to trigger self-improvement desires in non-Western than Western adolescents.

Our findings generate new research directions. Our findings show that social and temporal comparisons can be sources of pride and shame, but comparisons can affect a wider range of emotions. To date, work has primarily focused on the emotional consequences of social comparisons (for an overview see Buunk et al., 1990; Buunk et al., 2005; Smith, 2000). For example, with a relatively strong focus on others, social comparisons may trigger other-focused emotions. Downward social comparisons may trigger pleasure in the misfortune of others (Schadenfreude; Smith et al., 2009; Wang et al., 2019) and concern about maintaining one's standing relative to others (Buunk et al., 1990). Upward social comparisons can trigger resentment (Smith, 2000) and envy (Lange et al., 2018) but also admiration and inspiration (Buunk et al., 2005; Lange et al., 2018; Schindler et al., 2013; van de Ven et al., 2009). Unlike social comparisons, temporal comparisons focus exclusively on the self (rather than on others) and might therefore rarely trigger other-focused emotions. For example, upward temporal comparisons might not trigger resentment or envy, but instead make adolescents feel inspired by their past selves, as their past selves remind them of their potential. Future research should examine these ideas. Doing so will shed new light on the emotional dynamics of social and temporal comparison.

Conclusion

Adolescence is a developmental phase during which social comparisons become increasingly common and salient. Although such comparisons are helpful in gauging one's ability, they may entail some risks, as they can make adolescents concerned about their normative superiority. Downward temporal comparisons may avoid such downsides by

encouraging adolescents to strive for self-improvement rather than superiority, while contributing to pride and a sense of relatedness. Thus, daily downward temporal comparisons may contribute to adolescents' personal growth and satisfying relationships.

Table 1

Within- and Between-Person Correlations Among Comparisons, Emotions, Goals, and Basic Psychological Needs

	1	2	3	4	5	6	7	8	9	10
Within-Person Correlations										
1. Downward social comparison	1.00									
2. Upward social comparison	0.20***	1.00								
3. Downward temporal comparison	0.14***	0.00	1.00							
4. Upward temporal comparison	0.01	0.16***	0.09**	1.00						
5. Pride	0.13***	-0.03	0.27***	0.02	1.00					
6. Shame	-0.06*	0.26***	-0.03	0.16***	-0.14***	1.00				
7. Ratio	-0.08**	0.01	0.07*	-0.04	0.09**	-0.07*	1.00			
8. Competence	0.12***	-0.05	0.16***	-0.05	0.30***	-0.10***	0.09**	1.00		
9. Autonomy	0.15***	-0.06	0.13***	-0.10**	0.26***	-0.09**	0.03	0.38***	1.00	
10. Relatedness	0.04	0.00	0.10***	0.02	0.20***	-0.06*	0.09**	0.40***	0.27***	1.00
Between-Person Correlations										
1	1	2	3	4	5	6	7	8	9	10
1. Downward social comparison	1.00									
2. Upward social comparison	0.34***	1.00								
3. Downward temporal comparison	0.39***	0.18**	1.00							
4. Upward temporal comparison	0.19***	0.43***	0.22***	1.00						
5. Pride	0.22***	-0.18**	0.39***	-0.08	1.00					
6. Shame	0.05	0.53***	-0.03	0.25***	-0.27***	1.00				
7. Ratio	-0.38***	-0.17**	0.08	-0.10	0.07	-0.12*	1.00			
8. Competence	0.17**	-0.14**	0.36***	-0.08	0.53***	-0.18**	0.22***	1.00		
9. Autonomy	0.15**	-0.07	0.39***	0.05	0.36***	-0.13*	0.13*	0.57***	1.00	
10. Relatedness	-0.02	-0.20***	0.15***	-0.04	0.32***	-0.31***	0.27***	0.46***	0.28***	1.00

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Ratio = improvement over superiority goals.

Table 2
Within-Person and Between-Person Concurrent Associations With Comparison Types Across Five Days

	Within-person level					Between-person level								
	Day 1 (βs and 95% CIs)	Day 2 (βs and 95% CIs)	Day 3 (βs and 95% CIs)	Day 4 (βs and 95% CIs)	Day 5 (β and 95% CIs)	(βs and 95% CIs)								
Pride														
Dsoc	-.01 [-0.20, 0.18]	.19*** [0.09, 0.29]	.21*** [0.10, 0.31]	.17*** [0.08, 0.26]	.20*** [0.10, 0.30]	.14 [-0.04, 0.33]								
Usoc	-.11 [-0.27, 0.04]	.02 [-0.10, 0.13]	.01 [-0.09, 0.11]	.02 [-0.10, 0.14]	.02 [-0.10, 0.13]	-.33*** [-0.55, -0.12]								
Dtem	.12 [-0.11, 0.35]	.36*** [0.26, 0.46]	.31*** [0.21, 0.41]	.31*** [0.22, 0.40]	.34*** [0.25, 0.44]	.38*** [0.22, 0.54]								
Utem	-.06 [-0.28, 0.16]	.08 [-0.01, 0.18]	.09 [-0.01, 0.19]	.10 [-0.01, 0.21]	.09 [-0.01, 0.19]	-.33*** [-0.56, -0.11]								
Shame														
Dsoc	.07 [-0.11, 0.24]	-.04 [-0.14, 0.06]	-.05 [-0.18, 0.08]	-.04 [-0.15, 0.06]	-.05 [-0.16, 0.07]	.03 [-0.14, 0.20]								
Usoc	.21 [-0.01, 0.43]	.19* [0.02, 0.36]	.21* [0.01, 0.40]	.24** [0.07, 0.40]	.20* [0.03, 0.37]	.71*** [0.54, 0.89]								
Dtem	.09 [-0.05, 0.23]	-.05 [-0.12, 0.03]	-.05 [-0.13, 0.03]	-.05 [-0.13, 0.03]	-.05 [-0.14, 0.03]	-.05 [-0.18, 0.09]								
Utem	.24** [0.08, 0.40]	.14* [0.03, 0.26]	.19* [0.04, 0.35]	.18* [0.03, 0.32]	.17* [0.03, 0.31]	.30*** [0.14, 0.45]								
Improvement Over Superiority Goals														
Dsoc	-.06 [-0.24, 0.13]	-.03 [-0.11, 0.06]	-.03 [-0.12, 0.06]	-.03 [-0.11, 0.06]	-.03 [-0.14, 0.07]	-.55*** [-0.71, -0.40]								
Usoc	-.13 [-0.29, 0.02]	.04 [-0.05, 0.14]	.04 [-0.04, 0.12]	.04 [-0.05, 0.14]	.05 [-0.05, 0.14]	-.26** [-0.42, -0.10]								
Dtem	-.08 [-0.24, 0.08]	.13* [0.02, 0.24]	.11* [0.01, 0.20]	.11* [0.01, 0.21]	.14* [0.01, 0.26]	.07 [-0.11, 0.25]								
Utem	-.07 [-0.26, 0.11]	-.04 [-0.13, 0.04]	-.04 [-0.13, 0.04]	-.05 [-0.14, 0.05]	-.05 [-0.14, 0.04]	-.11 [-0.27, 0.05]								
Competence														
Dsoc	.06 [-0.11, 0.24]	.17*** [0.08, 0.27]	.14*** [0.06, 0.21]	.13*** [0.06, 0.20]	.13*** [0.06, 0.21]	.16 [-0.05, 0.36]								
Usoc	-.10 [-0.25, 0.05]	-.11 [-0.27, 0.04]	-.07 [-0.16, 0.02]	-.08 [-0.20, 0.03]	-.08 [-0.17, 0.02]	-.17 [-0.35, 0.02]								
Dtem	-.09 [-0.26, 0.09]	.06 [-0.16, 0.27]	.22** [0.06, 0.39]	.34*** [0.19, 0.48]	.33*** [0.20, 0.46]	.33** [0.11, 0.56]								
Utem	-.26** [-0.42, -0.10]	-.05 [-0.20, 0.10]	-.04 [-0.15, 0.07]	-.04 [-0.17, 0.08]	-.04 [-0.15, 0.07]	-.12 [-0.32, 0.07]								
Autonomy														
Dsoc	.04 [-0.16, 0.23]	.24*** [0.15, 0.33]	.23*** [0.15, 0.31]	.20*** [0.13, 0.28]	.24*** [0.16, 0.33]	-.00 [-0.23, 0.22]								
Usoc	-.07 [-0.22, 0.07]	-.07 [-0.19, 0.05]	-.05 [-0.15, 0.05]	-.06 [-0.17, 0.05]	-.06 [-0.17, 0.05]	-.08 [-0.30, 0.14]								
Dtem	-.16 [-0.36, 0.03]	.26*** [0.17, 0.35]	.24*** [0.14, 0.34]	.24*** [0.15, 0.34]	.27*** [0.17, 0.37]	.38*** [0.18, 0.57]								
Utem	-.17 [-0.36, 0.02]	-.08 [-0.18, 0.01]	-.08 [-0.16, 0.01]	-.08 [-0.17, 0.01]	-.08 [-0.16, 0.01]	.07 [-0.11, 0.25]								

Table 2 (continued)

Relatedness	Within-person level					Between-person level
	Day 1 (β s and 95% CIs)	Day 2 (β s and 95% CIs)	Day 3 (β and 95% CIs)	Day 4 (β s and 95% CIs)	Day 5 (β s and 95% CIs)	(β s and 95% CIs)
Dsoc	-.01 [-0.20, 0.17]	.04 [-0.04, 0.12]	.04 [-0.04, 0.13]	.04 [-0.03, 0.12]	.05 [-0.04, 0.13]	-.06 [-0.29, 0.16]
Usoc	-.03 [-0.18, 0.13]	.03 [-0.07, 0.14]	.03 [-0.06, 0.11]	.03 [-0.06, 0.12]	.03 [-0.06, 0.12]	-.48*** [-0.69, -0.27]
Dtem	-.12 [-0.32, 0.07]	-.01 [-0.18, 0.16]	.23** [0.08, 0.38]	.23** [0.09, 0.37]	.19* [0.03, 0.35]	.07 [-0.17, 0.32]
Utem	.03 [-0.13, 0.18]	-.01 [-0.11, 0.08]	-.01 [-0.11, 0.08]	-.01 [-0.12, 0.09]	-.01 [-0.11, 0.09]	-.03 [-0.26, 0.20]

Note. Dsoc = downward social comparisons; Usoc = upward social comparisons; Dtem = downward temporal comparisons; Utem = upward temporal comparisons. Day 2 to 5 correlations refer to within-person concurrent associations (i.e., whether within-person changes in comparisons are linked to within-person changes in outcomes). Unlike day 2 to 5 correlations, day 1 correlations refer to whether adolescents' deviations from their own expected scores in comparisons are linked to deviations from their own expected scores in outcomes. The values within brackets show 95% lower and upper confidence interval (CI) for standardized estimates, respectively.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3

Model specification and Final Random-Intercept Cross-Lagged Panel Models

Constructs	Baseline model					Final model
	A	B	C	D	E	
Comparisons & Pride						
Model 1. Dsoc & Pride	♣					A
Model 2. Usoc & Pride			♣			C
Model 3. Dtem & Pride						Baseline
Model 4. Utem & Pride						Baseline
Comparisons & Shame						
Model 5. Dsoc & Shame	♣					A
Model 6. Usoc & Shame						Baseline
Model 7. Dtem & Shame						Baseline
Model 8. Utem & Shame						Baseline
Comparisons & Improvement Over Superiority Goals						
Model 9. Dsoc & Ratio	♣		♣			C
Model 10. Usoc & Ratio						Baseline
Model 11. Dtem & Ratio						Baseline
Model 12. Utem & Ratio						Baseline
Comparisons & Competence						
Model 13. Dsoc & Competence	♣	♣				B
Model 14. Usoc & Competence		♣				B
Model 15. Dtem & Competence		♣			♣	E
Model 16. Utem & Competence		♣		♣		D

Table 3 (continued)
Model specification and Final Random-Intercept Cross-Lagged Panel Models

Constructs	Baseline model	A	B	C	D	E	Final model
Comparisons & Autonomy							
Model 17. Dsoc & Autonomy		♣					A
Model 18. Usoc & Autonomy			♣				C
Model 19. Dtem & Autonomy				♣			D
Model 20. Utem & Autonomy							Baseline
Comparisons & Relatedness							
Model 21. Dsoc & Relatedness		♣					A
Model 22. Usoc & Relatedness			♣		♣		D
Model 23. Dtem & Relatedness						♣	E
Model 24. Utem & Relatedness							Baseline

Note. Dsoc = downward social comparisons; Usoc = upward social comparisons; Dtem = downward temporal comparisons; Utem = upward temporal comparisons; Ratio = improvement over superiority goals. Baseline model = fully constraint model where group of autoregressive paths, cross-lagged paths, and within-person concurrent associations were set to be equal across five days in each model; A = the within-person autoregressive paths set to be free across five days for the predictor (i.e., specific comparison type); B = the within-person autoregressive paths set to be free across five days for the specific outcome variable; C = the within-person cross-lagged paths from predictor to outcome set to be free across five days; D = the within-person cross-lagged paths from outcome to predictor set to be free across five days; E = within-person concurrent associations set to be free across five days. The ♣ indicates the parameters that improved model fit when they were set to be free.

Table 4
Fit Indices for Final Random-Intercept Cross-Lagged Panel Models

Constructs	χ^2_{SB}	df	CFI	RMSEA [95% CI]	SRMR
Comparisons & Pride					
Model 1. Dsoc & Pride	38.18	33	.99	.02 [.00-.05]	.05
Model 2. Usoc & Pride	38.18	33	.99	.02 [.00-.05]	.06
Model 3. Dtem & Pride	46.01	36	.99	.03 [.00-.06]	.06
Model 4. Utem & Pride	51.05	36	.97	.04 [.00-.07]	.08
Comparisons & Shame					
Model 5. Dsoc & Shame	34.21	33	1.00	.01 [.00-.05]	.09
Model 6. Usoc & Shame	30.66	36	1.00	.00 [.00-.04]	.07
Model 7. Dtem & Shame	38.67	36	.99	.01 [.00-.05]	.06
Model 8. Utem & Shame	35.67	36	1.00	.00 [.00-.05]	.09
Comparisons & Improvement Over Superiority Goals					
Model 9. Dsoc & Ratio	32.36	30	1.00	.02 [.00-.05]	.05
Model 10. Usoc & Ratio	49.30	36	.97	.04 [.00-.06]	.06
Model 11. Dtem & Ratio	49.68	36	.98	.04 [.00-.06]	.05
Model 12. Utem & Ratio	43.83	36	.98	.03 [.00-.06]	.07
Comparisons & Competence					
Model 13. Dsoc & Competence	31.62	30	1.00	.01 [.00-.05]	.05
Model 14. Usoc & Competence	43.69	33	.97	.03 [.00-.06]	.06
Model 15. Dtem & Competence	54.41	30	.96	.05 [.03-.07]	.07
Model 16. Utem & Competence	44.35	30	.95	.04 [.01-.07]	.07

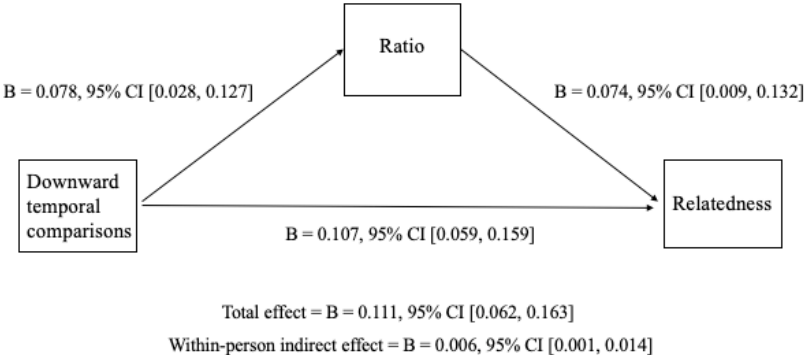
Table 4 (continued)
Fit Indices for Final Random-Intercept Cross-Lagged Panel Models

Constructs	χ^2_{SB}	df	CFI	RMSEA [95% CI]	SRMR
Comparisons & Autonomy					
Model 17. Dsoc & Autonomy	38.70	33	.99	.02 [.00–.05]	.05
Model 18. Usoc & Autonomy	30.57	33	1.00	.00 [.00–.04]	.05
Model 19. Dtem & Autonomy	74.02	33	.94	.06 [.04–.08]	.07
Model 20. Utem & Autonomy	49.12	36	.97	.04 [.00–.06]	.07
Comparisons & Relatedness					
Model 21. Dsoc & Relatedness	34.08	33	1.00	.01 [.00–.05]	.05
Model 22. Usoc & Relatedness	37.86	30	.98	.03 [.00–.06]	.06
Model 23. Dtem & Relatedness	43.93	33	.98	.03 [.00–.06]	.06
Model 24. Utem & Relatedness	51.03	36	.96	.04 [.00–.06]	.08

Note. Dsoc = downward social comparisons; Usoc = upward social comparisons; Dtem = downward temporal comparisons; Utem = upward temporal comparisons; Ratio = improvement over superiority goals. χ^2_{SB} = Satorra-Bentler scaled chi-square difference test; CFI = comparative fit index (robust); RMSEA = root mean square error of approximation (robust); CI = confidence interval; SRMR = standardized root mean square residual.

Figure 1

Within-Person Multilevel Mediation Model Examining the Mediator Role of Ratio (Improvement-to-Superiority Goal) on the Link Between Downward Temporal Comparisons and Relatedness



Note. B = unstandardized regression coefficient; CI = confidence interval.