

Boosting Yourself? Associations Between Momentary Self-Esteem, Daily Social Interactions, and Self-Esteem Development in Late Adolescence and Late Adulthood

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Research over the past 2 decades has repeatedly shown that the evaluation of one's own worth—trait self-esteem—is closely linked to the quality of social relationships and perceptions of social inclusion. However, there is limited evidence on the dynamics between momentary self-esteem and perceptions of social inclusion in everyday life, as well as on their possible long-term (bottom-up) effects on the development of trait self-esteem. We addressed this research gap using longitudinal data from a German multimethodological study ($N = 324$) in which $N = 235$ late adolescents ($M_{\text{age}} = 17.7$; 76% female) and $N = 89$ older adults ($M_{\text{age}} = 63.8$; 64% female) were followed over 1 year. Based on three trait questionnaires with 6-month intervals and a 7-day experience-sampling burst at the first measurement point, we investigated momentary dynamics in self-esteem and longitudinal change by using multilevel and latent growth modeling. Results confirmed the positive association between momentary self-esteem and perceptions of social inclusion in everyday life, that is, self-esteem reactivity in both age groups. In addition, both self- and other-reports showed a consistent increase in trait self-esteem over 1 year. However, because the slope parameters did not indicate substantial interindividual variance, we were unable to test for bottom-up effects of self-esteem reactivity. We discuss the importance of daily social experiences for momentary self-esteem in late adolescence and late adulthood but also point to the need for further multimethodological research.

Keywords: momentary self-esteem, trait self-esteem development, latent growth modeling

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There is increasing evidence that self-esteem—defined as the general tendency to evaluate oneself positively or negatively (Baumeister & Leary, 1995)—changes across the entire life span (Orth et al., 2018). Given the importance of self-esteem for a number of key life outcomes (Kuster et al., 2013; Orth et al., 2012; Steiger et al., 2014; Trzesniewski et al., 2006; Weidmann et al., 2022), it is vital to understand the factors that contribute to such lifelong changes. Although the development of self-esteem is most likely determined by multiple factors, it is assumed to be strongly driven by an individual's sensitivity to perceptions of social inclusion (Baumeister & Leary, 1995). Supporting this notion, one major stream of research provides empirical evidence for the importance of a diverse set of social factors, such as relationship

quality, loneliness, and partnership status, as predictors of trait self-esteem development (de Moor et al., 2021; Harris & Orth, 2020; Reitz, 2022; von Soest et al., 2018; Wagner, Becker, et al., 2015; Wagner, Gerstorf, et al., 2013; Wagner, Lüdtke, et al., 2013). A second stream of research found initial support for a dynamic interrelatedness between state self-esteem and social inclusion on a monthly (Hutteman et al., 2015) and on a daily (Denissen et al., 2008) basis. Linking broader developmental trends in trait self-esteem with these more dynamic processes, Hutteman et al. (2015) illustrated that changes in monthly self-esteem across 1 year explained a substantial amount of rank-order (in)stability in trait self-esteem. Thus, initial research suggests that bottom-up effects (i.e., effects of state self-esteem on trait self-esteem) might be

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are available at <https://osf.io/d6tfq/>. This study's hypotheses and analysis plan were preregistered; see <https://osf.io/tder4>.

Jenny Wagner played a lead role in conceptualization, funding acquisition, investigation, methodology, project administration, resources, supervision, writing—original draft, and writing—review and editing and an equal role in data curation. Larissa L. Wiczorek played an equal role in data curation, formal analysis, methodology, and writing—review and editing. Naemi D. Brandt played a supporting role in conceptualization and formal analysis and an equal role in methodology and writing—review and editing.

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pivotal for our understanding of trait self-esteem development. However, knowledge about the role of momentary perceptions of social inclusion within this broader bottom-up interplay is still limited.

The present study aims to fill this gap by first, investigating the question of self-esteem *reactivity* by testing everyday dynamics between social interaction quality and momentary self-esteem (*reactivity* question). Second, we address the question of self-esteem *development* by examining the possible long-term (bottom-up) effects of such dynamics on trait self-esteem. To address these two questions, we build on theoretical notions from personality psychology (Geukes et al., 2018; Roberts & Jackson, 2008; Wrzus & Roberts, 2017) and use multilevel and latent growth modeling to analyze data from the multimethodological SELFIE study (Personality and Self-esteem in Everyday Life, graduates: $N = 218$, $M_{\text{age}} = 17.7$, range 16–22 years,¹ 76% female; pensioners: $N = 86$, $M_{\text{age}} = 63.7$, range 55–72 years, 64% female). SELFIE combines a 7-day experience-sampling burst with three trait assessments across 1 year. By analyzing this unique data, the present study extends previous research on self-esteem development, integrating the study of long-term trait development and momentary dynamics in an age-diverse sample.

Trait Self-Esteem Development: Mean-Level Trends and Rank-Order Stability

Mean levels of trait self-esteem have been shown to develop across the entire life span (Orth et al., 2018): In adolescence, some studies suggest a dip around age 10, but most studies point to a gradual increase in the second life decade. This self-esteem increase continues into young and middle adulthood (Chung et al., 2017; Magro et al., 2019; Trzesniewski et al., 2004; von Soest et al., 2018; Wagner et al., 2018; Wagner, Lüdtke, et al., 2013), whereas a more or less profound decrease is observed after the age of 60 (Robins & Trzesniewski, 2005; Wagner, Gerstorf, et al., 2013; Wagner, Hoppmann, et al., 2015). In contrast, rank-order stabilities of self-esteem follow an inverted U-shape similar to the patterns of the Big Five personality traits, with lowest rank-order stabilities in early and late life (Meier et al., 2011; Trzesniewski et al., 2003; Wagner et al., 2019).

In addition to these developmental trends on the trait level, self-esteem also fluctuates on a daily basis reflecting state-like components (Donnellan et al., 2012; Wagner et al., 2016). Thus, along the lines of the whole trait theory (Fleeson & Jayawickreme, 2015), self-esteem can also be reflected as a distribution or variation of state-like components. Previous research illustrated two ways to describe the dynamics of self-esteem in daily life: First, researchers have looked at the average level of momentary self-esteem, that is, the degree of people's positive (or negative) momentary feelings about themselves across situations (Harter & Whitesell, 2003; Leary et al., 1995). Second, scholars were interested in the amount of state self-esteem fluctuation across situations (Harter & Whitesell, 2003; Kernis, 1993; Zeigler-Hill, 2006). Thus, recent studies have moved beyond the singular consideration of momentary levels of self-esteem by investigating interindividual differences in these fluctuations as well as the potential function or consequences of these fluctuations (e.g., Farmer & Kashdan, 2014; Geukes, Nestler, Hutteman, Dufner, et al., 2017; Meier et al., 2011).

Self-Esteem Reactivity: Underlying Process of Self-Esteem Development

People choose boosts in their momentary self-esteem over eating a favorite food or engaging in their favorite sexual activity (Bushman et al., 2011). Thus, momentary self-esteem appears to be highly desired in people's daily lives. Based on evolutionary notions, one key ingredient boosting self-esteem should be the perceptions of social belonging and inclusion (Baumeister & Leary, 1995). Empirical research based on samples from Western industrialized countries highlights that perceptions of social inclusion and social interaction quality are indeed related to state self-esteem, both in experimental settings (Leary et al., 1995; Pass et al., 2010; Thomaes et al., 2010) and in real-life situations (Denissen et al., 2008; Schmidt et al., 2021). We will refer to the association between perceptions of social inclusion and self-esteem as *self-esteem reactivity*.² Given that initial research so far has largely focused on self-esteem reactivity in the developmental phase from late childhood to young adulthood (Hutteman et al., 2015; Meier et al., 2011), evidence on the generalizability of effects on adulthood and old age is scarce. Acknowledging the evolutionary foundation of people's need to belong (Baumeister & Leary, 1995) and the general high importance of social relationships across the life span (Wrzus et al., 2013), we hypothesize that self-esteem reactivity can be observed across different age groups.

Of note, reactivity processes (i.e., responding to specific cues or showing intraindividual variability) were considered to have both positive and negative implications (Geukes, Nestler, Hutteman, Küfner, & Back, 2017). For example, high heart rate variability is a sign of health (Lehrer & Gevirtz, 2014), but higher emotional variability is associated with mortality (Mroczek et al., 2013). With regard to self-esteem reactivity, extant research presents a similarly contradictory picture: On the one hand, theoretical and empirical accounts suggest that self-esteem reactivity has evolved as an evolutionary-based monitor of social inclusion (Leary & Baumeister, 2000), emphasizing that reactivity to social information is crucial for assessing one's standing in a social group and behaving (socially) appropriately. On the other hand, empirical research has shown that self-esteem reactivity may be a sign of self-esteem fragility, which represents a core feature of narcissistic rivalry and may relate to maladaptive social behaviors (Geukes, Nestler, Hutteman, Dufner, et al., 2017). Altogether, these findings from previous research suggest that high self-esteem reactivity may have both positive and negative implications for individuals, while the capacity to respond to social stimuli can be seen as an important

¹ School graduation is a fairly clear age-linked life event, and age differences were largely due to skipping or repeating grades. As for retirement, Germany has a retirement age tied to the birth cohort. For example, those born in 1956 can retire at age 65 years and 10 months. However, there are many exceptions to this rule, and consequently, the average retirement age in 2019 in Germany was 64.4 years.

² Here, our conceptualization of self-esteem reactivity is based on the idea of sociometer theory (Baumeister & Leary, 1995), which assumes that social interactions shape a person's self-esteem. This implies a causal link from social interactions on momentary self-esteem that we cannot directly test in our data, but which has been tested in experimental settings (Leary et al., 1995). Whereas this direction of effects represents the primary focus of the present study, we are aware that the opposite direction of effects is also possible (i.e., a reciprocal effect between self-esteem and social interactions; Harris & Orth, 2020; Hutteman et al., 2015).

factor contributing to the way people's social relationships feed back into their self-esteem.

Whereas little is known about the degree to which momentary self-esteem reactivity is related to long-term self-esteem development, personality development theory suggests that change trajectories of traits are shaped in a bottom-up fashion (Geukes et al., 2018; Roberts & Jackson, 2008; Wrzus & Roberts, 2017). That is, repeated momentary or situational processes are expected to build up to long-term trait changes. Despite differences regarding the exact nature of and components within these processes (Geukes et al., 2018; Roberts & Jackson, 2008; Wrzus & Roberts, 2017), theories largely agree on the general condition that some form of momentary cue (social, environmental, internal, etc.) triggers a specific mental or behavioral state. The repeated occurrence of this state across several time points or situations may lead to changes in corresponding traits. Thus, according to different theories on personality development (Roberts & Jackson, 2008; Wrzus & Roberts, 2017), repeated trigger-state contingencies scale up to trait development.

So far, only a few studies were able to explicitly test this dynamic interplay between reactivity—in a sense of a repeated trigger and state expression contingency—and subsequent trait development. With respect to the Big Five traits, initial research illustrated that the long-term development of conscientiousness and agreeableness can be characterized as a function of momentary processes of corresponding states (Quintus et al., 2021; see also Wrzus et al., 2021). Interestingly, results in these studies were fairly consistent across younger and older adults. With respect to self-esteem, a first study by Hutteman et al. (2015) showed that change in monthly state self-esteem mediated the rank-order (in)stability in trait self-esteem across 1 year in a sample of international exchange students. Moreover, changes in monthly state self-esteem were reciprocally related to feelings of being socially included in the new social environment during the exchange. Whereas the study by Hutteman et al. (2015) illustrated bottom-up effects from self-esteem state change to trait development, monthly assessments of self-esteem might not be fully adequate to capture the dynamic nature of the social reactivity process in daily life. Therefore, the present study will extend existing research on self-esteem reactivity by taking momentary processes during social interactions in daily life into account.

As discussed in the neo-socioanalytic model of personality (Roberts & Nickel, 2017), another challenge in research on trait development is the question of visibility: Is a person's self-esteem development only visible to themselves and thus part of their identity or is it also visible to others and thus part of a person's reputation? Although self-esteem is inherently understood as a psychological construct that refers to self-evaluations, there is also empirical evidence for the observability of self-esteem in others, even at zero acquaintance (Hirschmüller et al., 2018). Moreover, it has been argued that self-esteem has status-signaling properties, such that perceptions of high self-esteem in others are related to positive social relationship functioning (Zeigler-Hill et al., 2013). With this in mind, we assume that other-reports of well-known acquaintances are a valid indicator of a person's self-esteem. We therefore aim to test for bottom-up effects concerning other-reports of well-known acquaintances in addition to individuals' corresponding self-reports of trait self-esteem. This way, the present study aims to extend initial findings from personality psychological

research demonstrating that changes in Big Five personality traits can be detected in both self- and other-reports (Luan et al., 2017; Oltmanns et al., 2020; Stieger et al., 2020).

The Present Study

With the present research, we aimed to increase the understanding of the dynamic nature of self-esteem development in late adolescence and late adulthood. Building on notions from both social and personality psychology, we examined the role of self-esteem reactivity as a building block for the long-term development of trait self-esteem. Along these lines, we first examined how momentary perceptions of social inclusion relate to momentary self-esteem in everyday life (*reactivity* question). Second, we tested bottom-up developmental effects and examined the role of self-esteem reactivity for trait self-esteem development (*developmental* question). With respect to both research questions, we test for potential age differences in reactivity and development between late adolescence and late adulthood. Specifically, we differentiated between two age groups: high school graduates and prospective pensioners. These two specific groups appear to be particularly well suited to study self-esteem changes by representing individuals in sensitive developmental phases that characterize either the entrance or the process of leaving the working life (Bleidorn & Schwaba, 2018; Wagner, Lüdtke, et al., 2013). In addition, both phases are related to social network changes (Wagner et al., 2014; Wrzus et al., 2013), which are likely to affect perceptions of daily social inclusion. Regarding the reactivity question, we expected a positive association between perceptions of social inclusion and momentary self-esteem and hypothesized no age-related differences in self-esteem reactivity. Regarding the developmental question, we hypothesized a linear bottom-up effect such that self-esteem reactivity is positively related to trait-self-esteem change. Furthermore, we expected no age-related differences in this bottom-up effect. In addition, we examined to what degree the bottom-up effects are also reflected by other-reports of trait self-esteem as an exploratory question.

Altogether, the present study extends existing research in three important ways: First, by assessing momentary self-esteem reactivity using the experience-sampling method (ESM), we were able to explicitly test the micro-level building blocks of self-esteem trait development in daily social interactions. Second, the composition of our sample extends research on the role of self-esteem reactivity for trait development to two important life phases, namely late adolescence and late adulthood. Third, given the existence of other-reports of acquaintances, we tested developmental trends and associations with self-esteem reactivity with respect to both, self- and other-reports of trait self-esteem.

Method

The current project uses data from the SELFIE study (Wagner et al., 2021), a German multimethodological study investigating the development of Big Five personality and self-esteem across two developmental transitions: graduates who finish high school within the next 12 months and pensioners who retire within the next 12 months. Participants were recruited through advertisements on the internet (e.g., eBay, Facebook) and in newspapers. In addition, we put up posters in places that were frequently visited by potential

participants (e.g., driving schools, tutoring centers, and information centers of German pension insurance companies). The sampling plan did not include strict timelines, but the transition had to occur within the next year. Ultimately, 44% of participants made the transition by T2 and 81% of participants made the transition by T3. Thus, as many as 19% did not make the transition, possibly due to not successfully completing school or postponing retirement, with retirement, in particular, being postponed (about 50%).³ Importantly, the two transitions per se were not the focus of this study. Rather, we assumed that developmental transitions trigger developmental processes and are therefore particularly suitable as a research context for developmental processes. All participants provided demographic information and various self-report measures in an online questionnaire at up to three measurement points (T1–T3) separated by half-year intervals. At T1 (and T3), the questionnaires were followed by an ESM week. During the ESM, participants received five questionnaires per day on their smartphones over 7 days and provided momentary ratings. The data assessment of the sample started in June 2018 and was finished by May 2021.⁴ Data collection was carried out according to the ethical standards based on a review and approval process by the ethics committee of the German Psychological Society (Protocol Code JW 052014_rev, date of approval: 2014-08-20). The materials accompanying the current research can be found on the Open Science Framework (OSF) project side (see <https://osf.io/d6tfq/>). Although there are already published articles based on this study, this is the first study using data from both age groups. Hypotheses and analyses were preregistered on the OSF, and all deviations from the preregistration are marked as such and summarized on page 1 in the online [Supplemental Material](#).

Sample

The sample consisted of $N = 332$ participants divided into two age groups: $n = 237$ late adolescents and $n = 95$ older adults. Given that we were interested in self-esteem reactivity following everyday social interactions, we only included those participants that reported at least one ESM entry after a daily social interaction. Based on this precondition, we excluded $n = 28$ participants, resulting in a final sample consisting of $N = 304$ participants with $n = 218$ late adolescents ($M_{\text{age}} = 17.70$, $SD = 0.98$, 76% female) and $n = 86$ older adults ($M_{\text{age}} = 63.67$, $SD = 3.47$, 64% female). Given that participants could give their ratings 5 times a day for 7 days, there was a maximum of 35 ESM entries per participant. The total number of ESM entries following social interactions varied between 1 and 33 in both age groups. On average, graduates reported 13.99 ($SD = 6.86$) social interactions, whereas pensioners reported 15.16 ($SD = 6.79$) social interactions.

Selectivity analyses illustrated that participants without reports of social interactions during the ESM ($n = 28$) did not differ from our final sample at any measurement point in terms of age and age group, gender, or self- and other-reported trait self-esteem (all $ps > .125$).

In addition, we had to cope with longitudinal sample attrition, a common issue in longitudinal studies. Specifically, $N = 196$ participants ($n = 132$ graduates and $n = 64$ pensioners) remained in the sample at T2 and $N = 185$ participants ($n = 127$ graduates and $n = 58$ pensioners) remained at T3. Longitudinal selectivity analyses showed that participants without longitudinal information did not

differ from those who participated at T2 or T3 with respect to age and age group, gender, as well as self- and other-reported trait self-esteem at the first measurement point (all $ps > .104$).

Sample Size Rationale

Based on the original research proposal, the defined goal with respect to the sample size was 360 participants. This was backed up by a power analyses in the original grant proposal: Latent change score model specifications were based on the findings by Wagner, Gerstorf, et al. (2013) following the description of simulations of growth curve modeling with one covariate and longitudinal missing values by Muthén and Muthén (2002). Due to difficulties in recruiting the group of pensioners, the size of the final sample ($N = 324$) was slightly smaller. An updated Mplus simulation for a three measurement points latent change score model, which considered longitudinal missing values (up to 50% at T3), indicated that the existing sample size of $N = 324$ had sufficient power ($>80\%$) to detect small effects ($\beta = .11$) of the covariate on the slope factor.

Measures

The present study included measures on two different time scales and from two types of raters. As outlined in the following, items were either answered as part of the questionnaires at T1–T3 (i.e., trait measures or demographic information) or as a part of the ESM (i.e., state measures). In addition, answers were either provided as self- or other-reports.

Self-Esteem

Self-reported trait self-esteem was measured with a short version of the Rosenberg Self-Esteem Scale (Denissen et al., 2008; Rosenberg, 1965). The shortened version consists of four items (including two reverse-scored items) assessed on a 7-point rating scale from 1 (*strongly disagree*) to 7 (*strongly agree*). We used a mean indicator of the four items. Trait self-esteem was assessed at three measurement points each being 6 months apart. Scale-based reliability was good across all three measurement points ($\omega_{SR} = .94/.91/.92$).

Using the same items as in the self-report, *other-reported trait self-esteem* was rated by acquaintances that had been nominated by the participants at the introductory session of the study. Of all participants, $n = 213$ at T1, $n = 136$ at T2, and $n = 116$ at T3 had at least one acquaintance report, respectively. Across measurement points, most acquaintances were female (67%–71%), from young or middle adulthood (M_{age} ranging between 34.64 and 37.06 years, SDs ranging between 19.54 and 20.00), and either family members (47%–55%) or friends (39%–44%) of the participants. If more

³ In addition to the analyses with the complete sample reported in the Results section, we estimated all final models using only data of those participants from whom we know with certainty that they have experienced a transition (i.e., graduation or retirement) until T3 ($N = 166$). Results based on this reduced sample were largely robust and are reported in [Supplemental Tables S4 and S5](#).

⁴ Although the study was completed during the COVID-19 pandemic, the ESM week took place before its start. Accordingly, all measures of social interactions including the self-esteem reactivity parameter were not affected by the pandemic.

than one other-report on the participant's self-esteem was available, we combined all available other-reports per measurement point (M_s ranging between 2.26 and 2.37; range: 1–5) and used this average measure (see also Breil et al., 2022). Again, we used a mean indicator across the four items, and scale-based reliability was good at each of the three measurement points ($\omega_{OR} = .93/.92/.93$).

During the ESM period, *self-reported state self-esteem* was assessed up to 5 times a day with one item "All things considered, how content are you with yourself right now?" Participants were asked to rate the degree of agreement with this item on a 10-point rating scale from 1 (*not at all*) to 10 (*very*). The intraclass correlation coefficient (ICC) Type 2 is used to assess the reliability of an individual's momentary self-esteem score across their ESM entries (Lüdtke & Trautwein, 2007). Based on the average of 13.99 ESM entries, the ICC(2) in our sample displayed a satisfactory reliability of 0.94 for momentary self-esteem.

Perceptions of Social Inclusion

Each time participants reported a social interaction during the ESM period, they were asked to what degree they rated the social interaction as *positive* and as *interesting* on a 10-point scale from 0 (*not at all*) to 10 (*very*). Assessments of social inclusion have varied widely across studies, ranging from explicit measures of rejection to measures of relationship or interaction quality (Denissen et al., 2008; Schmidt et al., 2021). Overall, the sociometer effect appears to be robust across these different assessment methods (Harris & Orth, 2020). In the present study, perceptions of social inclusion were operationalized as a composite measure of these two items ($r = .66$). Furthermore, with an ICC(2) of 0.80 in our sample, reliability for perceptions of social inclusion was also satisfactory.

Demographics

We assigned the participants to one of two age groups by differentiating between late adolescents (pensioner = 0) and older adults (pensioner = 1). In addition, participants were asked whether they identified themselves as female or male, with the female gender being coded as the reference category (i.e., male = 1).

ESM Characteristics

Along the lines of previous ESM studies using this sample (Bleckmann et al., 2023; Wiczorek et al., 2022), we included a number of control variables. First, following the recommendations by Bolger and Laurenceau (2013), we coded a variable indicating the starting date and timeline of the ESM for the 7 days (coded 0–6). Second, we assessed the day of the week (0 = *weekday*, 1 = *weekend*). Finally, the type of interaction partner was assessed based on eight categories: my partner (1), other family member (2), friend (3), colleague/fellow student/classmate (4), neighbor/acquaintance (5), teacher/superior/respected authority (6), service provider (7), other (8). Based on previous research (Neyer et al., 2011), we differentiated between three types of relationships: family (including Categories 1 and 2), friends (Category 3), and other relationships (all other categories). Friends served as the reference category in the analyses.

Analytic Strategy

Data cleaning, structuring, and analyses were performed with R Version 4.0.4 (R Core Team, 2021), using RStudio (R Studio Team, 2021). To answer our first research question, we used multilevel models. To answer our second research question, we used a two-step approach where we integrated estimates of reactivity scores derived from multilevel models as part of latent growth modeling (for similar procedures, see Mueller et al., 2021; Wrzus et al., 2021).

To address our first research question regarding self-esteem reactivity, we used a set of multilevel models. The model including all predictor variables necessary to answer our research question is taking the following form at the within-person level:

$$\text{momentary self-esteem}_{it} = \beta_{0i} + \beta_{1i} \left(\text{perceptions of social inclusion WP}_{it} \right) + e_{it}, \quad (1)$$

where β_{0i} is an individual-specific intercept coefficient, which corresponds to that person's average momentary self-esteem, β_{1i} indicates the extent to which the individual's momentary self-esteem corresponds to the momentary perceptions of social inclusion, and e_{it} is the residual error.

Between-person differences in the β coefficients were modeled as

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\text{pensioner}_i) + \gamma_{02}(\text{perceptions of social inclusion BP}_i) + u_{0i}, \quad (2)$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(\text{pensioner}_i) + u_{1i}, \quad (3)$$

where γ_{00} corresponds to the grand mean of momentary self-esteem in the sample, indicating the level of momentary self-esteem for the typical graduate (reference category). The parameter γ_{01} indicates the differences in this level of momentary self-esteem for pensioners, and γ_{02} indicates the extent to which the intercept is related to between-person differences in perceptions of social inclusion (the individual mean). The parameter γ_{11} indicates to what extent the association between momentary self-esteem and the perception of social inclusion is moderated by being a pensioner. The u parameters reflect residual differences (random effects) that are not explained by the person-level predictors and are assumed to follow a multivariate normal distribution. Ahead of running the multilevel models, we performed two types of centering. Following usual procedures for separating between-person from within-person associations (Bolger & Laurenceau, 2013), the repeated measures of perceptions of social inclusion were person-mean centered to obtain a state variable that reflects the occasion-specific (within-person variable) deviations from each individual's personal average (between-person variable). This individual average of perceptions of social inclusion was grand-mean centered.

To address our second research question, we used a two-step approach to model how the extent of self-esteem reactivity in daily life is related to trait self-esteem change. In the first step, we estimated a multilevel model following the setup described above excluding between-person variables. In the second step, we extracted the β_{1i} coefficients, which indicate individual differences in self-esteem reactivity to the momentary perception of social inclusion. These coefficients were used as predictors of trait self-esteem change across 1 year. In the final step, individual differences

in trait self-esteem development were predicted by the pensioner variable to differentiate the effects between the two age groups.

Change in trait self-esteem was modeled using a second-order latent growth curve model (LGM) with three measurement points (Bollen & Curran, 2006; see Wagner, Lüdtke, et al., 2013, for a similar approach). The specification of the second-order latent growth curve model was based on a measurement model with four items per measurement point, which allowed us to discriminate between structural relations and measurement error (Bollen & Curran, 2006). Time-specific self-esteem factors were then used to define two latent factors of self-esteem growth: the intercept factor, illustrating self-esteem at the first measurement point, and the slope factor, illustrating linear change in self-esteem across time. The variance of the intercept factor and the slope illustrate interindividual differences in self-esteem levels at T1 and in change trajectories, respectively. The measurement model was identified using the effect-coding method (Little, 2013), and same-worded item residuals were allowed to correlate across time.

Ahead and as a precondition of longitudinal growth modeling, we established measurement invariance across time using a stepwise procedure. We started with a configurable model and then compared model fits of increasingly restrictive models moving from configural to metric (i.e., equality of factor loadings) and to strong (i.e., additionally adding equality of item intercepts) measurement invariance across time. Latent model fit evaluations were based on the full information maximum likelihood estimator using the conventional criteria as guidelines for acceptable and for a close fit to the data (Marsh et al., 2005): root-mean-square error of approximation (RMSEA) below .08 and .05, standardized root-mean-square residual (SRMR) below .11 and .08, as well as comparative fit index (CFI) greater than .90 and .95. Increasingly restricting parameters across time was not associated with substantial decreases in model fit (full information can be found in the Supplemental Table S2), and the final model implementing strong measurement invariance across time illustrated a good model fit both with respect to self-reports and other-reports of self-esteem. Thus, measurement models implementing strong measurement invariance were used as input for all following latent growth models.

We preregistered two types of follow-up analyses: First, we added control variables to our models. Regarding the first research question on self-esteem reactivity, we included time, weekend, and type of interaction partner at Level 1 and gender at Level 2 in the multilevel model. Regarding the second research question, we included gender as a control variable in the latent growth model. Second, to answer our exploratory research question, we repeated the analyses regarding the second research question using other-reports of self-esteem.

Given the novelty of the research questions, we apply the traditional p value criteria and interpret all findings with $p < .05$ (two-tailed tests). However, we also report exact p values to provide the reader with all information to evaluate the findings.

Transparency and Openness

We embrace the values of transparency and openness in science (Schönbrodt et al., 2015). We report how we determined our sample size, all data exclusions, and all measures in the study (Simmons et al., 2012) or refer to project documentation in the OSF. All data, analysis code, and research materials are available at <https://osf.io/d6tfq/>.

Results

Descriptive statistics and correlations among all study variables can be found in Table 1 at the within-person level and in Table 2 at the between-person level. In the following, we report findings with respect to the self-esteem reactivity question and move on to the developmental question. Within this second part, we initially report the results of self-reports and complement these analyses by trait self-esteem based on other-reports.

Self-Esteem Reactivity: The Role of Daily Social Interactions

The ICC indicated that 53% of the variance of momentary self-esteem was at the between-person level. That is, we observed a fairly equal amount of within-person and between-person variability

Table 1

Means, Standard Deviations, and Intercorrelations Among Study Variables With Confidence Intervals: Within-Person Associations

Variable	<i>M</i>	<i>SD</i>	Intercorrelations					
			1	2	3	4	5	6
1. Momentary self-esteem	7.03	2.26	—					
2. Social inclusion WP	8.00	1.99	.36 [.33, .39]	—				
3. Time (day of ESM)	3.75	2.01	.03 [−.00, .06]	.04 [.01, .07]	—			
4. Weekend	0.27	0.45	.07 [.04, .10]	.03 [.00, .06]	−.02 [−.05, .01]	—		
5. Type of RS: Friend	0.28	0.45	−.05 [−.08, −.02]	.18 [.15, .21]	−.01 [−.04, .02]	−.07 [−.10, −.04]	—	
6. Type of RS: Family	0.42	0.49	.08 [.05, .11]	−.02 [−.05, .01]	.00 [−.03, .03]	.27 [.24, .30]	−.53 [−.55, −.51]	—
8. Type of RS: Other	0.30	0.46	−.04 [−.07, −.01]	−.16 [−.19, −.13]	.00 [−.03, .03]	−.22 [−.25, −.19]	−.41 [−.44, −.39]	−.55 [−.57, −.53]

Note. Values in square brackets indicate 95% confidence intervals. WP = within-person; ESM = experience-sampling method; RS = relationship. Bold parameters are substantial at $p < .05$.

Table 2
Descriptive Statistics and Intercorrelations Among Study Variables With Confidence Intervals: Between-Person Associations

Variable	M	SD	Intercorrelations										
			1	2	3	4	5	6	7	8	9	10	
1. Self-esteem T1 _{SR}	5.12	1.51	—										
2. Self-esteem T2 _{SR}	5.12	1.39	.75 [.68, .80]	—									
3. Self-esteem T3 _{SR}	5.27	1.42	.72 [.64, .78]	.65 [.55, .73]	—								
4. Self-esteem T1 _{OR}	5.23	1.19	.51 [.40, .60]	.47 [.35, .58]	.44 [.30, .56]	—							
5. Self-esteem T2 _{OR}	5.47	1.00	.57 [.44, .67]	.56 [.43, .66]	.41 [.24, .55]	.70 [.60, .78]	—						
6. Self-esteem T3 _{OR}	5.48	1.01	.57 [.43, .68]	.42 [.24, .57]	.52 [.38, .65]	.59 [.45, .70]	.71 [.59, .80]	—					
7. Momentary self-esteem BP	6.90	1.75	.66 [.59, .72]	.59 [.49, .67]	.49 [.37, .59]	.40 [.28, .51]	.41 [.26, .55]	.36 [.18, .51]	—				
8. Social inclusion BP	7.95	1.13	.22 [.11, .33]	.11 [−.03, .25]	.13 [−.02, .27]	.15 [.02, .29]	.10 [−.07, .27]	.17 [−.01, .34]	.47 [.37, .55]	—			
9. Self-esteem reactivity	0.28	0.11	−.03 [−.14, .08]	.02 [−.12, .16]	.08 [−.06, .22]	−.00 [−.14, .14]	−.19 [−.34, −.02]	−.07 [−.25, .12]	−.06 [−.17, .05]	.01 [−.10, .13]	—		
10. Pensioner	0.28	0.45	.27 [.16, .37]	.31 [.18, .43]	.28 [.15, .41]	.15 [.01, .28]	.27 [.10, .42]	.20 [.02, .37]	.30 [.19, .40]	.11 [−.00, .22]	.06 [−.05, .17]	—	
11. Male	0.27	0.45	.20 [.09, .31]	.23 [.09, .36]	.10 [−.04, .24]	.08 [−.06, .21]	.14 [−.03, .30]	.08 [−.10, .26]	.15 [.04, .26]	−.03 [−.14, .08]	−.02 [−.13, .10]	.12 [.01, .23]	

Note. Values in square brackets indicate 95% confidence intervals. SR = self-report; OR = other-report; T1/2/3 = first/second/third measurement point; BP = between-person. Bold parameters are substantial at $p < .05$.

supporting the need to implement multilevel modeling. The results of multilevel models on self-esteem reactivity are presented in Table 3. Converging with our hypothesis and previous findings, feeling socially included in daily social interactions was associated with reporting higher momentary self-esteem. Furthermore, pensioners reported higher momentary self-esteem in daily life than graduates, and the cross-level interaction between the pensioner age group and perceived social inclusion was not significant. That is, in line with our hypothesis, graduates and pensioners did not differ in self-esteem reactivity. Finally, Model 1 illustrated the additional between-person effect of social inclusion: On average, people who perceived higher levels of social inclusion also experienced higher momentary self-esteem. To illustrate an effect size approximation, the key predictors explained 22% of the variance at the within-person level and 28% of the variance at the between-person level of momentary self-esteem.

We reran the multilevel regression model including the control variables (Model 2 in Table 3) and all results remained robust. In addition to the above-reported effects, people's momentary self-esteem was, on average, substantially higher on weekends and higher among male compared to female participants.

Self-Esteem Development: Testing Bottom-Up Effects

To test the bottom-up effects of self-esteem reactivity, we estimated a multilevel model as described above but only with perceived social inclusion at Level 1 as a predictor. Subsequently, individual estimates of self-esteem reactivity, that is, each participant's within-person association between daily perceptions of social inclusion and momentary self-esteem, were extracted and

used as a predictor variable in the subsequent latent growth curve models. The final conditional models are presented in Table 4.

Self-Reported Self-Esteem Development

Based on strong measurement invariance models of self-reported trait self-esteem, we estimated a second-order growth curve model. The LGM with a linear trend had a good fit to the data ($CFI = .977$, $RMSEA = .057$, $SRMR = .034$). The results of the model indicate that individuals reported an average trait self-esteem score of $M_{\text{intercept}} = 5.11$ ($p = .001$) and, on average, reported a statistically significant increase in trait self-esteem over the 1-year duration of the study ($M_{\text{slope}} = 0.09$, $p = .023$). Furthermore, the model's variance components indicated statistically significant differences between people at the first assessment (1.42 , $p < .001$), but not in the slope across time (-0.11 , $p = .333$). Thus, participants differed substantially from each other in their levels of trait self-esteem at the first measurement point. In contrast, the findings showed no reliable interindividual differences in change trajectories across the year. Accordingly, despite the interindividual differences in mean levels at the first measurement point and the average increase in mean levels over the period of 1 year, there were no substantial individual differences in the amount of change (cf. Supplemental Figure S1).

Finally, we fitted a conditional LGM with gender as a covariate, which again illustrated a good model fit ($CFI = .967$, $RMSEA = .054$, $SRMR = .042$). We found no association between self-esteem reactivity and levels of trait self-esteem at the initial measurement point, but, on average, trait self-esteem was higher for pensioners and higher for male participants. Given the lack of reliable interindividual differences in change trajectories of trait self-esteem, we were unable to test our developmental question.

Table 3

Multilevel Model Examining Momentary Self-Esteem as a Function of Perceived Social Inclusion, Age Group, and Control Variables

Model estimates	Momentary self-esteem					
	Model 1			Model 2		
	Est.	95% CI	<i>p</i>	Est.	95% CI	<i>p</i>
Fixed effects						
Intercept, γ_{00}	6.67	[6.47, 6.87]	<.001	6.45	[6.22, 6.68]	<.001
Social inclusion WP, γ_{10}	0.26	[0.22, 0.31]	<.001	0.27	[0.23, 0.32]	<.001
Pensioner, γ_{01}	0.99	[0.62, 1.36]	<.001	0.90	[0.53, 1.26]	<.001
Social inclusion BP, γ_{02}	0.68	[0.53, 0.83]	<.001	0.70	[0.55, 0.85]	<.001
Social Inclusion WP $\times$ Pensioner, γ_{11}	0.05	[-0.03, 0.13]	.207	0.05	[-0.03, 0.13]	.265
Covariates						
Time (day of ESM)				-0.01	[-0.04, 0.01]	.204
Weekend				0.17	[0.06, 0.28]	.002
Type: Family				0.08	[-0.05, 0.21]	.248
Type: Other				0.11	[-0.03, 0.25]	.128
Male				0.50	[0.13, 0.87]	.008
Random effects						
Variance intercept, σ_{u0}^2	2.08			2.08		
Variance social inclusion, σ_{u1}^2	1.93			1.87		
Covariance intercept, inclusion, $\sigma_{u0,u1}^2$	0.04			0.04		
Residual variance, σ_e^2	-0.12			-0.11		
R^2 Level 1	0.22			0.24		
R^2 Level 2	0.28			0.30		

Note. The model is based on 4,254 observations at Level 1 nested in 304 Level 2 units. Unstandardized estimates were reported. Est. = estimate; WP = within person; BP = between person; ESM = experience-sampling method; CI = confidence interval.

Table 4*Results of Conditional Latent Growth Models of Trait Self-Esteem Including Predictors and Covariates*

Model parameters	Trait self-esteem							
	Self-reports				Other-reports			
	Intercept		Slope		Intercept		Slope	
	Est.	<i>p</i>	Est.	<i>p</i>	Est.	<i>p</i>	Est.	<i>p</i>
Mean	4.80	<.001	0.09	.025	5.29	<.001	0.09	.045
Variance	1.22	<.001	−0.10	.354	0.85	<.001	0.02	.802
Covariance _{Intercept, Slope}	0.02	.859			−0.08	.493		
Predictors (β s)								
Self-esteem reactivity	−.00	.963	/		−.06	.318	/	
Pensioner	.25	<.001	/		.20	.001	/	
Covariate (β s)								
Male	.19	<.001	/		.05	.482	/	
Model fit								
CFI		.967				.962		
RMSEA		.054				.046		
SRMR		.042				.053		

Note. Est. = estimate; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual.

Other-Reported Self-Esteem Development

Paralleling the analysis using self-reports, the invariant measurement model of other-reported trait self-esteem was used to establish a second-order latent growth curve model. The LGM with a linear trend had a good model fit (CFI = .968, RMSEA = .062, SRMR = .056). Similar to the previous model based on self-reports, the average initial level of trait self-esteem was $M_{\text{intercept}} = 5.30$ ($p = .001$) and results also illustrated an average increase in other-reported trait self-esteem across the 1-year duration of the study, although the effect was not significant ($M_{\text{slope}} = 0.09$, $p = .051$). As before, there were only statistically significant interindividual differences with respect to the intercept (0.91, $p < .001$), but not the slope (0.03, $p = .308$).

As the final step of our preregistered analyses, we conducted the conditional LGM of other-reported self-esteem with gender as a covariate. This model also illustrated a good model fit (CFI = .962, RMSEA = .046, SRMR = .053). In this conditional model, results replicated the findings of the self-report model with a substantial increase in self-esteem ($M_{\text{slope}} = 0.09$, $p = .045$). Also replicating the effects of the self-report model, trait self-esteem was, on average, higher in pensioners, with no association between self-esteem reactivity and the level of trait self-esteem at the first measurement point. Interestingly, we did not replicate the gender differences from the self-report models. Close others did not, on average, report higher levels of trait self-esteem for male participants. Again, we were unable to test the developmental question due to the lack of interindividual differences in the latent slope of other-reported trait self-esteem.

Discussion

With the present study, we set out, first, to examine the effects of self-esteem reactivity in daily social interactions and, second, to explore bottom-up effects of self-esteem reactivity on trait development. We identified four main findings: First, we were

able to illustrate the existence of self-esteem reactivity in daily social interactions such that both graduates and pensioners alike reported higher momentary self-esteem when experiencing positive social encounters in their daily lives. Second, on average, participants' self-esteem increased over the 1-year period. Again, this was true for both age groups. Third, quite unexpectedly, we found no substantial interindividual differences in change trajectories across the 1-year time span. Consequently, we were unable to test the bottom-up effect hypothesis. Fourth, all findings were replicated when using other-reports of trait self-esteem. In the following, we discuss these findings and suggest future steps to test the bottom-up effects of developmental processes.

Self-Esteem Reactivity: Positive Effects of Daily Social Interactions

Overall, our results emphasize the importance of daily social interactions for momentary self-esteem. Specifically, the experience of positive social encounters in daily life was related to more positive evaluations of the self in that moment. Extending previous research (Bleckmann et al., 2023; Denissen et al., 2008; Hutteman et al., 2015), this reactivity effect generalized across the two different age groups in our sample, that is, late adolescence and late adulthood. At the same time, it should be noted that the subsample of older adults was comparably small. Given that this is the first study to investigate self-esteem reactivity in this age group, our findings should be replicated in future research.

We would like to highlight three general patterns within these findings. First, the overall variance in momentary self-esteem was based on substantial amounts of variability located both within and between individuals. Thus, to better understand the patterns and sources of momentary self-esteem fluctuations, researchers should consider both levels and potentially even their interplay. Along these lines, our findings indicated that both within-person fluctuations and between-person differences in perceptions of social inclusion were related to differences in momentary self-esteem and

explained substantial amounts of variance in momentary self-esteem. That is, momentary perceptions of social inclusion but also the general tendency to feel socially included were related to higher momentary self-esteem in early and late life.

Second, looking at our age differential analyses, results showed no differences in the association between perceptions of momentary social inclusion and self-esteem (i.e., self-esteem reactivity). However, approaching pensioners reported higher average levels of momentary self-esteem compared to graduates. Previous research largely focused on trait self-esteem, where long-term developmental studies illustrate a strong increase in trait self-esteem from middle adolescence onwards, a peak around age 60, and a decline afterward (for a meta-analysis, see Orth et al., 2018). Our study extends such findings by illustrating that age differences also translate to momentary self-esteem.

Finally, we would like to emphasize that our results on self-esteem reactivity remained robust when controlling for several variables such as type of interaction partner, weekend, or gender. Specifically, our results illustrated that the type of interaction partner was not related to the level of momentary self-esteem. Furthermore, momentary self-esteem was not related to the time of assessment during the ESM period, but it was generally higher during weekends. Finally, and in line with most previous research on trait self-esteem (e.g., Bleidorn et al., 2015), male participants reported higher average levels of momentary self-esteem compared to female participants. Whereas these findings point to the relevance of controlling for covariates at the within- and between-person level, both reactivity and age effects were largely unaffected by their inclusion.

In sum, our findings on self-esteem reactivity illustrate the role of daily social interactions for people's self-esteem and emphasize their importance throughout the life span. Future studies should theoretically derive and empirically test factors that might explain which people are more (or less) prone to self-esteem reactivity. For example, initial research by Bleckmann et al. (2023) suggests that adolescents with higher agreeableness may experience higher momentary self-esteem when feeling socially included (i.e., stronger self-esteem reactivity) in social interactions with familiar others. Identifying such individual differences in self-esteem reactivity might be one important step forward in developing interventions to promote momentary self-esteem across the life span. Finally, previous theoretical and empirical work has demonstrated reciprocal associations between self-esteem and social interaction variables (Harris & Orth, 2020). Accordingly, future research might extend models to investigate reciprocal effects in daily life.

Self-Esteem Reactivity as an Underlying Process of Self-Esteem Development

In our second major research question, we tested predictors of trait self-esteem development. Along theoretical notions (Geukes et al., 2018; Roberts & Jackson, 2008; Wrzus & Roberts, 2017), we argued that self-esteem reactivity is one potential driver of self-esteem development and, again, tested for potential age differential effects. Although our findings support the assumption that the participants in our sample experienced self-esteem reactivity in their daily life, we were unable to test our final research question due to the lack of interindividual variability in trait self-esteem change across 1 year. Specifically, both age groups showed an average

increase in trait self-esteem, although the magnitude of change was similar for all study participants, and accordingly no substantial interindividual differences emerged. Accordingly, in the absence of variance in the slope, we could not include predictor variables to test their effect on possible interindividual differences in change trajectories. There are three facets to this pattern of findings we would like to discuss in more detail.

Trait Self-Esteem Increases in Late Adolescence and Late Adulthood

Indicating robustness, self- and other-reports consistently pointed to an overall increase in trait self-esteem in late adolescence and late adulthood. That is, in line with previous studies from late adolescence to early adulthood (Orth et al., 2018; Wagner, Lüdtke, et al., 2013), graduate participants in our study experienced an increase in trait self-esteem and this increase was also perceived by well-known others. Looking at older adults in our study, we also found this increase from both the self- and the other-perspective. This result is, however, somewhat contrary to findings from previous research: Whereas meta-analytic results suggest a peak of trait self-esteem around the age of 60 years and tendencies of decline afterward (Orth et al., 2018), Bleidorn and Schwaba (2018) found that trait self-esteem decreases in the 5 years before retirement but remains stable in the 5 years after this transition. How can this difference between previous research and our findings be explained? Given that our study was conducted at much shorter time intervals (every 6 months), potential negative effects, such as a lack of social contact with former colleagues, might only occur until sometime after the transition, and thus, our shorter time intervals might not capture these longer term effects. Also, about half of our sample of older adults appeared to be delaying the transition to retirement. Further research in later life is needed to better understand under which conditions and at what time intervals changes can and should be observed.

Overall, our results show that self-esteem increases slightly in both age groups. This developmental pattern is well expected for late adolescence, but further research is needed for late adulthood. Furthermore, the increase in trait self-esteem was supported by self- and other-reports in a parallel manner. This way, the present study extends initial findings from personality psychological research demonstrating that changes in Big Five personality traits can be detected in both self- and other-reports (Luan et al., 2017; Oltmanns et al., 2020; Stieger et al., 2020) to the development of trait self-esteem.

Interindividual Variability in Self-Esteem Change

Contrary to our expectation, there was a lack of interindividual variability in intraindividual change scores. From our perspective, there are at least four learnings from this. First, given that previous research was, to our knowledge, always able to model statistically significant variance in (linear) change trajectories of self-reported trait self-esteem (e.g., Orth et al., 2012; Wagner, Gerstorf, et al., 2013; Wagner, Lüdtke, et al., 2013), we expected to find this variance in our sample as well. Importantly, this lack of interindividual variability in intraindividual change scores was replicated when using other-reported self-esteem. This indicated the robustness of this finding.

Second, the methodological features of our study might have reduced the likelihood of observing interindividual differences in self-esteem change. Our study's time frame might have been too short to discover differences in change trajectories: Despite robust evidence for interindividual differences in trait change over the course of several years (e.g., Orth et al., 2012), previous research using (latent) trait-state models also indicated that trait self-esteem was largely characterized by trait and autoregressive stability (Donnellan et al., 2012; Wagner et al., 2016). These findings suggest that large amounts of trait variance seem to be fairly stable across shorter periods such as 1 year. Accordingly, future studies investigating bottom-up effects on self-esteem development should track individuals across several years. Related to this, although our study design starts before and follows up on the transition after the experience, three measurement points could be regarded as too few to model change trajectories sufficiently (Bleidorn et al., 2020).

Third, it might be the case that interindividual differences are less visible when assessed with short inventories. In order to decrease participant burden in longitudinal studies, we decided to use a short version of the Rosenberg scale including only four items of the established 10 items. In other contexts, shorter versions were already successfully applied (Denissen et al., 2008) and our latent models generally fit the data well. Nevertheless, a longer version might be regarded as a more reliable way to assess all nuances of self-esteem and interindividual differences in change therein.

Fourth, our findings might raise further questions with regard to the role of life transitions in self-esteem development. Despite quite differential and oftentimes inconsistent effects of life events on personality (Bleidorn et al., 2019), previous research emphasized their impact on individual differences in developmental trends (Luhmann et al., 2021). Given that the majority of our participants experienced either the transition out of high school or out of working life, one would expect interindividual differences in the experience to potentially produce interindividual differences in developmental pathways. For example, for some people, the transition into retirement might be regarded as quite positive because they have more time to spend with people (e.g., their grandchildren) and with their hobbies. For others, however, this transition might be regarded as quite negative or uncertain because work represented a major part of their adult life. At the same time, research has suggested that not all transitions are experienced alike and characteristics of life events such as controllability or predictability most likely affect the experience (Luhmann et al., 2021). Given that both transitions in our sample could be experienced as largely controllable and predictable, less variability in developmental trends might be the consequence.

Implications for the Role of Self-Esteem Reactivity

Although we were unable to test the bottom-up hypothesis, we highlight three aspects that we may learn about self-esteem reactivity in general and its role in self-esteem development specifically. First, when looking at the bivariate (linear) correlations (Table 2), self-esteem reactivity appears to be unrelated to trait self-esteem, except for one other-report association. Accordingly, people with lower or higher levels of trait self-esteem do not seem to differ in the degree to which their momentary self-esteem relates to social inclusion.

Second, and as mentioned previously, reactivity processes can have very different meanings (Geukes, Nestler, Hutteman, Küfner,

& Back, 2017): Little reactivity could be both rigidity, which is largely seen as negative, or as stability, which could also be interpreted as firmness and determination. In turn, strong reactivity could be seen as flexibility, which is often understood as positive adaptivity, or it could reflect an excessive sensitivity, which is rather seen as negative. Thus, despite the general importance of being able to monitor and react to social feedback (Leary & Baumeister, 2000), we also acknowledge the possibility that very strong self-esteem reactivity can be disadvantageous. Instead, there might be something like a "sweet spot," at which self-esteem reactivity is adaptive. To test this possibility, we conducted an exploratory follow-up analysis, in which we included both a linear and a quadratic effect of self-esteem reactivity in the final growth curve model. For the self-report, the results of this model showed statistically significant effects of both reactivity variables, a positive linear effect ($\beta = .40, p = .044$) and a negative quadratic effect ($\beta = -.43, p = .019$; model information in Supplemental Table S3). For other-reports, effects pointed in the same direction but were much smaller and not statistically significant. These exploratory results suggest that an average level of reactivity is related to higher levels of self-esteem as compared to very low and very high levels of reactivity. This is the first indication of the functional role of self-esteem reactivity in daily social interactions for trait self-esteem.

Third, self-esteem reactivity in our sample only covers 7 days of experience sampling. Given a general lack of theoretical knowledge on how many experiences or situations are needed to build up and trigger trait developmental processes, further theoretical and empirical work is needed to better tailor theoretical and empirical work (Hopwood et al., 2022). Thus, future research should help to increase our understanding on the role of self-esteem reactivity to social interactions as a potential bottom-up process, on the time scale on which the bottom-up process can scale up to trait change, and on the nature and function of self-esteem reactivity on its own.

Limitations

Despite many strengths, such as the combination of ESM data on daily social interactions with longitudinal assessments across 1 year, the inclusion of other-reports in longitudinal assessments, and the combination of two age groups, we also acknowledge a number of limitations. First, despite the application of power simulations before data assessment, latent growth curve models of the current sample illustrated no substantial interindividual differences in latent slope trajectories. Our power simulations were based on data from a previous study of emerging adults in the transition out of high school (Wagner, Lüdtke, et al., 2013) and, thus, closely resembling the current research. However, the original study assessed four measurement points and covered a longer time span. This highlights the challenges in simulating increasingly complex analytical models to arrive at sufficient sample sizes.

Second, one might question the comparability of the two age groups in our sample. Given our aim to investigate two normative transitions in late adolescence and late adulthood, both age groups were selected based on strict criteria. Despite defining these well-ascribed conditions and a normative retirement age in Germany, in real life, people retired at quite different ages. In addition, it was very difficult to encourage people in later life to take part in the study. Consequently, the pensioner group had a relatively broad age range and was much smaller than the graduate group. Furthermore, both

of these transitions have been related to self-esteem development (Bleidorn & Schwaba, 2018; Wagner, Lüdtke, et al., 2013), but we experienced (the reported) modeling difficulties in both age groups. Future research should broaden the age range and life conditions of participants to arrive at a more diverse sample, which is most likely best achieved in coordinated studies across several labs (Bleidorn et al., 2020).

Third, the assessment of self-esteem could be improved for both levels of self-esteem, that is, trait and momentary self-esteem. On the trait level, we included only four items from the established Rosenberg scale (Rosenberg, 1965) to assess change across time. Although our measurement models illustrated a very good fit, the full scale might have been beneficial to capture all nuances of self-esteem. At the momentary level, self-esteem was assessed with only one item to reduce participant burden. Although this is a well-established method and the descriptive findings indicated satisfactory reliability, a more comprehensive assessment based on more items would be desirable. Similarly, social inclusion was assessed with only two items, which should be improved in future studies.

Finally, our modeling of self-esteem reactivity can be considered an advancement in capturing daily social dynamics and their role in longitudinal developments. However, the two-step approach (i.e., combining multilevel modeling with structural equation modeling) might also be regarded as a limitation. Specifically, reactivity estimates derived from multilevel modeling are also characterized by uncertainty. These are, however, not further considered in the second analytical step. Previous research has illustrated only small differences between multilevel modeling and structural equation modeling (Brose et al., 2022) but also highlighted several benefits of integrating both approaches. Since our sample size was not simulated for such a more complex analytical procedure, however, we were hesitant to apply the integrated model and, thus, conducted the preregistered two-step approach.

Conclusion and Outlook

The present study aimed to examine, first, the reactivity of self-esteem in daily social interactions in early and late life and, second, the role of reactivity as one potential process driving the development of trait self-esteem. Across both age groups, results indicate the importance of perceived social inclusion, both at a momentary level and a general tendency toward a positive momentary view of the self in daily life. Given the importance of self-esteem to important life outcomes, this mechanism underscores the significance of positive social interactions in daily life. While both self- and other-reports indicated an increase in trait self-esteem across the two age groups, we observed little interindividual differences in this developmental trajectory. Consequently, we were unable to test the nature and function of self-esteem reactivity in the development of trait self-esteem. To this end, more diverse samples and longer time periods should be used in future studies. Specifically, given the evolutionary basis of sociometer processes, it could be argued that the positive effect of social interactions in daily life could be generalized not only across the age groups considered but also across the entire life span. Following the same logic, the positive association between social inclusion and momentary self-esteem may also generalize across cultures, although the strength of this association may vary. Given that our study and previous research were based on individuals from

Western industrialized countries, however, such universal processes and issues of generalizability need to be explored in future projects.

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