

Better with age: How social, emotional, and behavioral skills change across the life span

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Napolitano, Soto, and Roberts hold the copyright for the BESSI, a measure of social, emotional, and behavioral skills.

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Abstract

How do the social, emotional, and behavioral (SEB) skills essential for navigating life's challenges differ across age, from childhood to adulthood? This cross-sectional study investigated age-related differences in SEB skills and their gender variations using a large sample (N=31,315, ages 10-70). There were four key findings. First, there were temporary and modest decreases in some skill domains during early adolescence, possibly reflecting “adolescent disruption.” Second, despite these temporary declines, mean levels of all SEB skill domains increased with age, with most skill domains (Self-Management, Social Engagement, Cooperation, and Emotional Resilience) improving markedly during adolescence and early adulthood. This is broadly consistent with “maturation” in the personality trait literature. Third, there was considerable heterogeneity in age-related patterns when assessing specific skill facets. Fourth, there were some gender differences: men and women varied in age-related differences for Cooperation and Innovation skills, and non-binary youth reported lower initial levels on most skills but showed greater positive change during adolescence and early adulthood. These patterns show both parallels and distinctions with developmental principles derived from the personality trait literature, such as adolescent disruption and adult maturation. These findings provide the most comprehensive map of SEB skill development to date and should be used to inform future longitudinal studies and the design of developmentally-timed interventions (208).

Social, emotional, and behavioral (SEB) skills are functional capacities that people use to maintain social relationships, regulate emotions, manage goal-directed behaviors, and learn from experience (Soto et al., 2021). Understanding the developmental trajectory of these skills is crucial, as, broadly construed, they form the bedrock of psychosocial adjustment and well-being across the lifespan (e.g., Eisenberg, et al, 2006; Lerner et al, 2012; Masten, 2014). Previous research indicates that SEB skills can be reliably measured, are distinguishable from personality traits and intelligence, and predict a broad range of consequential life outcomes including social relationships, academic performance, occupational interests, civic engagement, health, and well-being (Chen et al., in press; Collie, 2024; Collie et al., 2024; Feraco et al., in press; Lechner et al., 2022; Sewell et al., 2023; Soto et al., 2022, 2023, 2024; Ringwald et al., 2024; Yoon et al., 2024). Said simply, SEB skills represent how well a person can think, feel, or behave in situations important for thriving.

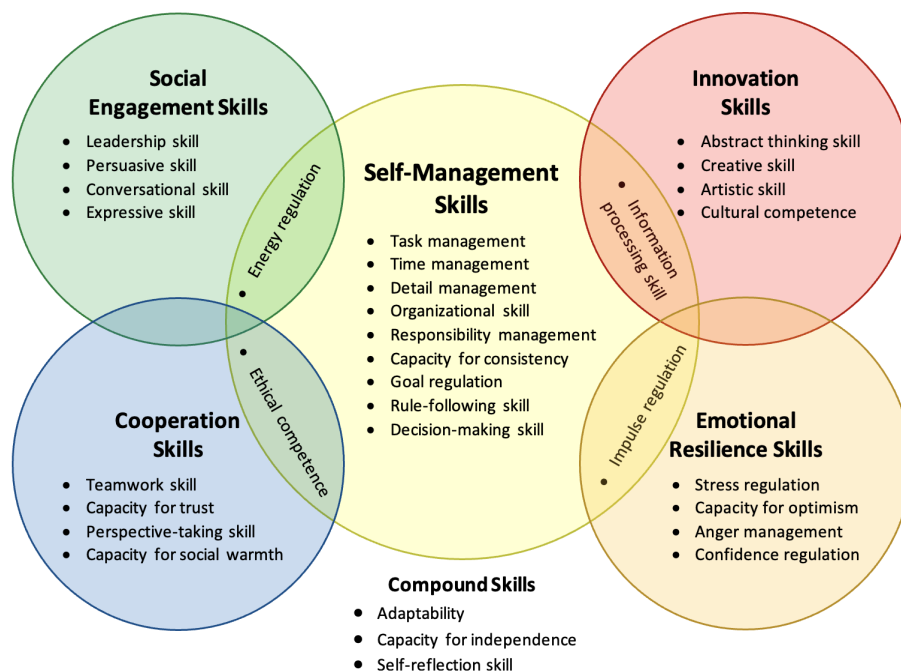
But how do SEB skills develop across the life span? The literature suggests two non-exclusive answers. The first is that older participants should generally report higher SEB skills, an idea aligned with the general assumption that people acquire and develop skills and competencies with time and experience (Feraco, Hudson, & Soto, 2025; National Research Council, 2012; OECD, 2015, 2021). The second answer is that, even though they are conceptually and empirically distinguishable, age-related differences in SEB skills should have similar patterns to age-related differences in personality traits, itself a well-researched topic (e.g., Bleidorn et al, 2022; Soto et al, 2011). In this research, we use a large sample to examine these viewpoints on age-related change in SEB skills.

Briefly introducing SEB skills

There are many conceptual and empirical frameworks for the study of socioemotional skills, broadly construed (see Berg et al., 2017; Soto et al., 2021). In this research, we adopt the widely used SEB skills framework, organized in the Behavioral, Emotional, and Social Skills Taxonomy (BESST; see Figure 1). At its core, the SEB skills framework emphasizes skills (how well a person can do something), rather than traits (how often a person does something), but is built upon the conceptual foundations of the trait-based Big 5 personality model (e.g., John et al., 2008). Thus, the BESST is organized across five domains that correspond to the Big 5. Self-Management Skills correspond with Conscientiousness, Social Engagement Skills with Extraversion, Cooperation with Agreeableness, Emotional Resilience with Emotional Stability, and Innovation with Openness to Experience. Moreover, like personality traits, each domain has several subordinate specific skill domains, or facets. Figure 1 displays the 32 specific SEB skill facets across five skill domains (Soto et al., 2022).

Figure 1

The Behavioral, Emotional, and Social Skills Taxonomy (BESST)



“Practice Makes Perfect:” A Developmental-Experiential Perspective on SEB Skills

With that foundation set, we return to our core question: do SEB skills change with age? A straightforward view on age-related differences in SEB skills is that they should develop in the same way as other complex capabilities. Just like playing the guitar or baking sourdough bread, they should improve with practice. From this perspective, SEB skills are expected to generally increase with age because age provides accumulating opportunities for practice. This aligns with developmental theories emphasizing the role of social context and life transitions in shaping individual competencies (e.g., Bronfenbrenner & Morris, 2006).

But not all practice is equally effective. The most efficient path to mastery might come from *deliberate practice*—the focused, goal-directed, and feedback-informed effort aimed at pushing the boundaries of one’s current capabilities (e.g., Ericsson, 2008). While people practice SEB skills throughout their lives, certain developmental periods may offer particularly fertile ground for intentional skill-building. For instance, the transition-rich periods of adolescence and early adulthood, which introduce new social roles, academic demands, and professional responsibilities, provide rich opportunities to intentionally practice SEB skills. Navigating these developmental tasks provides a natural context for the practice and refinement of SEB skills (e.g., Freund et al, 2018; Havighurst, 1953/72). As young people navigate these new contexts, they are often required to engage in the very kind of deliberate effort that might most effectively hone their skills (Napolitano et al., 2021). From this view, then, older participants should generally report higher levels of SEB skills, with marked improvement taking place during adolescence and early adulthood.

Connecting SEB Skill Development to Personality Maturation

A second viewpoint is that age-related differences in SEB skills is intertwined with and informed by the well-documented developmental trends in the related Big Five personality traits. This idea is justified by the parallel cognitive, affective, and behavioral referents between SEB skill domains and Big Five personality traits. However, importantly, traits represent how someone *tends to* think, feel, and behave averaged across situations, whereas skills represent how someone is *capable of* thinking, feeling, and behaving when they want or need to do so (Soto et al., 2021). For example, someone may typically be socially reserved (low trait Extraversion) but still be capable of starting conversations when needed (high Social Engagement Skills). Conversely, someone may typically be talkative and outgoing (high trait Extraversion) without demonstrating much social skill or tact (low Social Engagement Skills).

Empirically, previous studies have found that personality traits and SEB skill domains tend to correlate positively with each other (Feraco et al., in press; Lechner et al., 2022; Soto et al., 2022). This is likely because someone who frequently behaves in a particular way may also improve at enacting that behavior over time (a high trait level leading to a high skill level), and because someone who is highly capable of enacting a particular behavior may behave that way more often (a high skill level leading to a high trait level). We speculate that this bidirectional, informative association between SEB skills and personality traits may drive similarities in their patterns of age-related differences. In other words, SEB skills might exhibit age-related change patterns similar to personality traits because the two constructs are, developmentally, mutually informative.

Reviewing Age-Related Differences in Big Five Personality Traits

Given that speculation, it is important to briefly review the literature on age differences in the Big Five personality traits. This work provides three consistent findings. First, mean levels of Agreeableness and Conscientiousness temporarily decline during early adolescence, a phenomenon known as the *disruption principle* (Soto et al., 2011; Soto & Tackett, 2015; Van den Akker, et al., 2014). Second, mean levels of Agreeableness, Conscientiousness, and Emotional Stability tend to increase with age from adolescence through young adulthood, a phenomenon known as the *maturity principle* of personality development (Bleidorn et al., 2022; Roberts & Wood, 2006; Roemer et al., 2025). Third, these age-related differences are sometimes complemented by gender differences, more often in overall mean-levels. Starting from an earlier age, girls tend to score higher on Agreeableness and Conscientiousness, whereas boys and men tend to score higher on Emotional Stability (McCrae et al., 2005; Schmitt et al., 2008; Soto et al., 2011).

Although there is quite some research on age trends in related constructs (e.g., Bohlin & Hagekull, 2009; De Fruyt et al, 2016; Fingerman, et al., 2013; Trillingsgard et al., 2018), there are only a few studies that have investigated age-related differences in SEB skills. Feraco and colleagues (2023) investigated SEB skills across adolescence and found some support for disruption: mean levels of Social Engagement, Cooperation, Self-Management, and Innovation Skills all declined from ages 12 to 14 but then increased from ages 15 to 19. Moreover, boys and girls showed different age trends for some skills. For example, girls increased more than boys in Cooperation and Self-Management Skills during late adolescence. In contrast, Jalynskij et al. (2025) found that among a relatively smaller German sample (aged 18-65), many SEB skill domains remained stable or decreased somewhat across adulthood. Finally, in a one-year longitudinal study of American adolescents, Napolitano et al. (2025) demonstrated that SEB

skills can be malleable, finding that individual changes in skills were associated with corresponding changes in academic, social, and well-being outcomes. The present research expands this nascent developmental literature in two ways: as the first large-scale, broad examination of age trends in SEB skills domains across 60 years of the life span—from late childhood through middle age—and as the first report of age-related differences in specific SEB skill facets, which we review below.

Exploring age-related change in SEB skill facets

Both SEB skills and personality traits have been conceptualized hierarchically, with broad domains subsuming more-specific “facets” (Costa & McCrae, 1995; Soto & John, 2017; Soto et al., 2022). We therefore turn again to the Big Five to illustrate the utility of facet-level examinations of age-differences, which suggest that adopting a narrower focus exposes some heterogeneity that is otherwise obscured at the domain level (e.g., Jackson et al., 2009; Ringwald et al., 2024). For example, there is meta-analytic evidence that the Extraversion facet of social dominance increases across adulthood, whereas the social vitality facet initially increases during adolescence and adulthood, but then decreases into older age (Roberts et al., 2006). Uncovering potential SEB skill facet-level heterogeneity in age-related differences would be highly informative for researchers and practitioners who are interested in describing, explaining, or intervening to promote specific skills, such as leadership, empathy, or self-control.

Overview of the Present Research

How do SEB skills change across the life span? We have reviewed two non-exclusive perspectives here. The “practice makes perfect” perspective assumes that such SEB skills generally improve across the life span. Moreover, this perspective would hold that periods where SEB skills “practice” is prevalent, such as adolescence and early adulthood, would be

characterized by marked SEB skills improvements. The second perspective is that SEB skills domains will have age-related differences that resemble those of their related personality traits. We used these two perspectives to inform three research questions, which we elaborate below.

RQ1: Do SEB skills temporarily decrease during early adolescence? Mirroring personality psychology's *disruption principle* (Soto et al., 2011), we sought to discover whether the average SEB skill domain levels would decline from late childhood (ages 10-11) to early adolescence (between ages 12-13), and then begin to rebound through middle and later adolescence.¹ Should SEB skills parallel the patterns of their related personality traits (e.g., Denissen et al, 2013), early adolescents would report lower levels of Self-Management and Innovation Skills in particular (as well as potentially Social Engagement and Emotional Resilience Skills) compared to children, as well as compared to middle and late adolescents. Such findings would complicate the “practice makes perfect” model.

RQ2: Do SEB skills improve during late adolescence and early adulthood? Mirroring personality psychology's *maturity principle* (Roberts & Wood, 2006), we will investigate whether the average SEB skill domain levels from later adolescence through middle adulthood would be higher than the average skill levels of middle adolescents. Should SEB skills parallel the patterns of their related personality traits (e.g., Roberts et al, 2006; Bleidorn et al, 2023), Emotional Resilience, Self-Management and Cooperation Skills would increase from middle adolescence through early adulthood. These findings would complement the “practice makes perfect” model.

¹ We specified these age ranges in consultation with the developmental literature but note that arbitrary age cutoffs like these do not reflect the considerable developmental heterogeneity of individuals sharing the same chronological age. People develop at different paces.

RQ3: Do patterns of age-related change in SEB skills differ by gender? We will test whether girls/women and men/boys show differential age-differences in SEB skills. In an exploratory set of analyses, we will also report on gender variation in SEB skill differences for participants who reported a non-binary gender identity.

Method

Participants and Procedure

Participants were 31,315 individuals who completed an online survey about their SEB skills at PersonalityLab.org, a non-commercial, advertisement-free website maintained by the co-first author. On average, participants were about 23 years old, ($M = 22.95$; $SD = 9.25$), with participants ranging in age from 10 to 70. Compared to other periods of the life span, there were fewer participants in the youngest and oldest age periods. About 7% of participants were early adolescents (10-13), 21.9% middle adolescents (14-17), 31.1% late adolescents/ postsecondary (18-22), 23.2% “emerging adults,” (23-29), 11% early adults (30-39), 3% early middle-aged adults (40-49), and 2.8% middle-aged to older adults (50 and older)².

Most participants reported their gender as female (72.2%), with smaller numbers of participants reporting their gender as male (23.1%) or another identity (4.7%). The sample was somewhat diverse in terms of race and ethnicity, with 58.9% identifying as White, 12.3% Asian, 7.0% Hispanic or Latino, 2.3% Black, 9.5% Multiracial or multiethnic, 0.5% Native American, 0.2% Pacific Islander, and 4.9% another identity, with 4.5% of participants electing to not answer.

² Missingness was confined exclusively to participant ethnicity, which was missing for 1,417 participants, about 4.5% of the sample. A subsequent Little’s MCAR test was significant ($\chi^2(7) = 180.0$, $p < .001$), confirming that the propensity to not report one’s ethnicity was not completely random. All subsequent regression models were conducted on the subset of the sample that reported ethnicity.

Participants were not actively recruited and could instead find their way to the survey through search engines, links from other websites, or word of mouth. They volunteered to complete the survey in exchange for automatically generated feedback about either their SEB skills or their compatibility with the four Hogwarts school houses from the Harry Potter series of books and movies (Rowling, 1999).

This research was approved by the Colby College Institutional Review Board. The present sample includes some participants from a previously published study (Soto et al., 2022, Study 3). However, that previous study did not examine age-related differences in SEB skills. A version of this study was pre-registered, but we elected to adopt a more robust analytical approach that obviated that pre-registration. Thus, we present this work as exploratory in nature.

Measures

We assessed SEB skills using the Behavioral, Emotional, and Social Skills Inventory (BESSI; Soto et al., 2022). The BESSI assesses 32 specific skill facets organized within 5 broad skill domains: Self-Management, Social Engagement, Cooperation, Emotional Resilience, and Innovation Skills. Three skill facets (Self-reflection skill, Adaptability, and Capacity for Independence) are categorized as “Compound” facets not associated with any one domain. Each of the 192 BESSI items describes a specific behavior (e.g., “lead a group of people,” “stay calm in stressful situations”), and respondents rate how well they can enact that behavior on a Likert scale ranging from 1 = *not at all well* to 5 = *extremely well*. Reliability was high across skill domains ($\omega_{\text{average}} = .94$, $\omega_{\text{range}} = .91$ -.97) and individual skill facets ($\omega_{\text{average}} = .87$, $\omega_{\text{range}} = .81$ -.94). Observed SEB skill domain and facet means, standard deviations, and reliabilities are reported as [Table OSM 1](#). The BESSI is available for personal and academic use at sebskills.com.

Analyses

To get an initial understanding of the associations between SEB skills and participant age, we first computed partial correlations between participant age and SEB skill domains and facet scale scores, controlling for gender and race/ethnicity. Due to the large sample size, a significance criterion of $p \leq .01$ was adopted for these and all subsequent analyses.

After these preliminary analyses, we employed Generalized Additive Models (GAMs) implemented with R's "mgcv" package (Wood, 2017). GAMs extend generalized linear models by using smooth functions to model non-linear relations, allowing the data to determine the shape of the age-skill relationship and making them ideal for detecting complex patterns of age-related differences.

To assess RQ1 and RQ2, we estimated separate GAMs for each BESSI domain and facet, predicting their scale scores by participant age and including gender (male, female, non-binary) and race/ethnicity as covariates. Participants were retained for analyses if they had provided responses to these demographic variables. Model estimation was performed using Restricted Maximum Likelihood (REML). For all models, we set the basis dimension to $k=6$ for the age smooth, ensuring sufficient flexibility.³ Since GAM results vary depending on the age range analyzed—showing broad trends versus local dynamics—we modeled the full lifespan (10-70 years) alongside a model more-narrowly targeted on adolescence (10-20 years for RQ1) and the adolescence to young-adulthood (i.e., maturation) transition (10-40 years for RQ2). This allowed us to examine the overall and period-specific age-related differences. To further quantify these associations, we derived two main effect size indicators from each GAM: the overall model

³ To aid in model interpretation and comparison, we kept the number of basis functions equivalent across GAMs. We tested whether 6 basis functions were adequate across each GAM (at the domain and facet level) using the "gam.check" function in the "mgcv" package. Overall, we concluded that " $k=6$ " provided the best balance of model specification and comparability across analyses.

adjusted R-squared, or the proportion of variance in the SEB skill explained by age and the covariates, and a *d*-like standardized measure of change, calculated as the predicted change between two time points divided by the outcome's sample standard deviation, was calculated for the age trend across the start and end of each specified interval (10-70, 10-20, and 10-40 years).

We assessed RQs 1 and 2 by combining effect size estimates with visual inspection of the smoothed age-related differences trajectories⁴ and the first derivative of the smooth function of age (i.e., the rate of change at a given age). We used the “gratia” package (Simpson, 2023) to calculate these derivatives and their 99% confidence intervals. With these criteria, evidence supporting disruption would involve visual decline in age-related differences trajectories during early adolescence that later rebounds *and* a first derivative whose confidence interval upper bound falls *below* zero during early adolescence. Evidence supporting a pattern consistent with personality maturity would include increasing trajectories *and* a first derivative whose confidence interval lower bound falls *above* zero during middle adolescence through early adulthood.

To evaluate gender-related differences in developmental age differences (RQ3), we estimated domain-level GAMs with the inclusion of an age*gender interaction term. We tested for significant gender interactions by comparing models with and without the interaction term using Chi-squared likelihood ratio tests. To quantify the magnitude of these interactions, we calculated two effect size indicators: the change in adjusted R-squared (ΔR^2) between the main-effects and interaction models, and gender-specific *d*-like values, indicating the magnitude of change from the start to the end of the age interval for each gender group. We conducted these analyses to compare men and women across the full lifespan (10-70) and conducted similar

⁴ When using the term “trajectories,” we mean between-persons, cross-sectional age-related differences results and do not imply within-person age-related change.

exploratory analyses including non-binary participants across ages 10-40, where the data were sufficient. We used Google Gemini 2.5 Pro (Google, 2025) to assist in developing and refining the analytical code for this research.

Results

Preliminary analyses

Providing preliminary support for the “practice makes perfect” model, participant age in years was, on average, positively associated with all SEB skill domains ($r_{\text{average}} = .14$). There was little variation in this association after controlling for gender and ethnicity ($r_{\text{average}} = .13$). In the partialled correlations, increases in age were most strongly related to Self-Management skills ($r = .20$, 99% CI = [.18, .21]), whereas the association between participant age and Innovation skills was miniscule – ($r = .04$, 99% CI = [.03, .06]). Table 1 provides detailed results on the zero-order and partialled correlations.⁵

Table 1

Means, Standard Deviations, Zero-order and Partialled Intercorrelations Among Participant Age and SEB Skills Domains

	1	2	3	4	5	6
1. Age	22.95 (9.25)	.21 [.20, .22]	.14 [.13, .15]	.15 [.14, .17]	.19 [.18, .20]	.03 [.02, .04]
2. Self-Management Skills	.20 [.18, .21]	3.48 (.60)	.41 [.39, .42]	.47 [.45, .48]	.51 [.50, .52]	.32 [.30, .33]
3. Social Engagement Skills	.12 [.11, .14]	.40 [.38, .41]	3.22 (.72)	.48 [.47, .49]	.49 [.47, .50]	.43 [.42, .44]
4. Cooperation Skills	.14 [.13, .16]	.46 [.45, .47]	.48 [.46, .49]	3.66 (.63)	.52 [.51, .53]	.42 [.40, .43]
5. Emotional Resilience Skills	.16 [.15, .18]	.50 [.49, .52]	.48 [.47, .49]	.52 [.51, .53]	2.99 (.72)	.29 [.27, .30]
6. Innovation Skills	.04 [.03, .06]	.32 [.31, .33]	.44 [.43, .45]	.42 [.41, .43]	.30 [.29, .32]	3.74 (.59)

Note. $N = 31,315$ for descriptive statistics and zero-order correlations. For the partialled correlations, $N = 29,909$ due to listwise deletion for cases with missing data on gender or ethnicity. Means and standard deviations are shown in bold on the diagonal, with standard deviations in parentheses. Zero order correlations are shown in italics above the diagonal. Partialled correlations (for participant gender and ethnicity) are shown below the diagonal. 99% confidence intervals are reported in brackets. All correlations are significant at $p < .001$.

⁵ A similar pattern emerged when exploring the correlations between participant age in years and the specific SEB skill facets. Overall, 29/32 facets (all except Persuasive Skill, Artistic Skill, and Cultural Competence) were significantly and positively associated with participant age. Partialled, within-domain intercorrelations with age can be found in OSM Table 1.

Testing for SEB Skill Disruption During Adolescence

We then investigated whether SEB skills showed negative age trends during early adolescence, as predicted by the disruption principle. To do this, we fit a GAM for each skill domain and facet using data from all participants between the ages of 10 and 20 ($N = 14,447$). For all five domains, we found that SEB skills were indeed better predicted by a non-linear (vs. linear) function of age, but that the influence of age and demographic covariates on individual differences in SEB skills was modest ($R^2_{\text{average}} = .03$). Table 2 provides a summary of these GAMs. The pattern of effect size estimates ($d_{\text{average}} = -.07$) suggests that participants at age 10 and age 20 reported similar scores, even though the association between age and SEB skills domains is non-linear.

Table 2

Summary of GAMs for SEB Skills Domains, Age 10-20

Domain	<i>edf</i>	Ref. <i>df</i>	<i>F</i>	<i>p</i>	Overall Adj. R^2	<i>d</i> -like
Self-Management	4.53	4.89	48.2	< .001	.03	-.01
Social Engagement	4.46	4.85	17.3	< .001	.02	-.15
Cooperation	3.66	4.27	8.6	< .001	.01	-.04
Emot. Resilience	4.16	4.67	35.1	< .001	.05	.01
Innovation	4.47	4.85	17.3	< .001	.02	-.15

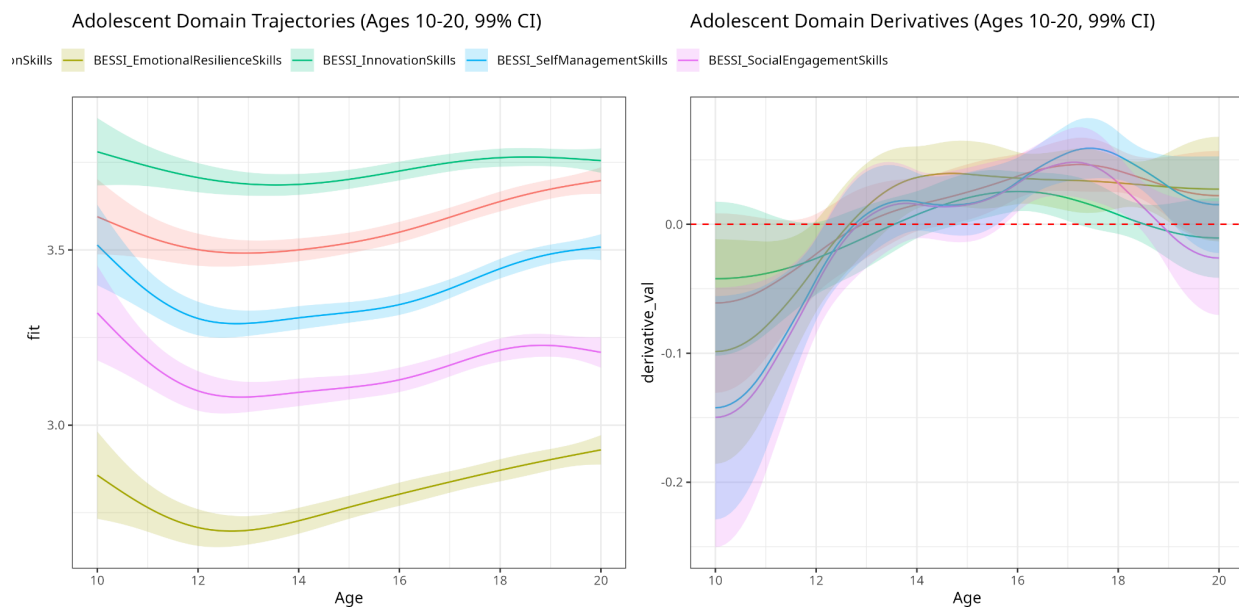
Note. *edf* = estimated degrees of freedom for the $s(\text{Age})$ smooth term; Ref. *df* = reference degrees of freedom for the $s(\text{Age})$ smooth term; *F* and *p* values are for the age smooth term; Overall Adj. R^2 = variance explained by the full model (Age, Gender, Ethnicity); *d*-like is the predicted change from age 10 to age 20, standardized by the standard deviation of the relevant SEB skill outcome

Figure 2 visualizes these non-linear associations for the five SEB skill domains. Visual inspection of the age-related trajectories shows a decline in ratings from 10-13, followed by a rebound in ratings through age 20 for all domains. Although all five domains exhibit statistically significant “rebound” trajectories at some point during the age 10-20 window, we only find evidence for disruption with Self-Management, Social Engagement and Emotional Resilience, as

they are the only domains with early adolescence decline trajectories with confidence intervals falling entirely below zero. These results resemble previous findings regarding personality trait disruption, except that Innovation Skills did not significantly decline.

Figure 2

Adolescent Age Trends in SEB Skill Domains



We saw a similar pattern among SEB skill facets. Overall, 41% of the skill facets (13/32) showed age differences that were consistent with disruption (with their 99% confidence intervals

falling entirely below zero at some point during early adolescence), with the Self-Management (6/9) and Social Engagement (3/5) domains being particularly well-represented. Emotional Regulation and Cooperation each had two facets consistent with disruption, whereas no Innovation or Compound facets met criteria for disruption. By late adolescence, about 81% of the skill facets (26/32) showed periods of statistically significant improvement (with their 99% confidence intervals falling entirely above zero). The GAMs are summarized in [Table OSM 2](#), and visualized in [OSM Figures 1-6](#).

Testing for SEB Skill Change During Emerging and Early Adulthood

Next, we tested whether SEB skills showed increasing age trends during emerging and early adulthood. To do this, we fit a GAM for each skill domain and facet using data from all participants between the ages of 10 and 40 ($N = 28,302$). Overall, we found patterns consistent with the changes shown in the Big Five such that most SEB skills domains and facets improved. These patterns were consistent with both the maturity principle and the “practice makes perfect” model.

Specifically, the relation of age to each domain was best represented non-linearly, and while significant, was (along with demographic variables) again a modest predictor of individual differences in SEB skills ($R^2_{\text{average}} = .04$). Table 3 provides a summary of these GAMs. The pattern of effect size estimates indicated that, on average, SEB skill levels increased by about a half standard deviation from late childhood through middle adulthood ($d_{\text{average}} = .46$), with those changes ranging from small ($d = .20$) for Innovation Skills to medium-to-large ($d = .62$) for Self-Management skills.

Table 3

Summary of GAMs for SEB Skills Domains, Age 10-40

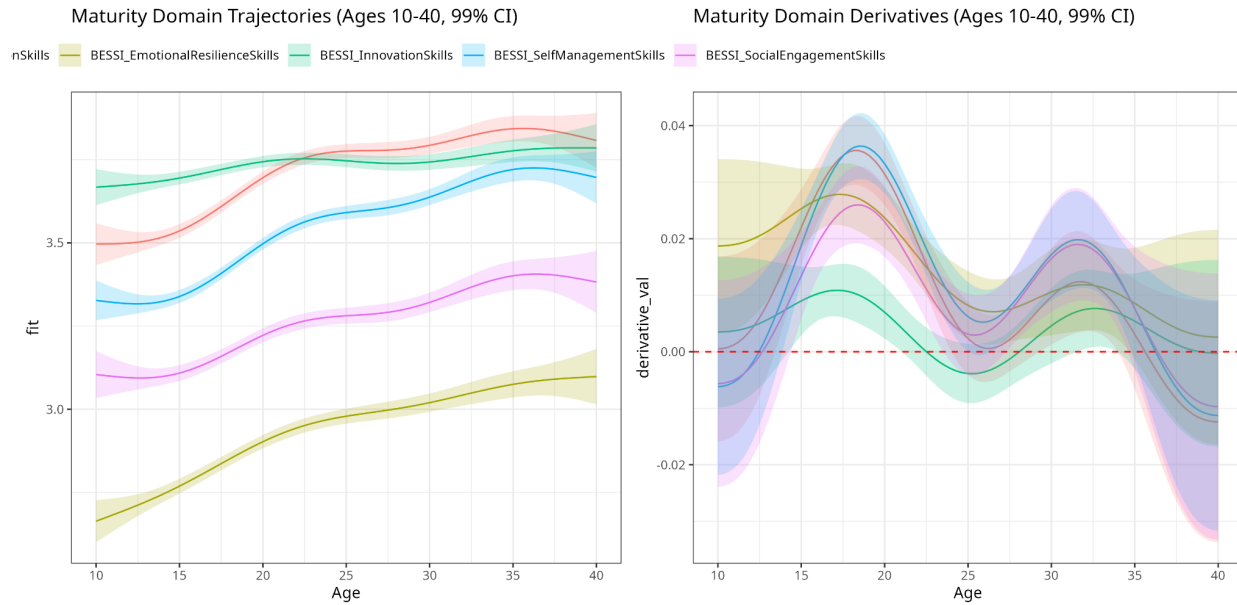
Domain	<i>edf</i>	Ref. <i>df</i>	<i>F</i>	<i>p</i>	Overall Adj. R^2	<i>d</i> -like
Self-Management	4.79	4.98	229.6	< .001	.05	.62
Social Engagement	4.60	4.92	81.1	< .001	.03	.39
Cooperation	4.72	4.96	159.1	< .001	.04	.49
Emot. Resilience	4.03	4.59	133.9	< .001	.07	.61
Innovation	4.09	4.64	12.0	< .001	.01	.20

Note. *edf* = estimated degrees of freedom for the *s*(Age) smooth term; Ref. *df* = reference degrees of freedom for the *s*(Age) smooth term; *F* and *p* values are for the age smooth term; Overall Adj. R^2 = variance explained by the full model (Age, Gender, Ethnicity); *d*-like is the predicted change from age 10 to age 40, standardized by the standard deviation of the relevant SEB skill outcome

Figure 3 depicts the non-linear associations for the five SEB skill domains. Visual inspection reveals that all domains have scores that increase with age. Assessing the derivatives shows that these increases can be characterized by two distinct “growth spurts,” the first occurring across ages 15 to 25, and the second, somewhat smaller, occurring across late 20s and into the mid 30s. Interestingly, all five skill domains showed significant, positive trajectories during both periods. Overall, the results suggest that SEB skills domains have dynamic, non-linear age trends. The uniformly positive age trends for all five domains differs from the maturity pattern found for the Big Five, which is concentrated in the conscientiousness and emotional stability domains. In contrast, all five domains of the BESSI show increases, which is more consistent with the practice-makes-perfect model.

Figure 3

Adolescent to Early Adult Maturation in SEB Skill Domains



The facet level results also showed similar patterns, albeit with greater detail and some heterogeneity. [Table OSM 3](#) provides a summary of the GAMs. Almost all facets (29/32) improved with age, with only Rule Following, Artistic, and Persuasive Skills having lower levels at middle adulthood compared to late childhood⁶. Most facets showed improving age related differences (28/29) that were non-linear in nature, with only Capacity for Independence improving in a strictly linear fashion. Several skill facets showed notable improvements across the age period, such as Ethical Competence ($d = 1.08$), Self-reflection Skill ($d = .93$), and Decision Making Skill ($d = .93$).

Interestingly, there was notable variation in the facet-level age-related difference trajectories. For example, some trajectories (12/32, about 41%) were characterized by the two “growth spurts” noted above in the domain results, and others (11/32, about 34%) characterized by a single “growth spurt” during adolescence and early adulthood that levelled off later into middle adulthood. Capacity for Independence, Leadership Skill, and Stress Regulation had

⁶ All age-related difference trajectories were non-linear, except for Capacity for Independence, which increased with age ($d = .48$) in a linear fashion.

steadier positive trajectories; Energy Regulation and Creative Skill had declines during adolescence that later rebounded; and Impulse Regulation improved only once participants were in their mid 20s. The facet level age-related differences trajectories are shown in [OSM Figures 7-12](#). Taken together, these results indicate overall growth in SEB skills during young adulthood, but with some skill facets showing larger gains than others.

Lifespan Age Trends in SEB Skill Domains and Facets

Finally, we fit GAMs for each skill domain and facet for participants aged 10-70 ($N = 29,909$) to describe the development of SEB skills across the lifespan. Here, our focus was less on identifying whether SEB skills domains and facets were characterized by disruption and/or maturity, and more on providing an overall view of age-related change in SEB skills across the life span. In general, we found that SEB skill levels increase with age, and that the most rapid improvements in SEB skills occurred earlier in the life span and then plateaued later in life. Results from this broad vantage provide the clearest support for the “practice makes perfect” model.

Overall, the relation of age and demographic variables to each domain was best represented non-linearly, and while significant, was again a modest predictor of individual differences in SEB skills ($R^2_{\text{average}} = .04$). Table 4 provides a summary of these GAMs. The pattern of effect size estimates indicates that, on average, SEB skill levels increased by about three quarters of a standard deviation from late childhood through late adulthood ($d_{\text{average}} = .73$), with those changes ranging from small-to-medium sized for Innovation Skills ($d = .36$) to very large for Emotional Resilience ($d = 1.00$) and Self-Management skills ($d = .98$). Combining these results with those using the age 10-40 subsample, we can infer that most of the improvement in

SEB skills from age 10-70 occurs before age 40, but that there are still meaningful age differences in many SEB skills across middle adulthood.

Table 4

Summary of GAMs for SEB Skills Domains, Age 10-70

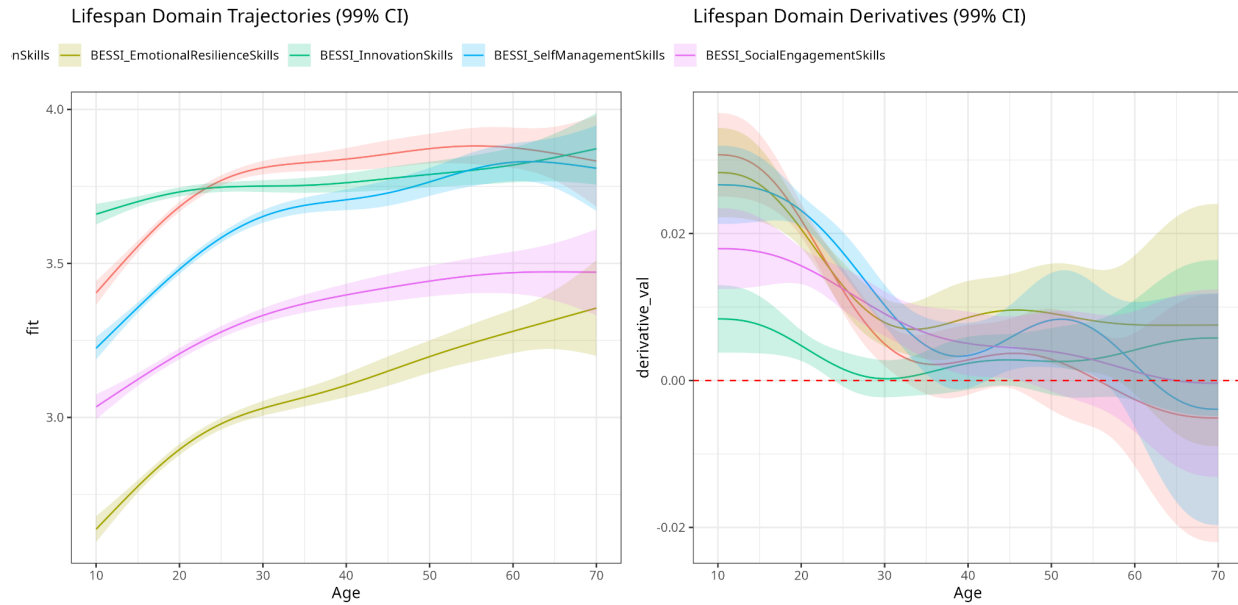
Domain	<i>edf</i>	Ref. <i>df</i>	<i>F</i>	<i>p</i>	Overall Adj. R^2	<i>d</i> -like
Self-Management	4.36	4.78	299.5	< .001	.06	.98
Social Engagement	3.50	4.09	127.3	< .001	.03	.61
Cooperation	4.39	4.80	188.7	< .001	.04	.68
Emot. Resilience	4.07	4.58	198.8	< .001	.08	1.00
Innovation	3.50	4.09	15.26	< .001	.01	.36

Note. *edf* = estimated degrees of freedom for the *s*(Age) smooth term; Ref. *df* = reference degrees of freedom for the *s*(Age) smooth term; *F* and *p* values are for the age smooth term; Overall Adj. R^2 = variance explained by the full model (Age, Gender, Ethnicity); *d*-like is the predicted change from age 10 to age 70, standardized by the standard deviation of the relevant SEB skill outcome

Figure 4 displays these age-related difference trajectories and their first derivatives for participants aged 10-70. To summarize, there is rapid improvement in four of the five SEB skill domains—Self-Management, Social Engagement, Cooperation, and Emotional Resilience—during adolescence and early adulthood that then slows but remains positive across most of adulthood. Innovation, by contrast, shows slow but steady growth across adolescence and adulthood.

Figure 4

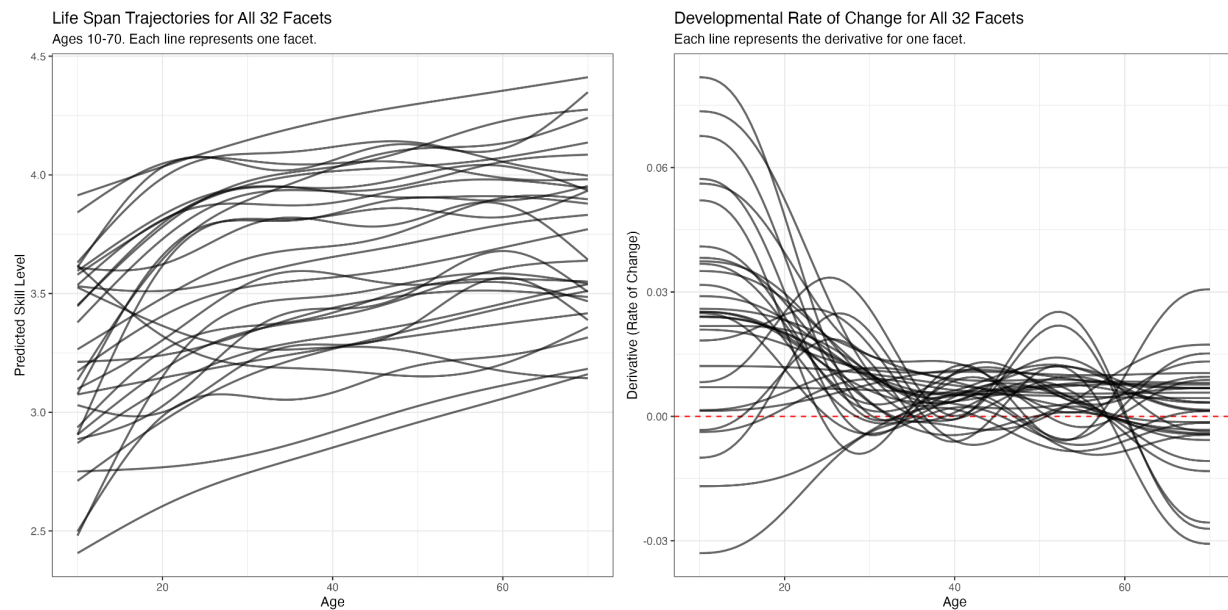
Age-related difference trajectories in SEB Skill Domains with 99% Confidence Intervals, Ages 10-70



At the facet level, consistent with a “practice makes perfect” conceptualization, almost every SEB skill facet improved across ages 10-70 ($d_{average} = .62$), with only Artistic Skill ($d = -.27$) and Persuasive Skill ($d = -.43$) declining. This is less consistent with the maturity pattern because, for personality traits, there are little or no changes in adulthood in extraversion and openness at the trait/domain level. Moreover, nearly every increasing SEB skill facet was characterized by non-linear improvements; only Capacity for Trust, Leadership Skill, and Capacity for Independence had more linear age-related difference trajectories. [Table OSM 4](#) provides a summary of the GAMs. As an illustration of these general trends, Figure 5 provides a summary view of the 32 SEB skill facet trajectories from age 10-70. (For ease of viewing, this figure does not include confidence intervals.) Consistent with the results detailed above, this figure shows considerable heterogeneity across facets’ age trends during adolescence, followed by smaller and more steady gains during young adulthood and middle age. We also note that several skill facets showed notable total improvements across the life span, such as Ethical Competence ($d = 1.44$), Self-reflection Skill ($d = 1.17$), and Responsibility Management ($d = 1.11$).

Figure 5

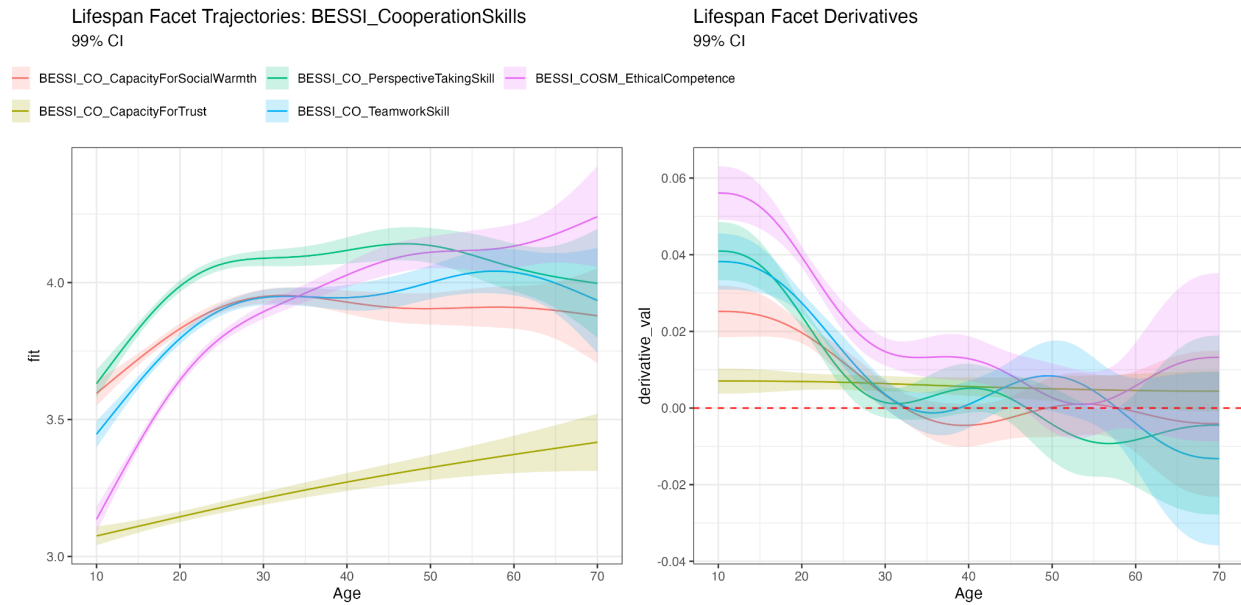
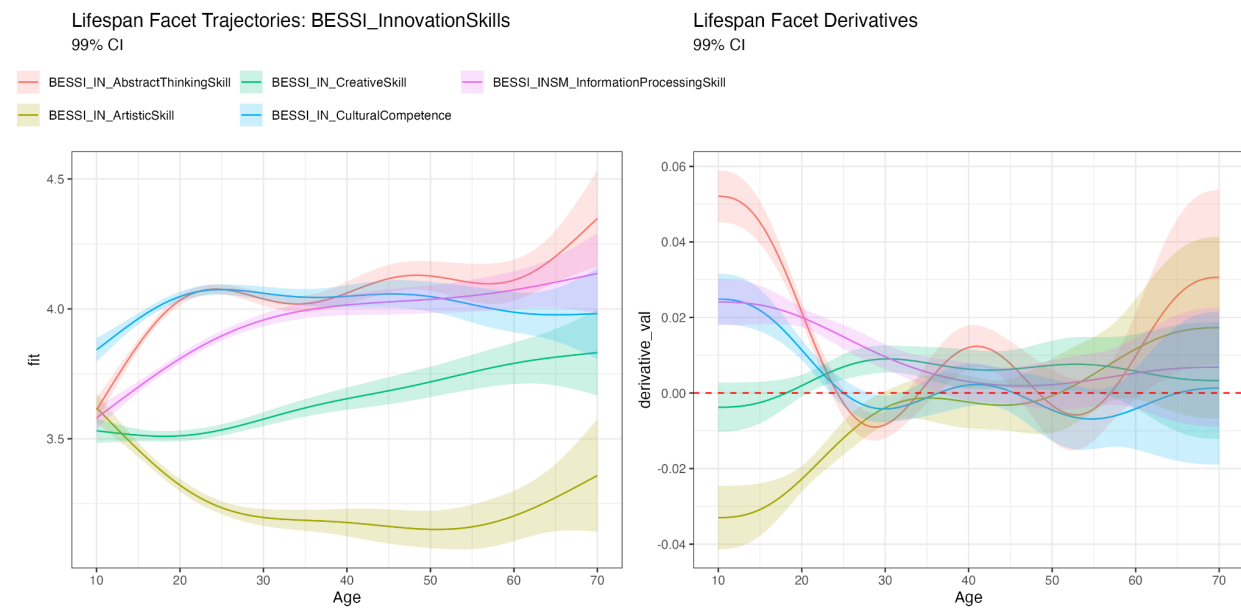
Summary view of age-related difference trajectories in SEB skill facets, Age 10-70



Beyond these general patterns, detailing each facet-level age-related difference trajectory is outside the scope of this paper; instead, we illustrate facet-level heterogeneity by examining the facets within two domains. In the Cooperation domain (Figure 6), most facets are characterized by rapid mean-level increases during adolescence and early adulthood, followed by slowing increases or flat age trends later in life. Capacity for Trust, however, had a linear association with age that slowly increased over time. By contrast, Innovation Skills facets offered more examples of heterogeneity (see Figure 7). For example, Artistic Skill decreased from adolescence through adulthood, whereas Abstract Thinking Skill increased substantially during adolescence and then decreased into early adulthood before improving again into middle adulthood. Thus, same-domain skill facets sometimes showed distinct age trends.

Figure 6

Lifespan Age Trends in Cooperation Skill Facets

**Figure 7***Lifespan Age Trends in Innovation Skill Facets***Gender differences in SEB skill domain age-related difference trajectories**

A final set of analyses tested for gender differences in age-related SEB skills differences (RQ3). We first compared boys/men and girls/women across the full lifespan (ages 10-70).

Likelihood ratio tests indicated significant differences in the trajectory shape for all domains except Social Engagement Skills (see Table 5, middle column).

Table 5

ANOVA Model Comparison Results for Gender Differences in SEB Skills Domain Age-Related Difference Trajectories

Domain	Men and Women, aged 10-70	Men, Women, and non-Binary people aged 10-40
	$\chi^2, (\Delta df), p$	$\chi^2, (\Delta df), p$
Self-Management Skills	4.40, (3.75), .008	4.71, (5.36), .019
Social Engagement Skills	1.02, (3.75), .686	2.70, (4.08), .255
Cooperation Skills	12.36, (4.75), <.001	9.19, (8.03), .002
Emotional Resilience Skills	7.77, (4.32), .003	9.91, (7.48), .005
Innovation Skills	5.18, (1.14), <.001	5.43, (4.70), .006

Note. Table shows results from ANOVA comparisons (likelihood ratio tests) between models with and without gender-specific age smooths. χ^2 represents the deviance difference, Δdf represents the difference in effective degrees of freedom between models. Significance levels based on $p < .001$.

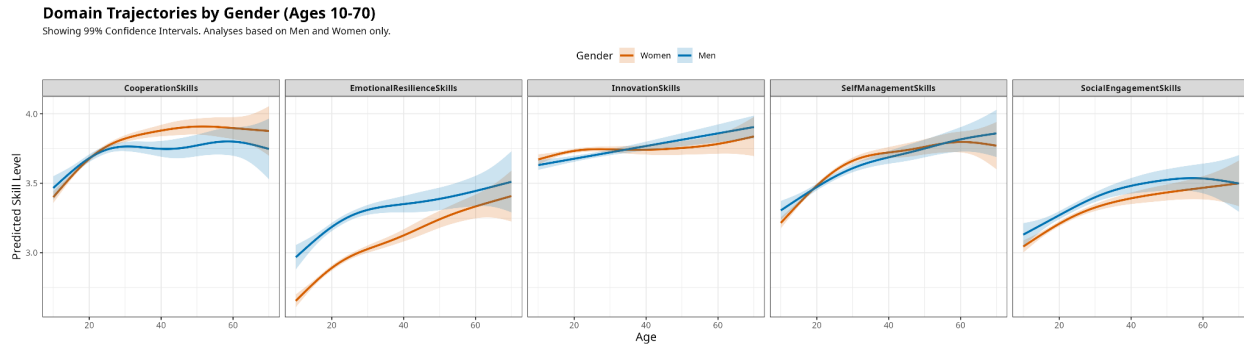
Table 6 summarizes the effect sizes for gender differences in SEB skill age-related differences. The interaction terms for Self-Management, Cooperation, Emotional Resilience, and Innovation were statistically significant but not necessarily meaningful, as the variance they uniquely explained was quite small ($\Delta R^2 = .001$). However, visual inspection of the trajectories suggested some differences of note (Figure 7). For example, for Cooperation Skills, women showed more improvement from age 10 to 70 ($d = 0.76$) than men ($d = 0.45$), particularly during middle adulthood, which led to the emergence of a significant gender difference during this developmental period (as shown by the non-overlapping confidence intervals in Figure 8). By contrast, women/girls reported significantly lower Emotional Resilience Skills than men/boys during adolescence and early adulthood, but then showed larger gains during middle adulthood, thereby closing the gender gap.

Table 6*Effect Sizes for Domain-Level Age Differences, by Gender*

Domain	Comparison	ΔR^2	d-like (Women)	d-like (Men)	d-like (Non- binary)
Self-Management Skills	Women & Men (10-70)	.001	.94	0.93	
	Women, men, and non-binary (10-40)	0	.59	0.70	1.17
Social Engagement Skills	Women & Men (10-70)	0	.64	0.52	
	Women, men, and non-binary (10-40)	0	.39	0.55	.91
Cooperation Skills	Women & Men (10-70)	.001	.76	0.45	
	Women, men, and non-binary (10-40)	.001	.52	0.41	.75
Emotional Resilience Skills	Women & Men (10-70)	.001	1.05	0.76	
	Women, men, and non-binary (10-40)	.001	.54	0.63	1.22
Innovation Skills	Women & Men (10-70)	.001	.28	0.46	
	Women, men, and non-binary (10-40)	0	.12	0.23	.37

Note. ΔR^2 = Change in adjusted R-squared from adding the gender*age interaction term. *d*-like values represent the standardized change across the specified age range for each gender group, derived from the interaction model.

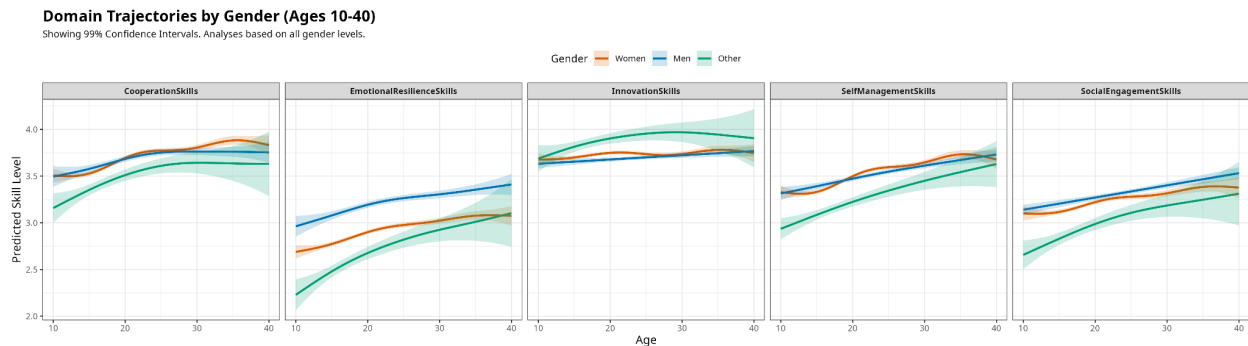
Figure 8*Lifespan Age-Related Difference Domain Trajectories for Men and Women*



We also conducted exploratory analyses to investigate age differences among non-binary individuals as compared with men and women. Of the 1,475 participants who reported their gender identity as non-binary, 1,448 (98%) were 40 years old or younger. Therefore, we restricted these analyses to participants aged 10-40. As illustrated in Figure 9, non-binary participants from age 10 to approximately age 25 reported significantly lower levels of Self-Management, Social Engagement, Cooperation, and Emotional Resilience skills, and significantly higher levels of Innovation Skills. Moreover, model comparison tests indicated that the developmental patterns for all domains except Social Engagement significantly differed across the three gender groups within this age range (see Table 5, right column). Examining the degree of change (see Table 6) revealed a striking pattern: across all five domains, non-binary individuals reported the most positive age differences in skills from age 10 to 40 (see Table 6, right column). This was particularly true for Emotional Resilience ($d = 1.22$) and Self-Management Skills ($d = 1.17$). Together, these results suggest that while non-binary youth may face considerable social, emotional, and behavioral challenges during adolescence, they tend to develop the skills needed to navigate these challenges with age.

Figure 9

Ages 10-40 Age-Related Difference Domain Trajectories for Men and Women and non-binary people



Discussion

This study provides one of the most comprehensive cross-sectional examinations to date of how social, emotional, and behavioral (SEB) skills show age-related differences across a large period of the life span. Our findings offer a nuanced picture of SEB skill development, which we can summarize by four key findings. We found that SEB skills:

1. *sometimes modestly and temporarily decline during early adolescence;*
2. *often improve markedly during late adolescence, then more gradually during adulthood;*
3. *display considerable heterogeneity in age-related trends at the facet level;*
4. *exhibit some gender differences in both initial levels and age trends.*

We structure most of this discussion around these four key findings, before turning to describe the limitations of this research, as well as future directions for research examining the development of SEB skills.

SEB skills modestly and temporarily decline during early adolescence, but then markedly improve across later adolescence and early adulthood

A first key finding is that, when focusing specifically on the adolescent period (ages 10-20), most SEB skill domains showed initial declines in average ratings from approximately age 10-11 to 12-13. This domain-level pattern was generally echoed at the facet level within this age range. One possible interpretation is that mean levels of SEB skills do, in fact, decline during early adolescence. These declines may reflect normative shifts in early adolescents' 1) social development, reflecting greater emphasis on peer relationships and social comparison than earlier in childhood (Lam et al., 2014; Sebastian et al., 2008); 2) academic development as students transition from primary school to middle or junior high school (Eccles & Roeser, 2011); and 3) biological development as youth undergo puberty, and brain systems linked with impulse generation develop faster than those linked with impulse regulation (Duckworth & Steinberg, 2015). This asynchrony between the socioemotional and cognitive control systems is a hallmark of adolescent brain development and offers a compelling neurobiological explanation for the temporary disruption in self-reported skills (e.g., Casey, Jones, & Hare, 2008). These rapid shifts may temporarily disrupt early adolescents' self-regulatory capacities.

Alternatively, SEB skills may not decline per se; rather, external expectations may increase faster than teens' capacity to meet them. This gap between expectation and capability produces a decline in self-reported skills until adolescents gain the necessary practice and development needed to meet these heightened expectations (Denissen et al., 2013). Future research that examines data on capacities and expectations drawn from multiple sources (e.g., self, peers, parents, teachers, performance-based assessments) is needed to distinguish between these two interpretations (Hang et al., 2023). However, regardless of their explanation, we also note that these early-adolescent declines in SEB skills are rather modest in size.

Following this disruption, our results suggest that SEB skills rapidly improve across middle adolescence through early adulthood (approximately ages 15-25). Should these cross-sectional data be supported by future longitudinal results, this would imply that middle adolescence through early adulthood is a particularly salient period for SEB skill development (Napolitano et al., 2021). This was not the only period of marked improvement: we also found unexpected evidence of a “second growth spurt” in SEB skills, occurring for most domains across the late 20s and into the mid 30s.

Why might these two developmental periods be associated with SEB skill improvement? If we view the results through the straightforward “practice makes perfect” lens, then these periods of the life span must be particularly marked by opportunities to practice and refine SEB skills (Roberts & Nickel, 2021). Adolescents and young adults navigate transitions across nearly every domain as they shape their identity and chart their futures. Similarly, many adults in their late 20s and early 30s marry (or enter committed relationships), start families, and establish careers. Taking on these new challenges and roles, we suspect, provides ample opportunities to develop and hone SEB skills.

Older participants generally report higher SEB skills

Zooming out beyond adolescence and young adulthood, an even broader finding is that, overall, SEB skills increase with age. That is, after participants emerged from the disruptions of early adolescence, their capacities to manage responsibilities, actively engage with people, maintain relationships, and regulate emotions improved. For Innovation Skills, this association was linear. For Self-Management, Social Engagement, Cooperation, and Emotional Resilience Skills age trends were instead nonlinear, with pronounced increases from adolescence through early adulthood, followed by decelerating growth and stabilization in middle-to-late adulthood.

These results support the “practice makes perfect” model because the upward trend characterized all 5 domains of SEB skills. In contrast, the gains in personality traits associated with maturity are localized to agreeableness, conscientiousness, and emotional stability (Bleidorn et al., 2022; Roberts & Wood, 2006; Roemer et al., 2025). This distinction is not merely of interest to personality psychologists; the finding that skills continue to develop across adulthood suggests that the capacity for positive change extends far beyond adolescence and that interventions aimed at promoting psychosocial skills may be effective across a wide range of adult ages.

The present findings provide further evidence that SEB skills and traits are empirically distinct. For example, the continued moderate improvements in Self-Management, Social Engagement, Cooperation, and Innovation Skills across middle and late adulthood contrast with evidence that Extraversion, Agreeableness, and Openness to Experience either plateau or decline during adulthood (Bleidorn et al., 2022). However, only a few studies to date have examined age differences in SEB skills (Feraco et al., 2023; Jalynskij et al., 2025). Thus, further data is needed, particularly with large, longitudinal samples of adolescents and adults, to fully substantiate this distinction.

SEB skill facets display considerable heterogeneity in age-related trends

One benefit of the BESSI is the ability to collect broad data on SEB skill domains as well as finer-grained data on specific SEB skill facets. Our results examining individual SEB skill facets revealed considerable heterogeneity in their age-related difference trajectories. While nearly all facets showed non-linear age trends, their specific shapes varied substantially, even within domains. This heterogeneity does more than illustrate diverse self-perceptions. It underscores that policymakers, educators, and practitioners targeting specific skills may need to consider their potentially distinct developmental timelines as they prepare programs and

interventions. Moreover, these results provide further evidence regarding the utility and sensitivity of the BESSI itself: the heterogeneity suggests that participants can discern variations between their skills, rather than uniformly assessing their skill levels as consistently high, for example.

SEB skills exhibit some significant gender differences in trajectory shapes and levels

A final category of findings involved gender differences in age-related difference trajectories. We found evidence for some gender differences, though the patterns depended on the specific comparison. Comparing men and women across the lifespan (10-70), significant differences in age differences emerged only for Cooperation and Innovation Skills. For Cooperation Skills, age differences diverged in the 40s, with women increasing but not men, leading to the emergence of a gender difference. By contrast, for Emotional Resilience Skills, adolescent boys showed higher initial levels than girls; however, women showed more rapid gains than men during young adulthood, thereby substantially reducing the gender difference by middle age. This pattern may suggest the need for additional supports (e.g., interventions) to promote Emotional Resilience Skills for girls during adolescence.

Interestingly, exploratory analyses including non-binary participants found that non-binary early adolescents showed lower initial levels of all skill domains except Innovation. However, non-binary individuals showed more-positive age trends for almost all skill domains across adolescence and young adulthood, leading to the emergence of a gender difference in Innovation—and the reduction of gender differences in Self-Management, Cooperation, and Emotional Resilience Skills—by age 40.

Taken together, these results underscore the importance of considering diverse gender identities in SEB skills research. Notably, the lower levels reported by non-binary youth in

several domains could reflect the impact of societal discrimination among non-binary youth, who often face unique challenges related to identity affirmation, social acceptance, and navigating gendered expectations (e.g., Johns, et al., 2021; Testa, et al., 2015). In contrast, the higher Innovation Skills reported by non-binary youth could also reflect their resilience and adaptability.

Strengths, Limitations, and Future Directions

This study had several notable strengths as well as limitations. In terms of strengths, the large sample size allowed for rigorous evaluation of our research questions, and promoted generalizability, particularly during early portions of the life span. Moreover, our use of GAMs allowed us to model non-linear age trends, and our use of the BESSI as a well-validated, reliable, and integrated instrument for assessing SEB skills at both the domain and facet levels stands apart from research assessing SEB skills using less-comprehensive measures.

Regarding limitations, one key characteristic of this work is its cross-sectional nature, and thus its inability to track within-person change. Nevertheless, age-related differences can provide initial insights into developmental processes, particularly when related findings and conceptual foundations do not suggest strong potential age-cohort effects. Future longitudinal research can replicate and extend these initial, cross-sectional findings. A second limitation involves the sampling technique. We used a volunteer internet sample, which may limit the generalizability of the present results to non-volunteer populations. Future work using alternative recruitment methods, such as community-based samples or paid survey panels, can further test the present findings' generalizability. Third, our data for participants at the youngest and oldest ages in the sample (early teens and late middle age) is comparably sparse. Thus, we recommend caution in

direct interpretation of the point estimates for those age ranges and call for future work extending the present findings into younger and older developmental periods.

Future directions are ambitious but clear: long-term, intensive longitudinal studies are needed to track within-person change in SEB skills and understand its antecedents, correlates, and consequences. Research is also needed to test whether targeted interventions—such as social and emotional learning programs and volitional change interventions—can accelerate the cycle of skill practice and improvement (Durlak et al., 2022; Hudson et al., 2019; Stieger et al., 2021). Other future projects could involve further exploration of between-person facet-level heterogeneity, perhaps using person-centered methods such as latent profile analysis, which could reveal clusters of people characterized by unique profiles of strengths and weaknesses across skill facets. Finally, continued efforts to understand SEB skill development across diverse gender identities, cultures, and socioeconomic contexts will remain critical.

Conclusion

Practice does seem to gradually make perfect when it comes to most SEB skills. In general, we found that SEB skills improve as participants age, especially from middle adolescence through adulthood, though there are important nuances in these general patterns when assessing specific skills and gender differences. These broad age-related trends in SEB skill domains are like the maturation and disruption principles in personality psychology, with some exceptions—especially more widespread positive age trends for skills during adulthood—that further underscore the skill/trait distinction. Our findings highlight the need for longitudinal research that confirms similar developmental trajectories and informs programs, policies, and self-driven volitional strategies for cultivating these vital capacities across the lifespan.

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