Longitudinal associations of neuroticism with life satisfaction and social adaptation in a nationally representative adult sample

Schunk, Fabian; Trommsdorff, Gisela

Veröffentlichungsversion / Published Version
Zeitschriftenartikel / journal article

Empfohlene Zitierung / Suggested Citation:
Schunk, F., & Trommsdorff, G. (2022). Longitudinal associations of neuroticism with life satisfaction and social adaptation in a nationally representative adult sample. *Journal of Personality*, Early View, 1-15. https://doi.org/10.1111/jopy.12783

Received: 25 April 2022 | Revised: 6 October 2022 | Accepted: 9 October 2022

DOI: 10.1111/jopy.12783

ORIGINAL ARTICLE

WILEY

Longitudinal associations of neuroticism with life satisfaction and social adaptation in a nationally representative adult sample

Fabian Schunk | **Gisela Trommsdorff**

Department of Psychology, University of Konstanz, Konstanz, Germany

Correspondence
Fabian Schunk, Department of Psychology, University of Konstanz, Konstanz 78457, Germany.
Email: fabian.schunk@uni-konstanz.de

Abstract

Objective: Correlational studies have frequently linked neuroticism to lower well-being and poorer social adaptation. In this study, we examined the longitudinal associations of neuroticism with life satisfaction and aspects of social adaptation (i.e., loneliness, number of close friends, and interpersonal trust).

Method: Cross-lagged panel models (CLPMs) and random intercepts cross-lagged panel models (RI-CLPMs) were used to analyze the prospective associations between variables in a nationally representative adult sample from Germany ($N = 5{,}663$ to 11,079 per analysis; 2–4 measurement waves with lags of 4–5 years).

Results: CLPMs indicated that higher neuroticism was related to lower life satisfaction, higher loneliness, fewer friends, and lower interpersonal trust, but not vice versa. At the within-person level, RI-CLPMs revealed similar findings with increased neuroticism predicting decreases in life satisfaction, increases in loneliness, and decreases in interpersonal trust. Indices of social adaptation partially mediated the link between neuroticism and life satisfaction at the between-person but not at the within-person level. Exploratory multigroup analyses support the generalization of the cross-lagged effects of neuroticism on life satisfaction and social adaptation across age, gender, and geographical regions (East versus West Germany).

Conclusions: These findings highlight the role of neuroticism in shaping psychosocial outcomes over time.

KEYWORDS

life satisfaction, longitudinal analysis, neuroticism, random intercepts cross-lagged panel model, social adaptation

1 | INTRODUCTION

Neuroticism is defined as "the tendency to experience negative, distressing emotions" (Costa & McCrae, 1987, p. 301). Individuals with high levels of neuroticism are more likely to feel a sense of uncontrollability, perceive the world as threatening, react poorly to stress, and prefer avoidant-coping and dysfunctional emotion regulation strategies, such as rumination (Barlow et al., 2021; Barlow, Ellard, et al., 2014; Barlow, Sauer-Zavala, et al., 2014; Costa

& McCrae, 1987; Widiger & Oltmanns, 2017). Neuroticism is sometimes also referred to as "negative affectivity" (Watson & Clark, 1984).

Higher levels of neuroticism have been linked to affective disorders (Barlow et al., 2021; Williams et al., 2021), lower perceived social support (see Barańczuk, 2019, for a meta-analysis), and lower cognitive (e.g., lower life satisfaction) as well as lower affective well-being (e.g., less positive and more negative affect; see Anglim et al., 2020 for a meta-analysis). Several meta-analyses emphasize the critical role of neuroticism for well-being by showing that neuroticism is the strongest predictor of life satisfaction and negative affect out of the Big Five personality traits (Anglim et al., 2020; DeNeve & Cooper, 1998; Steel et al., 2008). Moreover, higher neuroticism has been linked to mental and physical health problems, such as depression, anxiety, social phobia, somatic complaints, cardiovascular disease, and disrupted immune functioning (Kotov et al., 2010; Lahey, 2009; Naragon-Gainey et al., 2013; Widiger & Oltmanns, 2017).

Unfortunately, the cited findings are largely based on cross-sectional data that cannot clarify whether neuroticism predicts subsequent well-being, whether well-being predicts subsequent neuroticism, or whether neuroticism and well-being predict each other reciprocally. Further, the limited number of longitudinal studies on neuroticism focused on well-being, thereby disregarding neuroticism's associations with other aspects of psychological functioning, such as social adaptation. Social adaptation is defined as the "adjustments to the demands, restrictions, and mores of society, including the ability to live and work harmoniously with others and to engage in satisfying social interactions and relationships" (American Psychological Association, 2015, p. 18). Research suggests that individuals who have difficulties in coping with negative emotions may face undesirable interpersonal consequences (English & Eldesouky, 2020). In particular, correlational findings have linked higher neuroticism to a higher sensitivity to social threats (Denissen & Penke, 2008), greater expectations to be disliked by others (Back et al., 2011), lower number of friends (Demir & Weitekamp, 2007), higher loneliness (Abdellaoui et al., 2019), less perceived social support (Ayub, 2015), and lower friendship satisfaction (Wilson et al., 2015), as well as lower intimate partner's relationship satisfaction (Malouff et al., 2010). Certain characteristics of neuroticism (e.g., emotional lability, avoidant coping) might impair social adaptation and the maintenance of relationships due to maladaptive interpersonal behavior. For instance, higher neuroticism was shown to be related to inconsistent behavior in social interactions (Clegg et al., 2021) and destructive conflict behavior (Jensen-Campbell & Graziano, 2001) that may damage social relationships. In addition, the formation of social bonds might be impeded as neuroticism has been linked to lower interpersonal trust (i.e., lower propensity to trust others; Evans & Revelle, 2008). Fostering stable social relationships and experiencing positive social interaction are known as critical predictors of subjective well-being (Berscheid & Reis, 1998). In addition to directly affecting well-being, neuroticism might therefore indirectly reduce subjective well-being through impaired social adaptation.

1.1 | The present research

Despite much research on the assumed psychological consequences of neuroticism, the temporal order of effects often remains inconclusive due to the cross-sectional design of most studies. Neuroticism might negatively predict well-being and social adaptation, but it is also possible that individuals with lower well-being and low social adaptation develop higher neuroticism. For instance, Soto (2015) suggested that individuals who are low in well-being because they frequently experience negative affect might internalize these negative emotions and develop higher neuroticism. Longitudinal studies that measure the presumed predictor and outcome at two or more measurement points are necessary to examine the prospective effect of neuroticism while controlling for reverse or reciprocal effects. Previous longitudinal research among nationally representative samples found bidirectional associations between neuroticism and aspects of well-being (Fetvadjiev & He, 2019; Soto, 2015), whereas a study among elderly participants reported effects of neuroticism on well-being and not vice versa (Kandler et al., 2015). Contrarily, Specht et al. (2013) found evidence for a unidirectional effect of life satisfaction on neuroticism. In contrast to well-being, little research has examined the prospective associations of neuroticism with social adaptation. As previously outlined, neurotic individuals may behave in socially obtrusive ways which may reduce social resources. For instance, neuroticism was shown to prospectively predict decreases in marital satisfaction (Karney & Bradbury, 1995; O'Meara & South, 2019). Further, a study using twin family data found a reciprocal relation between neuroticism and loneliness (Abdellaoui et al., 2019).

The purpose of this study was therefore to examine the prospective associations of neuroticism with life satisfaction (indicating cognitive well-being) and several indices of social adaptation (loneliness, number of close friends, and interpersonal trust) to gain a deeper insight into their relations over time. Wilson and Olino (2021) recently emphasized the need for more longitudinal research, particularly among participants of various ages, to elucidate the

temporal dynamics and underlying mechanisms linking personality characteristics to psychological outcomes. We tested three competing hypotheses to examine the longitudinal associations of neuroticism with life satisfaction and indices of social adaptation: (H1a) Neuroticism is bidirectionally related to lower life satisfaction and worse social adaptation, or (H1b) neuroticism predicts lower life satisfaction and worse social adaptation, but not vice versa, or (H1c) life satisfaction and social adaptation predict lower neuroticism, but not vice versa.

Furthermore, researchers have suggested that personality characteristics may indirectly relate to well-being through social behavior that promotes (or impedes) positive experiences (Anglim et al., 2020; Fetvadjiev & He, 2019; Lahey, 2009; Soto, 2015). We therefore examined the possible mechanisms linking neuroticism to lower life satisfaction by testing whether the longitudinal effect of neuroticism on life satisfaction was partially mediated through impaired social adaptation (H2). Finally, we conducted exploratory analyses, examining age, gender, and regional differences (East versus West Germany), to investigate the generalizability of the longitudinal associations of neuroticism with life satisfaction and social adaptation.

2 | METHOD

2.1 | Participants and procedure

The present study used data from the Socio-Economic Panel (SOEP; Liebig et al., 2021), a representative longitudinal panel dataset of the adult population in Germany. The data is freely available for scientists who sign an agreement with the German Institute for Economic Research (DIW Berlin; https://www.diw.de/en/diw_01.c.601584.en/data_access.html). The SOEP survey is conducted annually. However, not all variables are measured each year. To improve the interpretability of findings, we tested our hypotheses with two different methodological approaches:

In the first approach, we maximized the temporal overlap in the measurement of variables, resulting in two waves of data from 2013 (here: Wave 1) and 2017/2018 (here: Wave 2). Neuroticism, life satisfaction, and number of friends were measured in 2017, whereas trust and loneliness were measured in 2018. Data was included if participants answered all items of interest and were at least 18 years old at Wave 1. These criteria resulted in a sample of 11,079 participants ($M_{\text{age at Wave 1}}$ = 52.75 years, SD_{age} = 16.38, Range = 18–98; 53.8% female). Data was analyzed using traditional cross-lagged panel models (CLPMs).

In the second approach, we accepted several discrepancies in the time of measurements to maximize the number of available waves. This resulted in four waves, except for analyses involving loneliness which had been only included in three waves of the SOEP. Neuroticism was measured in 2005, 2009, 2013, and 2017, loneliness in 2008, 2013, and 2018, number of close friends in 2003, 2008, 2013, and 2017, and interpersonal trust in 2003, 2008, 2013, and 2018. The years 2003 and 2005, 2008 and 2009, and 2017 and 2018 were merged into one measurement wave, respectively. Consequently, we obtained four waves with Wave 1 (2003/2005), Wave 2 (2008/2009), Wave 3 (2013), and Wave 4 (2017/2018). In the case of analyses involving loneliness, we used three waves starting with Wave 1 (2008/2009). Although this approach resulted in a somewhat messier data structure, the larger number of waves enabled us to calculate random intercepts cross-lagged panel models (RI-CLPMs) that require a minimum of three waves. The RI-CLPM extends the CLPM by including random intercepts that account for the trait-like, time-invariant stability of constructs (Hamaker et al., 2015; Lucas, 2022). We applied listwise exclusion for each RI-CLPM, resulting in sample sizes between 5,663 and 7,217 per model.

2.2 | Measures

2.2.1 | Neuroticism

The Big Five Inventory-SOEP (BFI-S; Schupp & Gerlitz, 2014), a short version of the Big Five Inventory by John et al. (1991), measured neuroticism using three items that ask participants how much they agree with various statements ("Worries a lot", "Gets nervous easily", "Is relaxed, handles stress well" [reverse scored]; 1 = *strongly disagree*, 7 = *strongly agree*). These items were used to create a latent neuroticism factor, and invariance tests were conducted to examine the equivalence of the measurement model across time (Little, 2013). First, configural invariance was investigated by testing whether the same factor structure was applicable across measurement points. Next, metric invariance was tested by comparing the configural model to a model in which the factor loadings were constrained to be equal across time. Finally, scalar invariance was evaluated by comparing the metric invariance model to a model that also constrained item intercepts to equality across time. Invariance can be assumed when the change in CFI between subsequent models does not exceed 0.01 (Cheung & Rensvold, 2002). Results of measurement invariance testing are summarized in Table 1. The two-wave model of neuroticism (used in CLPMs) and the three-wave model of neuroticism (used in RI-CLPM with loneliness) demonstrated scalar invariance. We established partial scalar invariance for the four-wave model of

TABLE 1 Results of measurement invariance testing

Model	χ^2 (df)	RMSEA	TLI	CFI	ΔCFI
Neuroticism (2 waves: 2013–2017)					
Configural	20.91 (5)**	0.017	0.997	0.999	–
Metric	23.60 (7)**	0.015	0.998	0.999	<0.001
Scalar	40.80 (9)**	0.018	0.997	0.998	0.001
Neuroticism (3 waves: 2009–2013–2017)					
Configural	38.68 (15)**	0.014	0.998	0.999	–
Metric	48.96 (19)**	0.014	0.998	0.999	<0.001
Scalar	112.40 (23)**	0.022	0.994	0.996	0.003
Neuroticism (4 waves: 2005–2009–2013–2017)					
Configural	74.59 (30)**	0.015	0.996	0.998	–
Metric	100.03 (36)**	0.016	0.996	0.998	<0.001
Scalar[a]	622.60 (42)**	0.045	0.967	0.979	0.019
Partial scalar[b]	179.01 (41)**	0.022	0.992	0.995	0.003
Interpersonal trust (2 waves: 2013–2018)					
Configural	40.81 (5)**	0.025	0.992	0.997	–
Metric	76.47 (7)**	0.030	0.989	0.995	0.002
Scalar	106.58 (9)**	0.031	0.988	0.993	0.002
Interpersonal trust (4 waves: 2003–2008–2013–2018)					
Configural	120.80 (30)**	0.022	0.989	0.995	–
Metric	142.04 (36)**	0.022	0.990	0.994	0.001
Scalar	176.49 (42)**	0.023	0.989	0.993	0.001

[a]This model was rejected since ΔCFI > 0.01.

[b]In this model, we released the constraint on one item intercept in the first wave ("Worries a lot", 2005).

**$p < .001$.

neuroticism (used in RI-CLPMs without loneliness) after releasing the constraint on one item intercept in the first wave ("Worries a lot", 2005).

2.2.2 | Life satisfaction

Overall life satisfaction was measured with a single item ("How satisfied are you with your life, all things considered?"; 0 = *completely dissatisfied*, 10 = *completely satisfied*).

2.2.3 | Social adaptation

We identified various indices of social adaptation provided by the SOEP that were relevant for our research purpose. These indices were analyzed separately as they capture distinct aspects of social adaptation. The subjective feeling of *loneliness* was measured with a single item ("I often feel lonely"; 1 = *strongly disagree*, 5 = *strongly agree*). Further, we used the item *number of close friends* ("How many close friends would you say that you have?"; Open answer format) to obtain information on participants' self-perceived amount of friends. Finally, *interpersonal trust* was assessed with three items ("On the whole, one can trust people", "Nowadays one can't depend on anyone", "When dealing with strangers, it is better to be cautious before trusting them" [last two items reverse scored]; 1 = *strongly disagree*, 4 = *strongly agree*). Further information on the use of this scale within the SOEP can be found in Dohmen et al. (2008). Analogous to neuroticism, we used these three items to estimate a latent factor for trust and assessed configural, metric, and scalar invariance over time. Both the two-wave model (used in CLPMs) and the four-wave model (used in RI-CLPMs) demonstrated scalar invariance (see Table 1).

2.3 | Data processing and analytic strategies

We ran cross-lagged panel models (CLPMs) and random intercepts cross-lagged panel models (RI-CLPMs) in Mplus 8.7 to examine the temporal associations of neuroticism with life satisfaction and social adaptation. Our models included both latent constructs (neuroticism and interpersonal trust) and observed indicators for single-item constructs (life satisfaction, loneliness, and number

TABLE 2 Zero-order correlations of variables within each wave of traditional cross-lagged panel models

Variable	1	2	3	4	5
1. Neuroticism	–	−0.38**	0.32**	−0.10**	−0.27**
2. Life satisfaction	−0.37**	–	−0.37**	0.14**	0.30**
3. Loneliness	0.27**	−0.30**	–	−0.10**	−0.18**
4. Number of friends	−0.09**	0.12**	−0.09**	–	0.19**
5. Interpersonal trust	−0.27**	0.29**	−0.18**	0.18**	–

Note: Correlations for Wave 1 are displayed above the diagonal and correlation for Wave 2 are displayed below the diagonal. Wave 1 = year 2013; Wave 2 = year 2017 (neuroticism, life satisfaction, number of friends) and year 2018 (interpersonal trust, loneliness).

**$p < .01$.

of close friends). Latent factors were estimated for the respective constructs, allowing for residual correlations between indicators across measurement points. CLPMs were used for models with two measurement waves, whereas RI-CLPM were used (and can only be used) for models with at least three measurement waves. CLPMs examine the prospective effect of individual differences in one construct on the change in individual differences in another construct by controlling for autoregressive effects (Orth et al., 2021). RI-CLPMs extend CLPMs by including random intercepts to control for the trait-like, time-invariant stability of constructs (Hamaker et al., 2015; Lucas, 2022). Consequently, cross-lagged effects in RI-CLPMs indicate the prospective effect of within-person deviation from the trait level of a construct on change in the within-person deviation from the trait level of another construct. For instance, analogous to the examples given by Orth et al. (2021), CLPMs test whether individuals high in neuroticism (relative to others) will experience a subsequent rank-order decrease in life satisfaction as compared to individuals with low neuroticism. In contrast, RI-CLPMs test whether individuals will experience a subsequent decrease in life satisfaction when they are higher in neuroticism than usual (i.e., relative to their trait level). For RI-CLPMs, we used cross-wave equality constraints on the standardized regression coefficients to obtain only one estimate per effect, thus simplifying the reporting and interpretation of findings (Orth et al., 2021; for Mplus syntax see https://jeroendmulder.github.io/RI-CLPM/). We evaluated the model fit of each model based on established rules of thumb for the interpretation of model fit indices (good fit: RMSEA ≤ 0.05, CFI ≥ 0.97, TLI ≥ 0.97, SRMR ≤ 0.05; acceptable fit: RMSEA ≤ 0.08, CFI ≥ 0.95, TLI ≥ 0.95, SRMR ≤ 0.10; Schermelleh-Engel et al., 2003). Orth et al. (2022) recently identified the following benchmarks for interpreting the effect size of cross-lagged effects for both CLPMs and RI-CLPMs: $\beta = .03$ (small effect), $\beta = .07$ (medium effect), and $\beta = .12$ (large effect). Mplus scripts of our analyses are provided on the Open Science Framework (OSF) at https://osf.io/cr2g9.

3 | RESULTS

3.1 | Neuroticism and life satisfaction

3.1.1 | Cross-lagged panel model (CLPM)

Zero-order correlations among study variables for both waves used within CLPMs (Wave 1 [W1]: 2013; Wave 2 [W2]: 2017/2018) are presented in Table 2. Longitudinal associations between neuroticism and life satisfaction were tested by running a CLPM with neuroticism at Wave 1 predicting both neuroticism at Wave 2 (autoregressive path) and life satisfaction at Wave 2 (cross-lagged path). Similarly, we used life satisfaction at Wave 1 to predict both life satisfaction (autoregressive path) and neuroticism (cross-lagged path) at Wave 2. Cross-sectional correlations between neuroticism and life satisfaction were calculated for both measurement points.

Model fit indices suggested an acceptable to good fit of the model, χ^2 (13) = 641.60, $p < .001$, RMSEA = 0.07, CFI = 0.97, TLI = 0.94, SRMR = 0.03. As can be seen in Figure 1, the autoregressive paths of neuroticism (W1) on neuroticism (W2) and life satisfaction (W1) on life satisfaction (W2) indicated a high stability of both constructs over the four years, particularly so for neuroticism ($\beta = .81$, $p < .001$ and $\beta = .46$, $p = .001$, respectively). In line with H1b, neuroticism (W1) predicted lower life satisfaction (W2), $\beta = -.14$, $p < .001$. In turn, life satisfaction (W1) did not predict neuroticism (W2), $p = .774$.

3.1.2 | Random intercepts cross-lagged panel model (RI-CLPM)

Next, we used a RI-CLPM to examine the longitudinal associations between neuroticism and life satisfaction across four waves at the within-person level (see Figure 2). The model fitted well, χ^2 (90) = 1023.90, $p < .001$, RMSEA = 0.04, CFI = 0.98, TLI = 0.97, SRMR = 0.04. The autoregressive paths were 0.41 ($p < .001$) for neuroticism and 0.10 ($p < .001$) for life satisfaction The cross-lagged

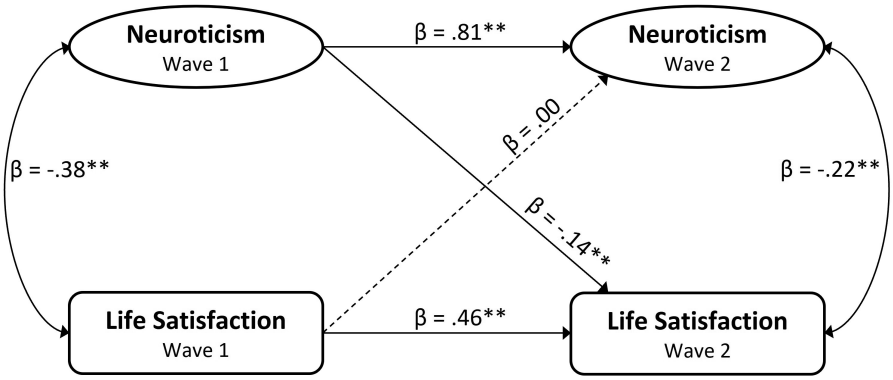

FIGURE 1 Cross-lagged panel model for neuroticism and life satisfaction. The items indicating the latent neuroticism factor are not depicted for better comprehensibility. Dashed lines indicate nonsignificant paths. *$p < .05$, **$p < .01$.

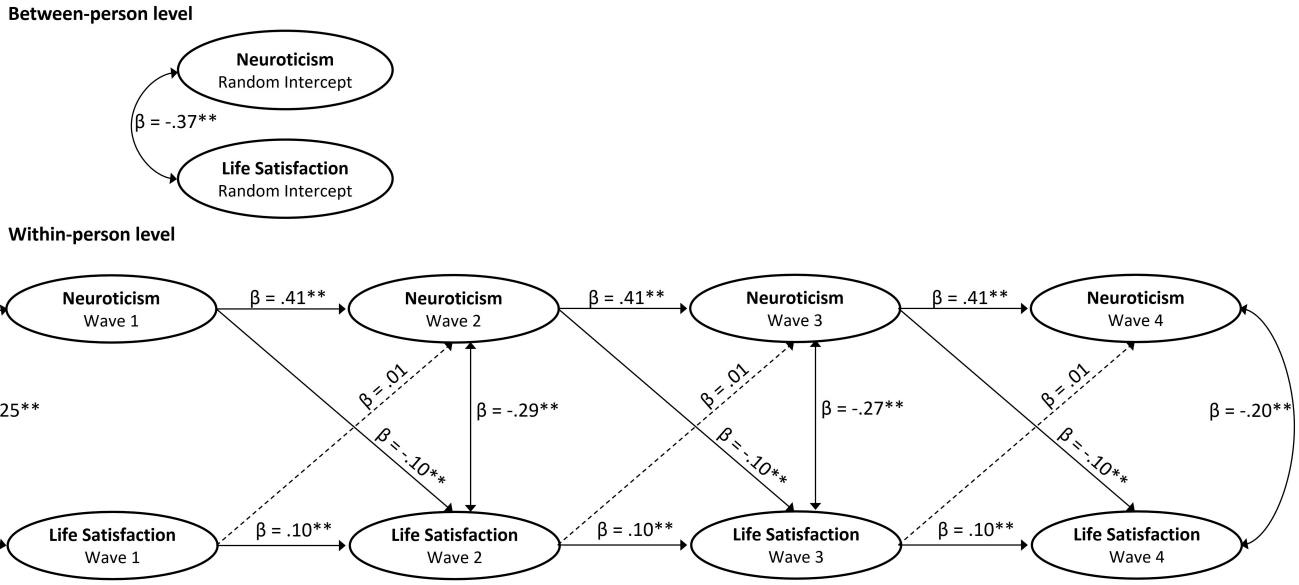

FIGURE 2 Simplified illustration of random intercepts cross-lagged panel model for neuroticism and life satisfaction. Dashed lines indicate nonsignificant paths. *$p < .05$, **$p < .01$.

effects were similar to the findings obtained using CLPM, with neuroticism predicting lower life satisfaction, $\beta = -.10$, $p < .001$, whereas life satisfaction did not predict neuroticism, $p = .664$. In other words, individuals with increased neuroticism (relative to their trait level) experienced a subsequent decrease in life satisfaction. Thus, H1b was supported with regard to life satisfaction.

3.2 | Neuroticism and social adaptation

3.2.1 | Cross-lagged panel models (CLPMs)

We analogously examined the temporal effects of neuroticism on each indicator of social adaptation (loneliness, number of close friends, and interpersonal trust, respectively). All three traditional CLPMs fitted well (Loneliness: χ^2 (13) = 302.76, $p < .001$, RMSEA = 0.05, CFI = 0.99, TLI = 0.97, SRMR = 0.02; Number of friends: χ^2 (13) = 84.28, $p < .001$, RMSEA = 0.02, CFI > 0.99, TLI = 0.99, SRMR = 0.01; Interpersonal trust: χ^2 (42) = 812.79, $p < .001$, RMSEA = 0.04, CFI = 0.98, TLI = 0.96, SRMR = 0.04). Path coefficients are summarized in Table 3. Again, findings are consistent with a unidirectional effect of neuroticism (H1b): neuroticism (W1) predicted higher loneliness (W2), $\beta = .15$, $p < .001$, lower number of close friends (W2), $\beta = -.03$, $p = .012$, and lower trust in others (W2), $\beta = -.08$, $p < .001$. Neither loneliness (W1), number of friends (W1), nor interpersonal trust (W1) predicted neuroticism (W2), $ps \geq .277$.

3.2.2 | Random intercepts cross-lagged panel models (RI-CLPMs)

We ran RI-CLPMs to test the associations of neuroticism with loneliness across three waves and with

TABLE 3 Standardized path coefficients from cross-lagged panel models (CLPMs) and random intercepts cross-lagged panel models (RI-CLPMs)

	CLPMs		RI-CLPMs	
	β	*p*	*β*	*p*
Autoregressive paths				
Neuroticism → Neuroticism	.80–.81[a]	<.001	.27–.41[b]	<.001
Life satisfaction → Life satisfaction	.46	<.001	.10	<.001
Loneliness → Loneliness	.30	<.001	.12	<.001
Number of friends → Number of friends	.51	<.001	.15	<.001
Interpersonal trust → Interpersonal trust	.65	<.001	.10	<.001
Cross-lagged paths				
Neuroticism → Life satisfaction	−.14	<.001	−.10	<.001
Life satisfaction → Neuroticism	.00	.774	.01	.664
Neuroticism → Loneliness	.15	<.001	.11	<.001
Loneliness → Neuroticism	.00	.862	.06	.016
Neuroticism → Number of friends	−.03	.012	.00	.897
Number of friends → Neuroticism	−.01	.277	.00	.926
Neuroticism → Interpersonal trust	−.08	<.001	−.08	.009
Interpersonal trust → Neuroticism	−.01	.659	.00	.887
Correlations between random intercepts				
Neuroticism ↔ Life satisfaction			−.44	<.001
Neuroticism ↔ Loneliness			.51	<.001
Neuroticism ↔ Number of friends			−.15	<.001
Neuroticism ↔ Interpersonal trust			−.31	<.001

Note: Path coefficients were constrained across waves. Time lags between assessments were between four and five years.

[a]The autoregressive path for neuroticism ranged from 0.80 to 81 across all four cross-lagged panel models.

[b]The autoregressive path for neuroticism ranged from 0.27 to 41 across all four random intercepts cross-lagged panel models.

number of close friends and interpersonal trust across four waves. Model fit indices were excellent (Loneliness: χ^2 (46) = 354.31, $p < .001$, RMSEA = 0.03, CFI = 0.99, TLI = 0.98, SRMR = 0.02; Number of friends: χ^2 (90) = 352.78, $p < .001$, RMSEA = 0.02, CFI = 0.99, TLI = 0.99, SRMR = 0.02; Interpersonal trust: χ^2 (228) = 1084.40, $p < .001$, RMSEA = 0.03, CFI = 0.98, TLI = 0.98, SRMR = 0.04). Path coefficients and correlations between random intercepts are provided in Table 3. At the within-person level, higher neuroticism predicted increases in loneliness, $\beta = .11$, $p < .001$, and decreases in interpersonal trust $\beta = -.08$, $p = .009$. Contrary to findings obtained via CLPM, higher loneliness also predicted increases in neuroticism, $\beta = .06$, $p = .016$, and neuroticism did not predict number of friends ($p = 897$).

3.3 | Social adaptation as a mediator

Next, we ran mediation analyses with both CLPMs and RI-CLPMs to test whether indices of social adaptation mediated the longitudinal link between neuroticism and life satisfaction.

3.3.1 | Cross-lagged panel models (CLPMs)

For CLPMs, a half-longitudinal design was applied since data for only two measurement points was available. In this case, the indirect effect is calculated by multiplying the effect of the predictor (W1) on the mediator (W2) with the effect of the mediator (W1) on the outcome (W2; as outlined by Cole and Maxwell [2003]; Little et al. [2007]; Preacher [2015]). We subsequently tested loneliness, number of close friends, and interpersonal trust as mediators in the longitudinal relationship between neuroticism and life satisfaction. For illustrative purposes, Figure 3 depicts the model with loneliness as a mediator. All three mediation models yielded acceptable to good model fit indices (Loneliness: χ^2 (24) = 804.21, $p < .001$, RMSEA = 0.05, CFI = 0.97, TLI = 0.94, SRMR = 0.03; Number of friends: χ^2 (24) = 672.56, $p < .001$, RMSEA = 0.05, CFI = 0.98,

TLI = 0.95, SRMR = 0.03; Interpersonal Trust: χ^2 (61) = 1380.10, $p < .001$, RMSEA = 0.04, CFI = 0.97, TLI = 0.95, SRMR = 0.04). Partial mediation (as predicted in H2) was supported as we obtained significant indirect effects of neuroticism on life satisfaction through loneliness, number of friends, and interpersonal trust, respectively. The direct and indirect effects of each half-longitudinal mediation model are summarized in Table 4.

3.3.2 | Random intercepts cross-lagged panel models (RI-CLPMs)

We ran RI-CLPMs to test loneliness, number of close friends, and interpersonal trust as mediators in the longitudinal relationship between neuroticism and life satisfaction, respectively. First, we computed three mediation models in which the direct effect of neuroticism on life satisfaction was modeled to take two units of time (e.g., from Wave 1 to Wave 3 and from Wave 2 to Wave 4; corresponding to Model 2 by Maxwell et al., 2011). All mediation models fitted well (Loneliness: χ^2 (74) = 801.27, $p < .001$, RMSEA = 0.04, CFI = 0.98, TLI = 0.97, SRMR = 0.03 Number of friends: χ^2 (147) = 1061.86, $p < .001$, RMSEA = 0.03, CFI = 0.98, TLI = 0.97, SRMR = 0.03; Interpersonal trust: χ^2 (317) = 1743.13, $p < .001$, RMSEA = 0.03, CFI = 0.97, TLI = 0.07, SRMR = 0.04). Notably, neither loneliness nor number of friends nor interpersonal trust mediated a link between neuroticism and life satisfaction ($ps > .172$).

Next, we calculated alternative mediation models in which the direct effect of neuroticism on life satisfaction was modeled to take one unit of time (e.g., from Wave 1 to Wave 2, and so on; corresponding to Model 1 by Maxwell et al., 2011). All models fitted similarly well (Loneliness: χ^2 (74) = 792.40, $p < .001$, RMSEA = 0.04, CFI = 0.98, TLI = 0.97, SRMR = 0.03; Number of friends: χ^2 (147) = 1032.75, $p < .001$, RMSEA = 0.03, CFI = 0.98, TLI = 0.97, SRMR = 0.03; Interpersonal trust: χ^2 (317) = 1710.81, $p < .001$, RMSEA = 0.03, CFI = 0.97, TLI = 0.97, SRMR = 0.04). Again, no indirect effects through loneliness, number of friends, or interpersonal were obtained ($ps > .147$). Notably, we retrieved indirect effects of neuroticism (time 1) through neuroticism (time 2) on life satisfaction (time 3), $\beta = -.05$ to -0.06, $ps < .017$, and indirect effects of neuroticism (time 1) through life satisfaction (time 2) on life satisfaction (time 3), $\beta = -.01$, $ps < .004$. Post-hoc analyses with CLPMs for the same waves used in the RI-CLPMs revealed significant but minor indirect effects through each mediator (βs between -0.002 and -0.016), similar to our findings obtained via the previously reported two-wave half-longitudinal CLPMs (see supplementary output files on the OSF at https://osf.io/cr2g9).

3.4 | Exploratory analyses: Age, gender, and regional differences in path coefficients

We ran multigroup analyses to explore whether the CLPMs and RI-CLPMs on associations of neuroticism with life satisfaction and social adaptation differ depending on participant's age, gender, or region (i.e., participants living in East [n = 2703 for CLPMs] or West [n = 8376 for CLPMs] Germany at Wave 1). Group differences in regression coefficients can be understood as moderation effects. To examine age differences, participants were categorized as young adults (18 to 34 years;

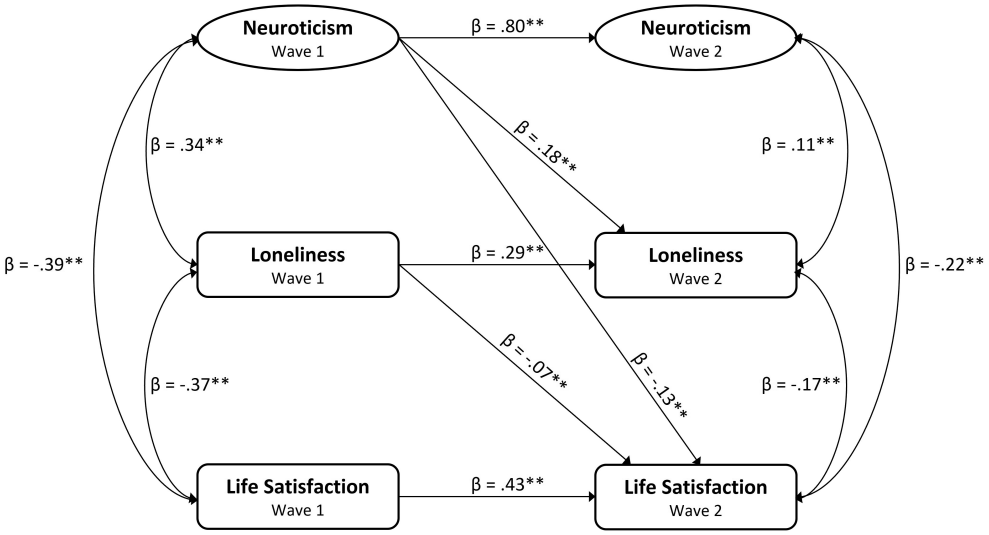

FIGURE 3 Half-longitudinal mediation model (mediator = loneliness). The items indicating the latent neuroticism factor are not depicted for better comprehensibility. *$p < .05$, **$p < .01$.

TABLE 4 Direct and indirect effects from cross-lagged panel models with half-longitudinal designs

	b	95% CI
Mediation Model 1 (Loneliness)		
Neuroticism W1 → Life satisfaction W2	−0.23	[−0.27, −0.18]
Neuroticism W1 → Loneliness → Life satisfaction W2	−0.02	[−0.03, −0.02]
Mediation Model 2 (Number of friends)		
Neuroticism W1 → Life satisfaction W2	−0.24	[−0.28, −0.20]
Neuroticism W1 → Number of friends → Life satisfaction W2	−0.003	[−0.004, −0.001]
Mediation Model 3 (Interpersonal trust)		
Neuroticism W1 → Life satisfaction W2	−0.20	[−0.24, −0.16]
Neuroticism W1 → Interpersonal trust → Life satisfaction W2	−0.02	[−0.02, −0.01]

Note: W1 = Wave 1 (year 2013); W2 = Wave 2 (year 2017 [neuroticism, life satisfaction, number of friends] and year 2018 [interpersonal trust, loneliness]). Values are unstandardized regression coefficients.

n = 1822 for CLPMs), middle-aged adults (35 to 64 years; n = 6292 for CLPMs), older adults (65 to 80 years; n = 2686 for CLPMs), or very old adults (81 years or more; n = 279 for CLPMs). However, for RI-CLPMs, we merged older adults and very old adults into one "older adults" category since this categorization was more sensible for analyses using large time intervals (e.g., individuals who were 81 years old during the first wave in our RI-CLPMs may have been deceased at the last measurement wave). We provided only the CLPMs' subsample sizes in brackets since these models used the same sample for all analyses, whereas sample sizes for RI-CLPMs differ slightly due to using listwise exclusion per analysis. The interested reader can find the individual sample sizes and further information on the calculated models on the OSF at https://osf.io/cr2g9. Multigroup SEMs were conducted by comparing an unrestricted model to a restricted model with constrained standardized path coefficients across the respective moderator variable. Results of chi-square difference tests for the comparison of constrained and unconstrained models are presented in Table 5. Significant differences were followed up using Wald tests to identify the specific path coefficient that differed across groups.

3.4.1 | Cross-lagged panel models (CLPMs)

CLPMs indicated that the autoregressive effect of life satisfaction at Wave 1 on life satisfaction at Wave 2 was significantly weaker among young adults (β = .37) as compared to middle-aged (β = .48), $\chi^2(1) = 25.64$, $p < .001$, and older adults (β = .46), $\chi^2(1) = 24.66$, $p < .001$. Further, the autoregressive effect of friends (Wave 1) on friends (Wave 2) was stronger among older adults (β = .56), as compared to young adults (β = .49), $\chi^2(1) = 14.78$, $p < .001$, middle-aged adults (β = .51), $\chi^2(1) = 9.79$, p = .002, and very old adults (β = .35), $\chi^2(1) = 4.17$, p = .041. The findings also revealed a significant but small effect of friends (W1) on neuroticism (W2) among young adults (β = −.06, p = .018) that was significantly stronger as compared to the nonsignificant effect among older adults (β = −.01, p = .522), $\chi^2(1) = 5.38$, p = .020.

As for gender differences, the autoregressive effect of friends (W1) on friends (W2) was stronger among females (β = .53) as compared to males, (β = .50), $\chi^2(1) = 19.44$, $p < .001$. Similarly, the autoregressive effect of loneliness indicated a higher stability across time for females (β = .32) as for males (β = .26), $\chi^2(1) = 8.02$, p = .005. We found no regional differences when comparing participants from East and West Germany.

3.4.2 | Random intercepts cross-lagged panel models (RI-CLPMs)

Interestingly, RI-CLPMs indicated a positive effect of life satisfaction on neuroticism for older adults (β = .12, p = .011) which was significantly stronger as compared to the nonsignificant effect among middle-aged adults, (β = −.01, p = .661), $\chi^2(1) = 6.16$, p = .013. We found no other age differences when using RI-CLPMs.

The exploration of gender differences revealed a significantly stronger effect of neuroticism on life satisfaction for males (β = −.17) as compared to females (β = −.06), $\chi^2(1) = 6.05$, p = .014. Further, life satisfaction predicted a prospective increase of neuroticism for females (β = .05, p = .027) but not for males (β = −.04, p = .132), $\chi^2(1) = 6.82$, p = .009. Similarly, loneliness predicted increased neuroticism for females (β = .12, p = .003) but not for males (β = .01, p = .760), $\chi^2(1) = 4.11$, p = .043. The effect of loneliness on loneliness was also stronger for females (β = .16) as compared to males (β = .06), $\chi^2(1) = 7.45$, p = .006. Finally, in the model including friends, the autoregressive effect of neuroticism on neuroticism was found to be stronger for males (β = .51) as compared to females (β = .29), $\chi^2(1) = 6.93$, p = .009. Consistent with

TABLE 5 Results of chi-square difference tests for the comparison of constrained vs. unconstrained multigroup models (predictor = neuroticism)

		CLPMs		RI-CLPMs	
Outcome variable	**Moderator/Grouping variable**	$\Delta\chi^2$ (Δdf)	*p*	$\Delta\chi^2$ (Δdf)	*p*
Life satisfaction	Age	49.00 (12)	<.001	16.96 (8)	.031
Loneliness	Age	12.84 (12)	.381	5.18 (8)	.738
Number of close friends	Age	28.92 (12)	.004	12.90 (8)[a]	.116
Interpersonal trust	Age	15.67 (12)	.207	6.07 (8)	.640
Life satisfaction	Gender	5.00 (4)	.287	13.51 (4)	.009
Loneliness	Gender	10.96 (4)	.027	12.08 (4)	.017
Number of close friends	Gender	22.32 (4)	<.001	11.53 (4)	.021
Interpersonal trust	Gender	5.22 (4)	.265	5.30 (4)	.258
Life satisfaction	East vs. West Germany	2.00 (4)	.736	0.82 (4)	.935
Loneliness	East vs. West Germany	2.84 (4)	.585	1.52 (4)	.823
Number of close friends	East vs. West Germany	0.51 (4)	.972	8.63 (4)	.071
Interpersonal trust	East vs. West Germany	2.42 (4)	.658	2.13 (4)	.711

[a]For this analysis, we originally calculated a RI-CLPM that yielded an improper solution (a negative variance for the random intercept of friends). We repeated the model with cross-wave equality constraints on the unstandardized (instead of standardized) regression coefficients which worked without issues. The here reported statistical values refer to this model.

CLPMs, we found no regional differences between participants from East and West Germany.

4 | DISCUSSION

The present study examined the longitudinal associations of neuroticism with life satisfaction and several specific indices of social adaptation (loneliness, number of close friends, and interpersonal trust) using both traditional cross-lagged panel models (CLPMs) and random intercepts cross-lagged panel models (RI-CLPMs). Further, we investigated the mechanisms linking neuroticism to decreased life satisfaction over time by testing the above-mentioned aspects of social adaptation as mediators. Supporting H1b, neuroticism unidirectionally predicted life satisfaction and social adaptation across all four CLPMs. Specifically, individuals with higher neuroticism (relative to others) at Wave 1 experienced a subsequent rank-order decrease in life satisfaction, number of close friends, and interpersonal trust, and an increase in loneliness at Wave 2 (i.e., after 4–5 years). In turn, neither life satisfaction nor indices of social adaptation predicted neuroticism over time. At the within-person level, RI-CLPMs revealed mostly similar findings with increased neuroticism predicting decreases in life satisfaction, increases in loneliness, and decreases in interpersonal trust. Contrary to findings obtained via CLPMs, however, increased loneliness also predicted increases in neuroticism and neuroticism did not predict number of close friends. Interestingly, mediation models using CLPMs indicated that each aspect of social adaptation partially mediated the prospective negative effect of neuroticism on life satisfaction, whereas longitudinal mediation analyses using RI-CLPMs revealed no mediation effects. Consequently, H2 was rejected at the within-person level.

By using a combination of CLPMs and RI-CLPMs, we obtained strong empirical support for the negative psychological effects of neuroticism over time which is consistent with previous studies suggesting negative consequences of neuroticism for prospective well-being (e.g., Fetvadjiev & He, 2019; Kandler et al., 2015; Soto, 2015). Additionally, our findings add to past research by indicating that higher neuroticism is associated with lower social adaptation over time. Individuals with high levels of neuroticism have been suggested as behaving in socially obtrusive ways that may damage social relationships, for instance, by frequently experiencing and expressing intense negative emotions (Ozer & Benet-Martínez, 2006), behaving inconsistently in social interactions (Clegg et al., 2021), and displaying destructive conflict behavior (Jensen-Campbell & Graziano, 2001). Neuroticism may facilitate maladaptive social behavior that impedes social relationships as suggested by our findings that higher neuroticism was associated with an increased feeling of loneliness at both between- and within-person levels and a decreased number of friends at the between-person level (CLPM). Interestingly, our results indicate that higher neuroticism may also predict changes in attitudes towards social interactions, such as interpersonal trust, at the between- and within-person level. Neuroticism has been linked to more rumination (Nolen-Hoeksema et al., 2008) and a

higher sensitivity to social cues (Denissen & Penke, 2008) which may induce individuals to worry about the success of social interactions and impede their trust in others (Thielmann & Hilbig, 2015). Critically, neuroticism might thereby prevent individuals from trying to establish stable social relationships, even if skepticism towards others is objectively unfounded.

Notably, our findings imply that neuroticism might be more powerful in shaping subjective rather than objective aspects of social adaptation as suggested by the negligible cross-lagged effect of neuroticism on close friends in the CLPM ($\beta = -.03$) and the nonsignificant within-person effect of neuroticism on close friends in the RI-CLPM. The small effect in the CLPM is not surprising, considering that the mere number of self-reported friends does not say much about the quality of these social relationships (see Demir & Weitekamp, 2007, for further discussion of this issue). For instance, individuals with one or two close friends might be completely satisfied with their social life. Further, an individual's amount of close friends can be assumed to remain relatively stable over time (as the respective item referred to close friends, specifically) which may explain the absence of within-person effects on number of friends in the RI-CLPM. For example, individuals whose neuroticism increased may maintain the same number of close friends due to the durability of close friendships.

In contrast to our results for number of friends, we found medium to large effects of neuroticism on loneliness (CLPM: $\beta = .15$; RI-CLPM: $\beta = .11$) and medium effects of neuroticism on interpersonal trust (CLPM and RI-CLPM: $\beta = -.08$). Both variables could be described as subjective evaluations of social adaptation. Similar effect sizes (CLPM: $\beta = -.14$; RI-CLPM: $\beta = -.10$) were obtained for life satisfaction which can be understood as a cognitive evaluation of an individual's subjective well-being (Lucas et al., 1996). Notably, cross-sectional correlations within measurement waves of the CLPM (see Table 2) underline the weak interrelations of both neuroticism and life satisfaction with number of friends, whereas we retrieved substantial correlations of neuroticism and life satisfaction with the two other indices of social adaptation (loneliness and interpersonal trust).

Importantly, CLPMs indicated that neither life satisfaction nor any indicator of social adaptation predicted neuroticism. RI-CLPMs yielded unidirectional links of neuroticism with life satisfaction and interpersonal trust, and a bidirectional link between neuroticism and loneliness. In the latter case, the cross-lagged effect of neuroticism on loneliness was stronger as compared to the cross-lagged effect of loneliness on neuroticism (0.11 versus 0.06). Taken together, our findings are more in line with a unidirectional view of neuroticism predicting life satisfaction and social adaptation, but not vice versa (H1b). This contradicts previous findings on reciprocal relations between neuroticism and aspects of well-being (Fetvadjiev & He, 2019; Soto, 2015). Yet even those studies obtained stronger effects of neurotic tendencies on well-being than vice versa—analogous to our RI-CLPM result for loneliness—thereby supporting the relative importance of neuroticism for shaping psychological outcomes. The different findings for well-being, namely the absence of bidirectional relationships between neuroticism and life satisfaction in our study, might be partly explained by the different concepts and measures being used. For instance, the studies by Soto (2015) and Fetvadjiev and He (2019) included affective well-being which might be more likely to cause changes in neuroticism as compared to a cognitive evaluation of one's life satisfaction. Specifically, individuals who are low in affective well-being because they frequently experience negative affect might internalize these negative emotions and develop higher neuroticism (Soto, 2015). Although Soto (2015) assessed life satisfaction as well, his measure covered various domains of life satisfaction (e.g., satisfaction with financial situation) as opposed to our single-item measure of overall life satisfaction which may explain discrepancies in findings. Further, Fetvadjiev and He (2019) noted that "well-being's effects on traits are less consistent across measures and populations than traits' effects on well-being" (p. 461).

In addition to direct effects, personality traits might be indirectly related to well-being through social behavior that promotes or obstructs rewarding experiences (Fetvadjiev & He, 2019; Soto, 2015). Traditional CLPMs supported this assumption by showing that each indicator of social adaptation partially mediated the longitudinal effect of neuroticism on life satisfaction. This is consistent with a previous study demonstrating the mediating role of social support in the longitudinal link between neuroticism and life satisfaction among older adults (ages 60–66; Hansson et al., 2020). However, indirect effects had negligible effect sizes and mediation models using RI-CLPMs failed to replicate indirect effects at the within-person level. Even though decreased social adaptation seems to play some role in neuroticism's effect on life satisfaction at the between-person level, future research should look into further mediators that may account for stronger effects of neuroticism on life satisfaction (e.g., affective mediators, Liu et al., 2012). The mediating effect of social adaptation might be stronger across shorter intervals (e.g., over a few months or one or two years) as findings suggest that effect sizes decrease with longer longitudinal periods (Drummond et al., 2020). In particular, Orth et al. (2021) argued that cross-lagged effects obtained by the RI-CLPM are often more short-term compared to the cross-lagged effects

captured by the CLPM which may explain the absence of indirect effects in RI-CLPMs.

Using a large nationally representative adult sample from Germany allowed us to conduct exploratory multigroup comparisons to examine several potential moderators (age, gender, and region) in our models. All multigroup analyses indicated that the obtained negative effects of neuroticism on life satisfaction and social adaptation applied across age, gender, and geographical regions (East versus West Germany), albeit the strength of neuroticism's effect differed in one case. Specifically, the within-person effect of neuroticism on life satisfaction was stronger for females as compared to males, suggesting that women who increased in neuroticism experienced a stronger subsequent decrease in life satisfaction as compared to men. Further, RI-CLPMs revealed bidirectional associations for females (but not for males) in the links of neuroticism with loneliness and life satisfaction, respectively. Women whose loneliness increased experienced a subsequent increase in neuroticism. Surprisingly, women who increased in life satisfaction also experienced an increase in neuroticism (however, this effect was small with $\beta = .05$). We obtained further gender differences with females having stronger autoregressive effects of number of friends (only in CLPM) and loneliness (both CLPM and RI-CLPM) as compared to males.

Furthermore, CLPMs indicated some interesting age differences in the autoregressive effects of life satisfaction and number of friends. Life satisfaction predicted a stronger subsequent rank-order increase in life satisfaction for middle-aged and older adults as compared to young adults which is in line with studies on the stability of well-being in later adulthood (e.g., Kandler et al., 2015). Young adults might experience more changes in their life (e.g., career, marriage, getting children) that facilitate a higher variation in life satisfaction as compared to older participants. Similarly, the autoregressive effect of number of friends was stronger among older adults as compared to young, middle-aged, and very old adults. Older participants might have established a stable circle of friends, whereas younger participants might be more likely to change their friendship networks. The reason why the stability of friends became lower among very old (>80 years at first wave) adults as compared to older adults (65 to 80 years) is probably due to the increasing likelihood of losing friends passing away at higher age. Multigroup comparisons through CLPM further revealed that young adults with a high relative to a low number of friends experienced a (small) rank-order decrease in neuroticism, and this effect was significantly different from the nonsignificant effect among older adults. Yet, these age differences were absent in RI-CLPMs which can be attributed to the inclusion of random intercepts that captured the stable, trait-like stability of constructs.

Finally, we obtained an intriguing age difference through RI-CLPMs, indicating a positive effect of life satisfaction on neuroticism for older adults (>65 years at first wave) that was significantly stronger as compared to the nonsignificant effect among middle-aged adults. Specifically, older adults whose life satisfaction increased experienced a subsequent increase in neuroticism. Notably, we still found higher neuroticism predicting a subsequent decrease in life satisfaction among older adults. The positive within-person effect of life satisfaction on neuroticism among older adults seems baffling and further research might be needed to understand the nature of this longitudinal association, for instance, by examining potential confounding variables.

4.1 | Limitations and future directions

The present research used traditional cross-lagged panel models (CLPMs) and random intercepts cross-lagged panel models (RI-CLPMs) to examine the longitudinal associations of neuroticism with life satisfaction and social adaptation. Despite the obvious advantage of this methodology compared to cross-sectional designs and longitudinal studies that do not control for the prior level of outcomes or do not account for between-person variance (as does the RI-CLPM), we are unable to draw causal inferences which require experimental designs. Our findings would provide evidence for causal effects of neuroticism on life satisfaction and social adaptation only under the assumption that there are no time-varying confounding factors that affect the examined variables with different time lags (Hamaker et al., 2015; Usami et al., 2019). Yet, the influence of confounding variables cannot be ruled out. Furthermore, restricted data availability induced us to allow for several discrepancies in the time of measurements for the calculation of RI-CLPMs by merging different years into the same wave (e.g., variables measured in 2003 and 2005 were included in Wave 1). The resulting RI-CLPMs could be criticized as using a messy research design. For this reason, RI-CLPMs were complemented by two-wave CLPMs that applied a cleaner design by maximizing the temporal overlap in the measurement of variables. CLPMs, in turn, were limited by not controlling for the trait-like stability of constructs. Although both models have their weaknesses, the comparison of results obtained through CLPMs and RI-CLPMs allowed for more substantial conclusions than would have been possible using either method alone. It is particularly noteworthy that both models yielded very similar cross-lagged effects for our primary analyses (see Table 3), despite not only using a different methodology but also including a different number of measurement waves (i.e., between two and four waves).

Since we used nationally representative data from German adults, the generalization of our findings to younger participants (<18 years) and other cultures is limited. Cultural differences are known for the associations of neuroticism (Matsumoto et al., 2009) and specific emotion regulation strategies (Schunk et al., 2021; Schunk et al., 2022) with well-being and social adaptation. Further, individuals' level of neuroticism was shown to be more flexible over time in non-Western cultures (Chopik & Kitayama, 2018). Future studies may test the replicability of our findings in other cultures or directly compare effects across diverse cultural samples.

Finally, it would be interesting to gain a deeper insight into the nature of the longitudinal psychological effects of neuroticism by assessing the specific emotion regulation strategies used by individuals who are high in neuroticism. For instance, neuroticism has been linked to less cognitive reappraisal and more rumination but was unrelated to emotional suppression (Gross & John, 2003; Nolen-Hoeksema et al., 2008). Specific emotion regulation strategies, in turn, may differently predict well-being over time (e.g., Dawel et al., 2021). More research on the effects of neuroticism and its underlying mechanism can facilitate the development of effective treatments for emotional disorders by promoting emotional competence to counter and reduce neurotic tendencies among individuals (Barlow et al., 2021; Nelis et al., 2011) as neuroticism was shown to decrease during psychotherapy (Nguyen et al., 2020).

5 | CONCLUSION

Our findings highlight the longitudinal associations of neuroticism with life satisfaction and several indices of social adaptation, such as loneliness, number of close friends, and interpersonal trust, in a nationally representative adult sample. Traditional cross-lagged panel models and random intercepts cross-lagged panel models indicated that neuroticism predicted lower life satisfaction and poorer social adaptation at the between- and within-person level, and these associations were mostly unidirectional. Each indicator of social adaptation partially mediated the longitudinal link between neuroticism and life satisfaction at the between-person but not at the within-person level. Notably, multigroup comparisons support the generalizability of neuroticism's effects on life satisfaction and social adaptation across age, gender, and geographical regions (East versus West Germany). Future studies might extend our findings using longitudinal data with shorter time intervals, by collecting data from other cultures, or by assessing further mediators and potential confounding variables to uncover the mechanisms linking neuroticism to well-being and social adaptation.

ACKNOWLEDGMENT

Open Access funding enabled and organized by Projekt DEAL.

CONFLICT OF INTEREST

We have no conflicts of interest to disclose.

AUTHOR CONTRIBUTIONS

Fabian Schunk: Conceptualization; data curation; formal analysis; project administration; writing—original draft. **Gisela Trommsdorff**: Conceptualization; supervision; writing—review and editing.

ETHICS STATEMENT

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

ORCID

Fabian Schunk https://orcid.org/0000-0001-6537-890X

REFERENCES

Abdellaoui, A., Chen, H.-Y., Willemsen, G., Ehli, E. A., Davies, G. E., Verweij, K. J. H., Nivard, M. G., de Geus, E. J. C., Boomsma, D. I., & Cacioppo, J. T. (2019). Associations between loneliness and personality are mostly driven by a genetic association with Neuroticism. *Journal of Personality*, *87*(2), 386–397. https://doi.org/10.1111/jopy.12397

American Psychological Association. (2015). Adaptation. In *APA dictionary of psychology* (2nd ed., p. 18).

Anglim, J., Horwood, S., Smillie, L. D., Marrero, R. J., & Wood, J. K. (2020). Predicting psychological and subjective well-being from personality: A meta-analysis. *Psychological Bulletin*, *146*(4), 279–323. https://doi.org/10.1037/bul0000226

Ayub, N. (2015). Predicting suicide ideation through intrapersonal and interpersonal factors: The interplay of Big-Five personality traits and social support. *Personality and Mental Health*, *9*(4), 308–318. https://doi.org/10.1002/pmh.1301

Back, M. D., Schmukle, S. C., & Egloff, B. (2011). A closer look at first sight: Social relations lens model analysis of personality and interpersonal attraction at zero acquaintance. *European Journal of Personality*, *25*(3), 225–238. https://doi.org/10.1002/per.790

Barańczuk, U. (2019). The Five Factor Model of personality and social support: A meta-analysis. *Journal of Research in Personality*, *81*, 38–46. https://doi.org/10.1016/j.jrp.2019.05.002

Barlow, D. H., Curreri, A. J., & Woodard, L. S. (2021). Neuroticism and disorders of emotion: A new synthesis. *Current Directions in Psychological Science*, *30*(5), 410–417. https://doi.org/10.1177/09637214211030253

Barlow, D. H., Ellard, K. K., Sauer-Zavala, S., Bullis, J. R., & Carl, J. R. (2014). The origins of neuroticism. *Perspectives on Psychological Science*, *9*(5), 481–496. https://doi.org/10.1177/1745691614544528

Barlow, D. H., Sauer-Zavala, S., Carl, J. R., Bullis, J. R., & Ellard, K. K. (2014). The nature, diagnosis, and treatment of neuroticism: Back to the future. *Clinical Psychological Science*, *2*(3), 344–365. https://doi.org/10.1177/2167702613505532

Berscheid, E., & Reis, H. T. (1998). Attraction and close relationships. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (4th ed., pp. 193–281). McGraw-Hill.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling*, *9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5

Chopik, W. J., & Kitayama, S. (2018). Personality change across the life span: Insights from a cross-cultural, longitudinal study. *Journal of Personality*, *86*(3), 508–521. https://doi.org/10.1111/jopy.12332

Clegg, K.-A., Moskowitz, D. S., Miners, C. T. H., Andrevski, G., Sadikaj, G., & Zuroff, D. C. (2021). Interpersonal perception and interpersonal spin. *Journal of Personality*, *89*(3), 483–499. https://doi.org/10.1111/jopy.12594

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology*, *112*(4), 558–577. https://doi.org/10.1037/0021-843X.112.4.558

Costa, P. T., & McCrae, R. R. (1987). Neuroticism, somatic complaints, and disease: Is the bark worse than the bite? *Journal of Personality*, *55*(2), 299–316. https://doi.org/10.1111/j.1467-6494.1987.tb00438.x

Dawel, A., Shou, Y., Gulliver, A., Cherbuin, N., Banfield, M., Murray, K., Calear, A. L., Morse, A. R., Farrer, L. M., & Smithson, M. (2021). Cause or symptom? A longitudinal test of bidirectional relationships between emotion regulation strategies and mental health symptoms. *Emotion*, *21*(7), 1511–1521. https://doi.org/10.1037/emo0001018

Demir, M., & Weitekamp, L. A. (2007). I am so happy 'cause today I found my friend: Friendship and personality as predictors of happiness. *Journal of Happiness Studies*, *8*(2), 181–211. https://doi.org/10.1007/s10902-006-9012-7

DeNeve, K. M., & Cooper, H. (1998). The happy personality: A meta-analysis of 137 personality traits and subjective well-being. *Psychological Bulletin*, *124*(2), 197–229. https://doi.org/10.1037/0033-2909.124.2.197

Denissen, J. J. A., & Penke, L. (2008). Neuroticism predicts reactions to cues of social inclusion. *European Journal of Personality*, *22*(6), 497–517. https://doi.org/10.1002/per.682

Dohmen, T., Falk, A., Huffman, D., & Sunde, U. W. E. (2008). Representative trust and reciprocity: Prevalence and determinants. *Economic Inquiry*, *46*(1), 84–90. https://doi.org/10.1111/j.1465-7295.2007.00082.x

Drummond, A., Sauer, J. D., & Ferguson, C. J. (2020). Do longitudinal studies support long-term relationships between aggressive game play and youth aggressive behaviour? A meta-analytic examination. *Royal Society Open Science*, *7*(7), Article 200373. https://doi.org/10.1098/rsos.200373

English, T., & Eldesouky, L. (2020). We're not alone: Understanding the social consequences of intrinsic emotion regulation. *Emotion*, *20*(1), 43–47. https://doi.org/10.1037/emo0000661

Evans, A. M., & Revelle, W. (2008). Survey and behavioral measurements of interpersonal trust. *Journal of Research in Personality*, *42*(6), 1585–1593. https://doi.org/10.1016/j.jrp.2008.07.011

Fetvadjiev, V. H., & He, J. (2019). The longitudinal links of personality traits, values, and well-being and self-esteem: A five-wave study of a nationally representative sample. *Journal of Personality and Social Psychology*, *117*(2), 448–464. https://doi.org/10.1037/pspp0000212

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*(2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348

Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, *20*(1), 102–116. https://doi.org/10.1037/a0038889

Hansson, I., Henning, G., Buratti, S., Lindwall, M., Kivi, M., Johansson, B., & Berg, A. I. (2020). The role of personality in retirement adjustment: Longitudinal evidence for the effects on life satisfaction. *Journal of Personality*, *88*(4), 642–658. https://doi.org/10.1111/jopy.12516

Jensen-Campbell, L. A., & Graziano, W. G. (2001). Agreeableness as a moderator of interpersonal conflict. *Journal of Personality*, *69*(2), 323–362. https://doi.org/10.1111/1467-6494.00148

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory—Versions 4a and 5*. Institute of Personality and Social Research, University of California.

Kandler, C., Kornadt, A. E., Hagemeyer, B., & Neyer, F. J. (2015). Patterns and sources of personality development in old age. *Journal of Personality and Social Psychology*, *109*(1), 175–191. https://doi.org/10.1037/pspp0000028

Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, methods, and research. *Psychological Bulletin*, *118*(1), 3–34. https://doi.org/10.1037/0033-2909.118.1.3

Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, *136*(5), 768–821. https://doi.org/10.1037/a0020327

Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist*, *64*(4), 241–256. https://doi.org/10.1037/a0015309

Liebig, S., Goebel, J., Grabka, M., Schröder, C., Zinn, S., Bartels, C., Fedorets, A., Franken, A., Gerike, M., Griese, F., Jacobsen, J., Kara, S., König, J., Krause, P., Kröger, H., Liebau, E., Metzing, M., Nebelin, J., Petrenz, M., … Zimmermann, S. (2021). *Socio-Economic Panel (SOEP), data from 1984–2019, EU Edition* [Data set]. DIW Berlin. https://doi.org/10.5684/soep.core.v36eu

Little, T. D. (2013). *Longitudinal structural equation modeling*. Guilford Press.

Little, T. D., Preacher, K. J., Selig, J. P., & Card, N. A. (2007). New developments in latent variable panel analyses of longitudinal data. *International Journal of Behavioral Development*, *31*(4), 357–365. https://doi.org/10.1177/0165025407077757

Liu, Y., Wang, Z.-H., & Li, Z.-G. (2012). Affective mediators of the influence of neuroticism and resilience on life satisfaction. *Personality and Individual Differences*, *52*(7), 833–838. https://doi.org/10.1016/j.paid.2012.01.017

Lucas, R. E. (2022). It's time to abandon the cross-lagged panel model. *PsyArXiv*. https://doi.org/10.31234/osf.io/pkec7

Lucas, R. E., Diener, E., & Suh, E. (1996). Discriminant validity of well-being measures. *Journal of Personality and Social Psychology*, *71*(3), 616–628. https://doi.org/10.1037/0022-3514.71.3.616

Malouff, J. M., Thorsteinsson, E. B., Schutte, N. S., Bhullar, N., & Rooke, S. E. (2010). The Five-Factor Model of personality and relationship satisfaction of intimate partners: A meta-analysis. *Journal of Research in Personality*, *44*(1), 124–127. https://doi.org/10.1016/j.jrp.2009.09.004

Matsumoto, D., Nakagawa, S., & Estrada, A. (2009). The role of dispositional traits in accounting for country and ethnic group differences on adjustment. *Journal of Personality*, *77*(1), 177–212. https://doi.org/10.1111/j.1467-6494.2008.00542.x

Maxwell, S. E., Cole, D. A., & Mitchell, M. A. (2011). Bias in cross-sectional analyses of longitudinal mediation: Partial and complete mediation under an autoregressive model. *Multivariate Behavioral Research*, *46*(5), 816–841. https://doi.org/10.1080/00273171.2011.606716

Naragon-Gainey, K., Gallagher, M. W., & Brown, T. A. (2013). Stable "trait" variance of temperament as a predictor of the temporal course of depression and social phobia. *Journal of Abnormal Psychology*, *122*(3), 611–623. https://doi.org/10.1037/a0032997

Nelis, D., Kotsou, I., Quoidbach, J., Hansenne, M., Weytens, F., Dupuis, P., & Mikolajczak, M. (2011). Increasing emotional competence improves psychological and physical well-being, social relationships, and employability. *Emotion*, *11*(2), 354–366. https://doi.org/10.1037/a0021554

Nguyen, P. L. L., Kim, H. L., Romain, A.-M. N., Tabani, S., & Chaplin, W. F. (2020). Personality change and personality as predictor of change in psychotherapy: A longitudinal study in a community mental health clinic. *Journal of Research in Personality*, *87*. Advance online publication. https://doi.org/10.1016/j.jrp.2020.103980

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, *3*(5), 400–424. https://doi.org/10.1111/j.1745-6924.2008.00088.x

O'Meara, M. S., & South, S. C. (2019). Big Five personality domains and relationship satisfaction: Direct effects and correlated change over time. *Journal of Personality*, *87*(6), 1206–1220. https://doi.org/10.1111/jopy.12468

Orth, U., Clark, D. A., Donnellan, M. B., & Robins, R. W. (2021). Testing prospective effects in longitudinal research: Comparing seven competing cross-lagged models. *Journal of Personality and Social Psychology*, *120*(4), 1013–1034. https://doi.org/10.1037/pspp0000358

Orth, U., Meier, L. L., Bühler, J. L., Dapp, L. C., Krauss, S., Messerli, D., & Robins, R. W. (2022). *Effect size guidelines for cross-lagged effects*. Advance online publication. https://doi.org/10.1037/met0000499

Ozer, D. J., & Benet-Martínez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology*, *57*(1), 401–421. https://doi.org/10.1146/annurev.psych.57.102904.190127

Preacher, K. J. (2015). Advances in mediation analysis: A survey and synthesis of new developments. *Annual Review of Psychology*, *66*, 825–852. https://doi.org/10.1146/annurev-psych-010814-015258

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research - Online*, *8*(2), 23–74.

Schunk, F., Trommsdorff, G., & König-Teshnizi, D. (2022). Regulation of positive and negative emotions across cultures: Does culture moderate associations between emotion regulation and mental health? *Cognition and Emotion*, *36*(2), 352–363. https://doi.org/10.1080/02699931.2021.1997924

Schunk, F., Trommsdorff, G., Wong, N., & Nakao, G. (2021). Associations between emotion regulation and life satisfaction among university students from Germany, Hong Kong, and Japan: The mediating role of social support. *Frontiers in Psychology*, *12*, Article 745888. https://doi.org/10.3389/fpsyg.2021.745888

Schupp, J., & Gerlitz, J.-Y. (2014). Big Five Inventory-SOEP (BFI-S). *Zusammenstellung sozialwissenschaftlicher Items und Skalen (ZIS)*. https://doi.org/10.6102/zis54

Soto, C. J. (2015). Is happiness good for your personality? Concurrent and prospective relations of the Big Five with subjective well-being. *Journal of Personality*, *83*(1), 45–55. https://doi.org/10.1111/jopy.12081

Specht, J., Egloff, B., & Schmukle, S. C. (2013). Examining mechanisms of personality maturation: The impact of life satisfaction on the development of the Big Five personality traits. *Social Psychological and Personality Science*, *4*(2), 181–189. https://doi.org/10.1177/1948550612448197

Steel, P., Schmidt, J., & Shultz, J. (2008). Refining the relationship between personality and subjective well-being. *Psychological Bulletin*, *134*(1), 138–161. https://doi.org/10.1037/0033-2909.134.1.138

Thielmann, I., & Hilbig, B. E. (2015). Trust: An integrative review from a person–situation perspective. *Review of General Psychology*, *19*(3), 249–277. https://doi.org/10.1037/gpr0000046

Usami, S., Murayama, K., & Hamaker, E. L. (2019). A unified framework of longitudinal models to examine reciprocal relations. *Psychological Methods*, *24*(5), 637–657. https://doi.org/10.1037/met0000210

Watson, D., & Clark, L. A. (1984). Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin*, *96*(3), 465–490. https://doi.org/10.1037/0033-2909.96.3.465

Widiger, T. A., & Oltmanns, J. R. (2017). Neuroticism is a fundamental domain of personality with enormous public health implications. *World Psychiatry*, *16*(2), 144–145. https://doi.org/10.1002/wps.20411

Williams, A. L., Craske, M. G., Mineka, S., & Zinbarg, R. E. (2021). Neuroticism and the longitudinal trajectories of anxiety and depressive symptoms in older adolescents. *Journal of Abnormal Psychology*, *130*(2), 126–140. https://doi.org/10.1037/abn0000638

Wilson, R. E., Harris, K., & Vazire, S. (2015). Personality and friendship satisfaction in daily life: Do everyday social interactions account for individual differences in friendship satisfaction? *European Journal of Personality*, *29*(2), 173–186. https://doi.org/10.1002/per.1996

Wilson, S., & Olino, T. M. (2021). A developmental perspective on personality and psychopathology across the life span. *Journal of Personality*, *89*(5), 915–932. https://doi.org/10.1111/jopy.12623

How to cite this article: Schunk, F., & Trommsdorff, G. (2022). Longitudinal associations of neuroticism with life satisfaction and social adaptation in a nationally representative adult sample. *Journal of Personality*, *00*, 1–15. https://doi.org/10.1111/jopy.12783