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"Like two peas in a pod?" Homogamous personalities, education, and union dissolution

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Abstract

This paper examines the association between the level of similarity in the "Big Five" personality traits of the partners in different-sex couples and their risk of union dissolution. Prior research has mainly focused on homogamy in socio-economic, demographic, and cultural characteristics, such as age, education, employment, and religion. The few studies on the effects of homogamy in the personalities of the partners on separation find mixed results. We extend on this by analysing the moderating effect of education. Using data from the German Socio-Economic Panel (SOEP) for the 2005–2019 period, we follow 3958 coresidential couples and observe 534 separations. Personality is measured via the "Big Five" personality traits. We estimate discrete-time event history models for union dissolution. In addition to reporting the main effects, we calculate interactions between personality and the level of education of the partners. Our results indicate that greater dissimilarity with regard to the personality trait "openness" is associated with a higher probability to separate. However, analysing interaction effects reveals that this is relevant mainly among medium educated men. Moreover, persons with high education seem to be less likely to separate if they are dissimilar from their partner in their level of "extraversion". These findings suggest that relationship dynamics differ across educational groups.

Keywords: Personality, Big Five, Cohabitation, Marriage, Intimate relationships, Separation, Longitudinal

Introduction

Divorce and separation are widespread phenomena in modern societies. Union dissolution can have negative consequences for both the partners (Leopold, 2018) and their children (Härkönen et al., 2017). Therefore, it is important to understand the factors that are associated with a higher risk of separation. Prior research has suggested that homogamy—i.e. the partners in a couple having similar characteristics—is positive for union development (Kalmijn, 1998), and that partners with more dissimilar traits are more likely to separate. Empirically, dissimilarity between the partners has been shown to have a positive effect on the risk of union dissolution for demographic and cultural characteristics, such as ethnicity (Zhang & van Hook, 2009), nationality (Milewski & Kulu, 2014), religion (Kalmijn et al., 2005), age (Kraft & Neimann, 2009), and education (Bumpass et al., 1991). In line with this, with regard to personality, one might expect that

more similar partners have more stable relationships, because they tend to have fewer misunderstandings and conflicts, and thus have higher levels of relationship satisfaction. However, the few existing studies on this topic have yielded inconclusive results. In line with theoretical expectations, some studies have found that partnerships in which the partners have more similar personalities are more stable (Arránz Becker, 2013). However, other studies were unable to confirm this association (Solomon & Jackson, 2014; Spikic, 2020). In our study, we investigate in how far effects of personality homogamy differ across educational groups. Specifically, we argue that highly educated persons are more capable to deal with dissimilarities. Prior research has shown that there is a negative educational gradient in separation risks in the last decades (Härkönen & Dronkers, 2006; Kalmijn, 2013; Matysiak et al., 2014). One mechanism discussed in the literature is that highly educated individuals have higher quality interactions (Boertien & Härkönen, 2018), and better coping skills than people with lower education. Additionally, we assume that highly educated individuals have a more thorough mate selection process, as it has been shown that individuals with higher education take longer before they move in with a new partner (Sassler et al., 2018; Wagner et al., 2019). Therefore, we assume that compared to their less educated counterparts, highly educated partners are better able to solve potential conflicts induced by their different personalities, and therefore have more stable and resilient relationships.

In this paper, we analyse the effect of homogamy in the "Big Five" personality traits (agreeableness, conscientiousness, extraversion, neuroticism, and openness) on the likelihood of dissolving a different-sex marital or cohabiting union. We extend prior research by analysing the interaction effects of individual education and couples' homogamy in personality traits. Our analyses are based on data from the German Socio-economic Panel (SOEP), a household survey that has existed since 1984. Since 2005, the question program has included the "Big Five" personality traits battery, which is collected every four years. We analyse 3,958 couples and observe 534 separations. In the statistical analyses, we estimate discrete-time event history models of union dissolution.

Background

Individuals' personalities and relationship behaviour

Individual-level personality is an important aspect of a person's attractiveness on the partner market, affects a person's behaviour and emotions, and thus naturally influences the development of his/her romantic relationships. It has been shown that individuals tend to choose mates based on a variety of personality characteristics that they find desirable, such as warmth, kindness, and emotional stability (Buss & Barnes, 1986). Prior research highlighted that kindness is an important trait in mate selection (Li et al., 2002). The results showed that when individuals had limited choices, kindness was the second most valued trait by both men and women (while they differed in the value they assigned to physical appearance and social status of potential matches). With regard to the Big 5 personality traits, it has been shown that individuals with higher levels of extraversion are more likely to form a partnership than those with lower levels of this trait (Nettle, 2005; Sodermans et al., 2017). In respect to relationship dissolution, there is empirical evidence indicating that personality is also associated with relationship stability. In their study on the causes of divorce in the US, Amato and Previti (2003) found

that "personality problems" were among the top five reasons for separation. Two meta-analyses detected a small but consistent effect of personality (as measured using the "Big Five" personality traits) on the likelihood of divorce. The effect differed across personality dimensions; both meta-analyses found that neuroticism had a positive association, while conscientiousness had a negative association with divorce (Roberts et al., 2007; Spikic, 2020). For other personality traits, the effects were found to be more ambiguous.

Personality differences within couples and relationship dynamics

When analysing union dissolution, some studies have taken into consideration *couple-level differences in personality traits*. Older studies show that differences between partners in their levels of warmth, outgoingness (Levine & Hennessy, 1990), and ambition (Bentler & Newcomb, 1978) were associated with a higher likelihood of separation. However, more recent studies that focused on the relationship between the degree of similarity in the partners' "Big Five" personality traits and their risk of union dissolution yielded mixed results. These inconsistent findings might be attributable to differences in the measures used. For example, while Arránz Becker (2013) found that differences between the partners in terms of single personality traits had no effect on the likelihood of separation, he also observed that the degree of profile similarity between the partners (i.e. a single measure of similarity based on all personality traits) had a negative effect on the risk of union dissolution. One study found that couples in which the partners had very different levels of neuroticism and conscientiousness were more likely to separate than more similar couples (Kurdek, 1993). Some studies showed no statistical association between the partners' personality traits and their likelihood of union dissolution (Bleske-Rechek et al., 2009; Solomon and Jackson, 2014). Two prior analyses drew on data from the German Socio-Economic Panel (SOEP)—the data we use in the present study—with partly inconsistent results. One study found that separated couples had less similar levels of the "openness" personality trait than stable couples (Rammstedt et al., 2013). The second study detected no statistical association between the partners' levels of similarity in any of the personality traits and their likelihood of divorce (Spikic, 2020). Methodological differences might account for the variation in the findings of the two studies. While Rammstedt et al. (2013) compared the difference in personality between separated and stable couples in cross-sectional data, Spikic (2020) analysed the likelihood to separate with logistic regression analyses. It has to be noted that Spikic (2020) did not take into consideration the censoring and truncation present in his longitudinal study design.

Apart from methodological differences, a theoretical reason for inconsistent findings might be heterogeneous effects over educational groups in samples with varying educational composition. Prior research on personality homogamy and separation did not take into account that individuals with varying educational resources might be differently prone to separation if they and their partner have dissimilar personalities. In an extreme case, this could lead to the erroneous conclusion that there is no effect. If personality dissimilarity has a negative effect only in a specific educational group, this could be concealed in the statistical analyses of main effects. To our knowledge, no previous study has analysed whether individuals' education moderates the effect of homogamy in

personality on the risk of union dissolution and explored the possibility of heterogeneous effects of personality similarity on union dissolution.

Theoretical account and hypotheses

In the vernacular, opposites attract. This idea is reflected in the complementary needs hypothesis by Winch et al., (1954). This hypothesis posits that individuals seek partners with traits that complement their own, thereby suggesting that similarity between partners is associated with a higher likelihood of union dissolution. Empirically, this idea was supported by some more dated studies that used the Fundamental Interpersonal Relations Orientation scales (Kerckhoff & Davis, 1962; Winch et al., 1954) while others contested it (Levinger et al., 1970; Seyfried & Hendrick, 1973, the latter using the Nurturance and Succorance Scales of the Edwards Personal Preference Schedules). With regard to the "Big Five" personality traits, empirical studies either found a negative or no association between similarity and union dissolution but no study supported the complementary needs hypothesis. In our study, we base our argumentation on the spousal discrepancy theory. This theory was first proposed by Kurdek (1993) and further developed by Kilmann and Vendemia (2013). It posits that (personality) homogamy has a positive impact on relationship stability. According to this theory, the degree of similarity between the partners is important when it comes to dealing with crucial life course events; but also in coping with more quotidian challenges, such as relationship conflicts. It is assumed that couples who are more different in terms of their individual characteristics (such as education and religion, but also personality) may view crucial turning points in the relationship differently, and might also have different perceptions of and approaches to dealing with these life course events (Cowan et al., 1985). Translated to the "Big Five" personality traits, spousal discrepancy theory suggests that compared to partners with less similar personality traits, partners with more similar personality traits are likely to get along with each other better, because they act and react in similar ways in certain situations, and thus have fewer misunderstandings and conflicts, and higher levels of relationship satisfaction. Hence, we hypothesise that partners with more similar personality traits are less likely to separate than partners with more dissimilar personality traits (*Hypothesis 1*). From spousal discrepancy theory, similar couples should be more stable regardless of the dimension of similarity. Therefore, we expect this association to hold for all "Big Five" personality traits, i.e. openness, extraversion, neuroticism, conscientiousness and agreeableness.

The spousal discrepancy theory assumes a negative effect of dissimilar personality traits on relationship quality for all couples. However, the effects might vary across educational groups. While theoretically, it might be argued that especially highly educated women are particularly able to exit unsatisfactory marriages (Kraeger et al., 2013; Lyngstad & Jalovaara, 2010), empirical evidence of recent cohorts shows that those with higher education are less likely to separate (Boertien & Härkönen, 2013; Jalovaara & Andersson, 2023). One explanation is that those with lower education face more life strains that negatively impact relationship quality (Hogendoorn et al., 2022). Another explanation for the educational gradient in union dissolution might be that partners with higher education tend to have better communication skills than partners with lower education (Amato, 1996; Ono, 1998). Good communication can enable couples to deal

with crises and differences and is thus associated with higher relationship satisfaction (Smith et al., 2008). If it is assumed that more dissimilar partners have more conflicts than more similar partners, the better communication skills of highly educated individuals may enable them to cope with difficulties in their relationships more successfully than if they have lower education. Therefore, we expect to observe that the negative effects of individuals having dissimilar personality traits than their partner are less severe for persons with higher education. Moreover, it is possible that highly educated individuals have more thorough mate selection processes, resulting in a more durable, functioning relationship (South, 2001). This idea is reflected in the empirical finding that college educated women are less likely than their lower educated counterparts to move in with a sexual partner within a few months of the start of the relationship (Sassler et al., 2018); i.e. they wait longer before starting to cohabit. We assume that the tendency to more carefully select and test a relationship leads to a more accurate evaluation of its stability. When a highly educated person commits to a relationship, it is often because the prospective partner has proven to be a promising match, even if the partners' personalities are dissimilar. Therefore, we expect that the negative effect of partners' homogeneous personality traits on union dissolution will be observed only among persons with lower levels of education (*Hypothesis 2*).

Hypothesis 2 expects the same moderating effect of education for men and women. However, especially in the traditional economic view it has been assumed that men's and women's education affects union dissolution in different ways. Men's education stabilises partnerships because it is associated with more economic resources and thus greater household utility. By contrast, women's education can have a destabilising effect on (marital) partnerships. First, female human capital lowers the returns to a gendered division of labour (Becker et al., 1977). Second, higher education reduces women's financial dependence on their husbands allowing them to exit unhappy partnerships (Kreager et al., 2013; Sayer et al., 2011; Schoen et al., 2002). Following our Hypothesis 1, greater dissimilarity in personality traits increases conflicts and decreases partnership satisfaction. From this perspective, we expect that dissimilarity in partners' personalities leads to a higher separation risk in couples where the female partner is highly educated (*Hypothesis 3*).

Data, variables, and methods

Data and methods

The dataset we analyse is the German Socio-economic Panel (SOEP), a household survey that started in 1984, and that has been conducted annually since that time.[1] Over the years, more than 75,000 survey participants and more than 40,000 households (SOEP, 2021) have taken part in the SOEP. We analyse data collected between 2005 and 2019. Information about personality traits was collected only from 2005 onwards. Our focus is on different-sex coresidential partnerships (cohabitations and marriages) that started between 1984 and 2018. Overall, we analyse 3958 coresidential couples (24,100 couple-years). In the data, we observe 534 separations. The SOEP contains information on a

[1] Since 1990, the sample also includes households in eastern Germany.

variety of different domains and variables. Apart from its focus on socio-economic variables, such as income and education, it contains information on the respondents' personality traits, values, and perceptions. The SOEP also provides partnership histories. One drawback of the dataset is that it focuses on partners who live in the same household, which means that data on the (personality) traits of living apart together (LAT) partners who live in different households are unavailable. Therefore, we analyse coresidential partners (married and unmarried) only.

In our main analyses, we use discrete-time event history models to estimate the effect of personality (dis-)similarity of partners on their separation risk. With this method, we calculate the risk to experience a separation after a specific time. The process time in our analysis is partnership duration. In a second step, we calculate interaction effects of personality (dis-)similarity and educational level. In our data, couple-years are nested within couples (long format). To estimate the probability of union dissolution occurring in a given relationship-year, we use the complementary log–log link function—which is often used to analyse rare events such as separation (Allison, 1982; Kraft & Neimann, 2009; Prasetyo et al., 2019). Each separation event is identified based on the information on the end date of coresidence for each partnership, which is available in SOEP's relationship histories. Because information about the "Big Five" personality traits are collected since 2005, we consider separations that occur between 2006 and 2019. For our data preparation and analysis, we use STATA 15.1, and report cluster robust standard errors to account for the nested data structure.

Explanatory variables

The first of our key explanatory variables, *dissimilarity in the "Big Five" personality traits*, is based on SOEP's BFI-S scale (Schupp & Gerlitz, 2008). As shown in Table 1 in the Appendix, the scale consists of 15 items. The respondents indicated their agreement with the statements on a seven-point scale ranging from "*strongly disagree*" to "*strongly agree*" (Lang et al., 2011). This scale utilises self-description, as opposed to partner and observer description (Luo & Klohnen, 2005). Based on the items, we conduct factor analysis, deriving individual factor scores for the "Big Five" personality dimensions. For the factor analysis, we used z-standardised items and performed a varimax-rotation (see e.g. Hahn et al., 2012, for a similar procedure with the "Big Five" scale). The items for the factor analysis were standardised across waves, not for each wave. The factor analyses were performed across the whole sample. One major issue is that information about the "Big Five" personality traits is surveyed only every four years (2005, 2009, 2013, and 2017) in the SOEP. Therefore, we carry forward the last value reported between the years in which the BFI-S items were collected. This procedure is based on evidence indicating that personality traits are relatively stable over time (Cobb-Clark & Schurer, 2012). We measure personality homogamy based on the degree of *dissimilarity in the partners' personality traits*. To do so, we calculate absolute difference scores (see also Arránz Becker, 2013). To generate difference scores, we subtract the personality trait score of the male partner in one dimension from the personality trait score of the female partner in the same dimension. Because we will not consider which partner scores lower and which partner scores higher on respective personality trait, we multiply negative values by -1, i.e. the larger the value the larger the dissimilarity of partners. While the use of an overall personality similarity

measure has been mentioned in previous research (e.g. profile correlations as deployed in Luo & Klohnen, 2005, and Arránz Becker, 2013), we refrained from using them since they might cover potential differences in the effects of personality (dis-)similarity on union dissolution between personality traits (although the theory would not suggest that there be any differences). Moreover, we also control for the level of each personality trait in the couple by including each *partner's individual personality scores* in each dimension.

Our second key explanatory variable is education. We generate a *three-level education variable* based on the ISCED-97 classification. We differentiate between low (ISCED 0–2), medium (ISCED 3–5), and high education (ISCED 6). As expected, we find that the majority of the sample are in the medium category (65.91 percent of the overall couple-years, 66.13 percent of women and 65.68 percent of men), while smaller shares of the sample are in the high category (26.07 percent overall, 24.27 percent for women and 27.86 percent for men) and the low category (8.03 percent overall, 9.60 percent of women and 6.46 percent of men). In our interaction analysis, we focus on the individual education level of the partners. We present results with a dyadic education variable in the sensitivity analysis. Due to the low number of observations especially in the low educated group (see Tables 2 and 3 in Appendix), we grouped the low and medium educated together—resulting in some loss of detail compared to the individual education variable. We present both results with this grouped education variable and the dyadic education variable in the sensitivity analyses (see distribution of separations across the dyadic education variable in appendix, Table 6).

Control variables

Apart from these two key explanatory variables, we control for a number of factors in the multiple regression analyses. The process time is the duration of the coresidential union at the time of the interview. We include in the model *duration of coresidence in years.* We also control for *age at the survey year* for both partners (Bentler & Newcomb, 1978; McKenry et al., 1978). Another control variable we include in the model is *marital status*. It has been argued that married couples are more committed to their partnership than couples who share a household without being married (Stanley et al., 2004). Therefore, we expect to find that marriages are more stable than cohabitations. In the data, the vast majority (80.55 percent) of the couples are married. Moreover, we account for regional differences using a binary variable denoting residence in either western or eastern Germany. It has been shown that in the decades since the fall of the Berlin Wall, divorce rates have been lower in the east than in the west (Grünheid, 2013). To take individual partnership experiences into account, we control for the *number of coresidential partnerships* that have been observed in the data. It has to be noted that we do not have full partnership biographies for all individuals (with 63.6% of the female and 53.7% of male partners observed before age 30), i.e. this might not reflect the full cohabitation history of these individuals. Moreover, we account for *parenthood* using a dummy variable indicating whether children had been born during each couple's coresidence. The stability of partnerships might have changed over time; we therefore control for the calendar year when a *coresidence* started (to account for potential period effects). We do not control for religion in our main models due to a substantial amount of missing data for this variable (even after carrying forward values from earlier years to fill in gaps).

Table 1 Descriptive statistics of the analytical sample

	Mean/ ***percentage***	**Std. dev./*Freq***	**Min**	**Max**
Big Five: dissimilarity in personality:				
Openness	0.846	0.672	0	5.545
Conscientiousness	0.802	0.636	0	4.576
Extraversion	0.820	0.632	0	4.361
Agreeableness	0.668	0.533	0	3.825
Neuroticism	0.650	0.525	0	3.971
Individual Big Five personality traits:				
Female partner:				
Openness	0.036	0.860	− 4.783	2.272
Conscientiousness	− 0.033	0.759	− 2.596	3.680
Extraversion	0.194	0.730	− 2.836	2.698
Agreeableness	− 0.035	0.622	− 3.035	2.534
Neuroticism	− 0.107	0.577	− 2.585	2.924
Male partner:				
Openness	− 0.117	0.883	− 4.974	2.272
Conscientiousness	− 0.034	0.763	− 3.197	3.365
Extraversion	− 0.204	0.707	− 2.475	2.349
Agreeableness	− 0.062	0.666	− 2.678	2.578
Neuroticism	0.150	0.587	− 2.619	2.915
Age at survey year (female partner)	41.290	11.483	18	92
Age at survey year (male partner)	44.128	11.907	19	102
Education (categorised, female partner)				
Low	*9.598%*	*2313*		
Medium	*66.133%*	*15,938*		
High	*24.270%*	*5849*		
Education (categorised, male partner)				
Low	*6.465%*	*1558*		
Medium	*65.676%*	*15,828*		
High	*27.859%*	*6714*		
Number of coresidence (female partner)	1.115	0.386	1	5
Number of coresidence (male partner)	1.127	0.405	1	5
Parenthood				
No own children	*46.162%*	*11,125*		
With own children	*53.838%*	*12,975*		
Duration of coresidence in years (until then)	10.307	7.180	1	35
Year of coresidence begin	2001.662	8.061	1984	2018
Region				
Western Germany	*78.154%*	*18,835*		
Eastern Germany	*21.846%*	*5265*		
Marital status				
Not married	*19.452%*	*4688*		
Married	*80.548%*	*19,412*		
Number of coresidence-years (in sample)		24,100		
Number of couples (in sample)		3958		
Number of separations (in sample)		534		

Means (standard deviations), percentages (frequencies) of coresidence-years. Source: SOEP, years 2005–2019. Authors' own calculations

Moreover, we refrain from controlling for ethnicity or migration background in these models, as only a small share of individuals are in an interethnic relationship in Germany (Braack et al., 2022). We do, however, include both religion and migration background in additional analyses (both as individual predictors and homogamy variables)—demonstrating that the inclusion of these variables does not substantially affect our results. We also provide a methodological reasoning why we should not include it in the main analyses (see sensitivity analyses). For descriptive statistics of all variables, see Table 1.

Empirical results

Personality dissimilarity and union dissolution

The results of the multiple regression analyses are displayed in Table 2. The dependent variable is the occurrence of a separation; in our case, the dissolution of a coresidential partnership. We present the average marginal effects, as they allow us to compare effect sizes across different models (Mood, 2010). The average marginal effect (AME) in a logistic regression depends on the values of all explanatory variables. It is the mean of the marginal effects for each combination of covariates in the dataset and represents the average change in the probability of observing a specific outcome when the respective independent variable is altered from the reference category to another category based on our sample. With regard to continuous variables, the AME represents the average change in the probability of the outcome occurring for a one-unit increase in the continuous independent variable, holding all other variables constant.

In the analyses in Table 2, we test our first hypothesis: i.e. whether partners who are more similar in terms of their personality traits are less likely to separate. In Model 1 to Model 5, we analyse the impact of each of the "Big Five" traits separately (including all control variables). Model 6 includes all traits.

With regard to main effects, our results indicate that there is only one trait for which the level of dissimilarity between the partners plays a role in the risk of separation: openness. The effect (see Model 1) is positive but small, with AME = 0.003 (p = 0.054). This effect is, overall, unchanged in the full model that includes the other personality measures (Model 6, even with a decreased p-value). The AMEs of the other four personality dimensions do not reach statistical significance. These results are in line with those of Rammstedt et al. (2013), who also found in their analysis based on the SOEP data that only the level of dissimilarity in openness has a statistically significant effect on the risk of union dissolution. Our findings therefore only partly support our Hypothesis 1—where we expected an increase in the probability to separate for dissimilar partners also with regard to the other four "Big Five" personality traits.

With respect to the control variables, we find that the level of conscientiousness (both male and female partners), and also partly the level of openness (female partner) and extraversion (male partner) affects the likelihood of union dissolution: i.e. we observe that with higher scores on these variables, the relationship is more likely to dissolve.[2] Moreover, we find that stabilising factors, such as having a longer lasting

[2] These results contradict the findings of other authors (Roberts et al., 2007; Spikic, 2020), finding a negative relationship between conscientiousness and union dissolution. These different results could be explained by our focus on separation of coresidence, not divorce, and by the inclusion of the difference scores into the model. In this case, these findings are not the main concern of our study.

Table 2 Discrete time event history models of separation (average marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)
Dissimilarity in personality:						
Openness	0.003#					0.003*
Conscientiousness		− 0.000				− 0.000
Extraversion			− 0.001			− 0.001
Agreeableness				0.001		0.001
Neuroticism					− 0.001	− 0.002
Partner's individual personality scores:						
Openness (female partner)	0.002#					0.002#
Openness (male partner)	0.000					0.000
Conscientiousness (female partner)		0.004**				0.004**
Conscientiousness (male partner)		0.003*				0.003*
Extraversion (female partner)			0.001			0.001
Extraversion (male partner)			0.003*			0.003#
Agreeableness (female partner)				− 0.001		− 0.002
Agreeableness (male partner)				− 0.000		− 0.000
Neuroticism (female partner)					− 0.001	− 0.001
Neuroticism (male partner)					− 0.000	− 0.001
Duration of coresidence in years	− 0.001**	− 0.001**	− 0.001**	− 0.001**	− 0.001**	− 0.001**
Year of coresidence begin	− 0.000*	− 0.001***	− 0.000#	− 0.000*	− 0.000*	− 0.000*
Marital status						
Not married	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Married	− 0.024***	− 0.024***	− 0.024***	− 0.024***	− 0.024***	− 0.024***
Parenthood						
No own children	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
With own children	− 0.006*	− 0.006*	− 0.005*	− 0.006*	− 0.006*	− 0.005*
Region						
Western Germany	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Eastern Germany	0.003	0.004#	0.003	0.003	0.003	0.004#
Age at survey year (female partner)	− 0.000	− 0.000	− 0.000	− 0.000	− 0.000	− 0.000
Age at survey year (male partner)	0.000	0.000	0.000	0.000	0.000	0.000
Education (female partner)						
Low	0.010*	0.008*	0.008*	0.009*	0.009*	0.009*
Medium	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
High	− 0.004#	− 0.005*	− 0.004#	− 0.004#	− 0.005#	− 0.005#
Education (male partner)						
Low	0.001	0.002	0.002	0.002	0.002	0.001
Medium	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
High	− 0.007**	− 0.007**	− 0.007**	− 0.007**	− 0.007**	− 0.007**
Number of coresidence (female partner)	0.008***	0.009***	0.009***	0.008***	0.009***	0.008***
Number of coresidence (male partner)	− 0.002	− 0.003	− 0.003	− 0.002	− 0.002	− 0.003
N	24,100	24,100	24,100	24,100	24,100	24,100

# $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: SOEP, years 2005–2019. Authors' own calculations

relationship, having joint children, and being married, have a positive effect on the relationship outcome. In our data, couples from eastern Germany have a higher propensity to separate than their western counterparts. Although this finding contradicts the results of earlier studies that found that divorce rates are lower in eastern than in western Germany (Grünheid, 2013), it is in line with recent results that indicate that cohabiting couples are more likely to separate in eastern than in western Germany (Krapf & Wagner, 2020; van Damme et al., 2021). For female partners, the risk of union dissolution increases the higher the number of coresidential partnerships they have experienced. We observe that coresidential unions are less likely to dissolve if the partners have higher educational attainment (although 'low' educated men do not seem to have statistically significant different separation risks than 'medium' educated men).

Heterogenous effects

In our second and third hypotheses, we are interested in investigating whether the effect of dissimilar personality traits varies over individuals' level of education. We expected this interaction effect for all dimensions of the "Big Five" personality traits. However, the results are statistically significant merely for the dimensions openness and partly extraversion. These results are presented in Figs. 1 and 2 while the results for the other dimensions are shown in the Appendix (see Figs. 1–3 in Appendix). The graphs on the left-hand side show the results for the female partners based on their educational levels, while the graphs on the right-hand side show the same results for the male partners. In the upper rows, we show the predicted probability of union dissolution by partners' level of dissimilarity in openness and extraversion, by education of the respondents (black line for low educated, dashed grey line for medium educated and light grey solid line for high educated). The lower rows show the average marginal effects of the same models. This enables us to test whether the differences between the educational groups are statistically significant. The horizontal grey line (at $y = 0$) displays the results for the reference group: namely, women (left) or men (right) with a medium level education.

In our second hypothesis, we expect a smaller destabilising effect of dissimilar personalities for highly educated individuals. The results of the interaction analyses support this hypothesis only partly, namely for openness and extraversion. For these two dimensions, we find a statistically significant moderation effect. For women, we find that those with a difference score of 0 have a similar predicted probability to separate regardless of their education (see left-hand panels in Figs. 1 and 2). With increasing dissimilarity, the probability to separate diverges, with highly educated women being less likely to experience union dissolution. The average marginal effects (lower left-hand panel in Fig. 2) indicates that the difference in the probability to separate between women with high and medium education (reference) is statistically significant for extraversion. For openness, the effect turns statistically insignificant (at $p = 0.172$) for difference scores of 3 and higher (lower left-hand panel in Fig. 1). The difference between women with high and low education is statistically significant until a difference score of 3 (where it still has a p-value of 0.092). These findings do not support our gender hypothesis: contradicting our expectation, highly educated women in couples with more pronounced differences in personality are not more likely to separate than those with lower education.

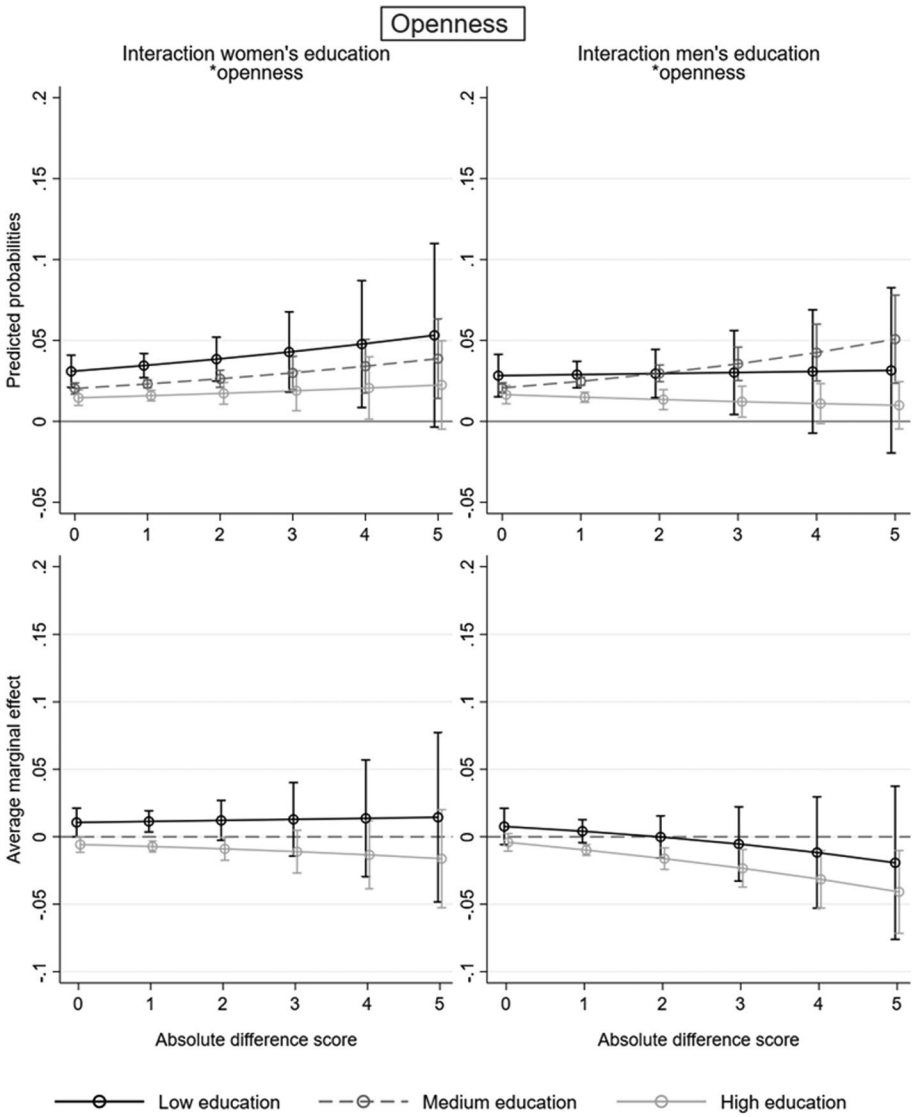

Fig. 1 Effect of the absolute difference score in openness on the risk of union dissolution for different educational groups (education of the female partner and education of the male partner). Source: SOEP, years 2005–2019. Authors' own calculations. Notes: 95% confidence intervals. Control variables: year of coresidence, year of the start of coresidence, marriage (y/n), children (y/n, woman and man), household sample (east or west Germany), age at the survey year (woman and man), number of coresidences (woman and man), individual personality score in openness (woman and man). *Medium education as the reference group (in the lower graph)*

Our findings for highly educated female and male partners are similar for openness and extraversion (light solid grey line in the right-hand panels in Figs. 1 and 2). Regarding extraversion, the predicted probability to separate rises with increasing dissimilarity for lowly educated men (upper right hand-side panel in Fig. 2)—but the separation risk is not statistically significantly different from the medium education group (lower right hand-side panel in Fig. 2). At the same time, the separation risk for the highly educated (men and women) decreases with increasing difference in the extraversion trait (we provide an account of this pattern in the conclusion). The difference between those with high and those with medium education (reference

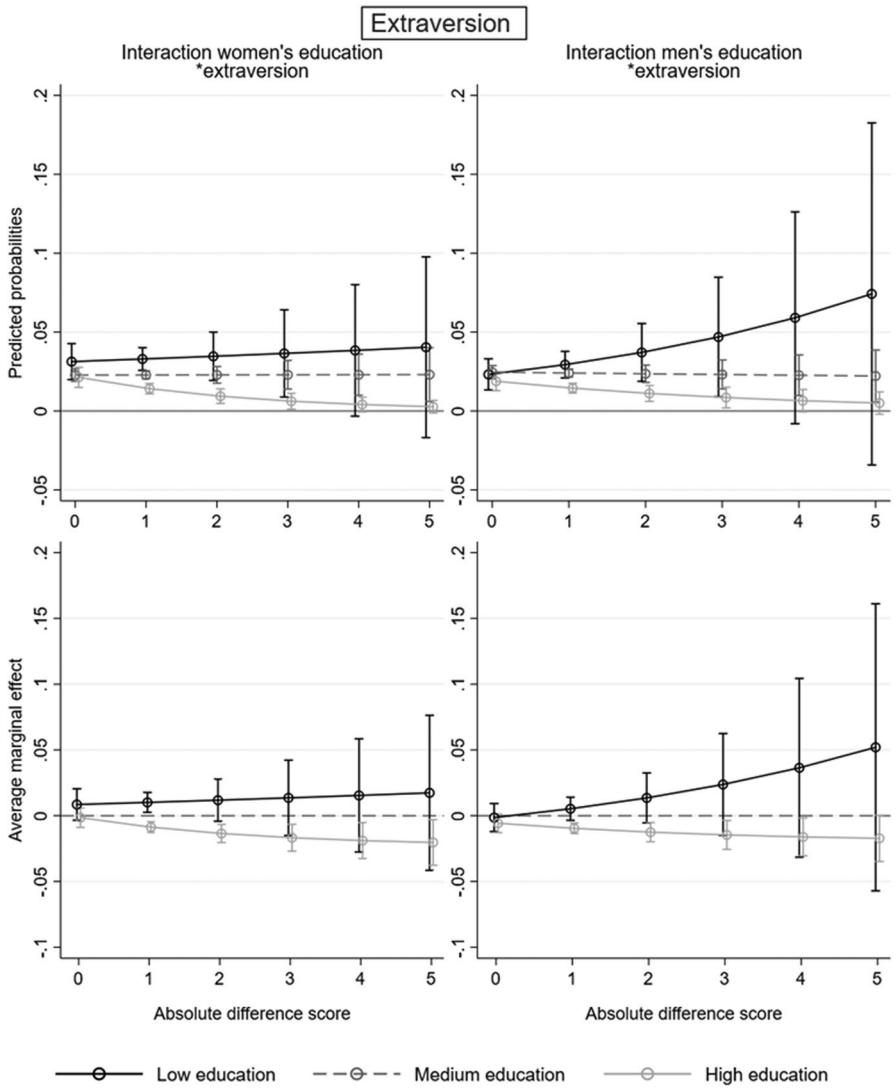

Fig. 2 Effect of the absolute difference score in extraversion on the risk of union dissolution for different educational groups (education of the female partner and education of the male partner). Source: SOEP, years 2005–2019. Notes: Authors' own calculations. 95% confidence intervals. Control variables: year of coresidence, year of the start of coresidence, marriage (y/n), children (y/n, woman and man), household sample (east or west Germany), age at the survey year (woman and man), number of coresidences (woman and man), individual personality score in extraversion (woman and man). *Medium education as the reference group (in the lower graph)*

category of the second-row panels in Fig. 2) is statistically significant at conventional p-levels (10%). Our results also show that the difference between medium and low education is not statistically significant among men. For openness, we observe that the predicted probability of union dissolution among men with medium education increases with higher difference scores and even exceeds the probability of men with low education. Still, while the difference in separation risks from the medium education group is statistically significant for the high education group, it is not significant for the lower education group (see the second-row panel in Fig. 1). For highly educated males we see a similar pattern as with extraversion, where higher personality

dissimilarity comes with lower separation risks (while there is only a weak positive effect of personality heterogamy on union dissolution for low educated).

When considering the other personality traits (see Figs. 1 to 3 in the Appendix), we see that there are no consistently statistically significant differences in separation risk between the education groups. Only for conscientiousness, we find that low educated women have a higher separation risk than medium educated women. This difference retains its statistical significance only at difference scores from 1 to 3, however. Tables for all interaction models are shown in the Appendix (Tables 4 and 5). As the computation and interpretation of interactions as marginal effects is complex (Buis, 2010; Norton et al., 2004) and following the concern that the display of AME and odds ratios may lead to erroneous conclusions (Best & Wolf, 2015), we report the coefficients as logits. For a more holistic overview of the heterogenous effects of personality dissimilarity across education groups, refer to the figures. It shows that the interpretation differs slightly. Nevertheless, it is not unusual to observe different results when comparing AME and log odds in interaction analyses with a binary outcome. This is because AMEs provide a measure of the average effect of a variable across all observations, whereas log odds represent the effect on the logit scale, leading to differences in interpretation and results (Long & Freese, 2014).

The AMEs resulting from our models appear to be small in size. For instance, in Model 6 of Table 2, an increase in the dissimilarity score in openness by one unit raises the average probability of experiencing a union dissolution by 0.3 percentage points. However, within a single year, separation is a rare event. Of the 3958 couples we have in our sample, only 13.49% dissolved their union, indicating that the overall probability of experiencing the separation of a coresidential union is low. To put our results into perspective, comparing the AME of being married is useful: the predicted probability of separation for unmarried couples was, on average, 2.4 percentage points lower than that of married couples (Model 6 in Table 2). This means that the AME of a two-unit increase in the dissimilarity score of openness was about one-fourth the size of the AME of the cohabitation effect. Given the importance of marriage for couple stability, this finding suggests that the association between partners' dissimilarity in openness and the risk of union dissolution is non-negligible.

Sensitivity analyses

We conducted additional analyses with alternative model specifications (Tables 7 to 10 and Figs. 4 to 8 in Appendix). Given the differing effects of personality dissimilarity on highly educated couples compared to low and medium educated ones (as expected based on our theoretical considerations), we grouped low and medium educated couples together and compared them with highly educated couples. The results were similar to those using the three-level education variable (see Figs. 4 and 5 in the Appendix). We also tested whether the combination of partners' education affects coping strategies by running interaction models that differentiated between couples where (a) both partners have low/medium education, (b) both have high education, and (c) one partner has high and the other low/medium education. Due to small case numbers, we combined low and medium education into one group. For openness (Fig. 6 in Appendix), couples with both partners highly educated showed more stability and even benefited from personality

differences, while couples with only one highly educated partner saw increased separation risk with personality differences. For extraversion (Fig. 7 in Appendix), personality differences reduced separation risk for both those with one and those with two higher educated persons. Other personality traits showed insignificant results, aligning with our individual education analysis. These findings suggest a need for further research with more detailed education variables and greater statistical power (see Table 6 in the Appendix for the distribution of separations across these groups).

We estimated additional models including educational homogamy (using a three-level migration variable), religion, migration background, and age differences (± 3 years) as control variables, as well as individual measures of religion and migration background. Due to small case numbers, religious denominations were grouped into broader categories. Educational homogamy was not linked to relationship stability when controlling for both partners' individual education. However, religious homogamy (although not statistically significantly), both having (no) (direct/indirect) migration background, and being of similar age all predicted lower separation risks (Table 7 in Appendix). These findings must be interpreted cautiously due to high collinearity between individual-level and homogamy variables. Additionally, if the male partner is Catholic or the female partner belongs to another Christian denomination or Islam, separation risks decrease (Table 8 in Appendix). Importantly, neither the individual-level controls nor homogamy variables substantially altered the results for personality homogamy.

Further, we added analyses with interactions of personality dissimilarity and marital status of couples (Table 9 in appendix). The role of marital status in determining the separation risk has already been highlighted by the seminal work of Brines and Joyner (1999). Their study reveals that a specialised division of labour modestly decreases the risk of divorce among married couples, while cohabiting partners are more likely to remain together under conditions of equality, especially when their employment and earnings are similar. To consider whether different relationship dynamics between married and unmarried couples also apply for the link between personality dissimilarity and union dissolution, we have (in addition to controlling for marital status in the main models) estimated interaction analyses by marital status. We find that although there are strong differences in the propensity to separate between these groups overall, there are (besides for neuroticism, where the main effect of personality dissimilarity is statistically insignificant) no statistically significant effects of marital status on the link between personality heterogamy and union dissolution. Further analyses with more statistical power are needed to explore the role of marital status in this context.

Moreover, we investigate in how far stable couples with long relationship durations drive our results. For instance, because in our data information on personality measures are collected only from 2005 onwards and in four-year intervals, the couples in our sample might be more stable than those who never enter our sample. To illustrate this point, consider a couple who had been living in the same household since 2006 and separated in 2007. Because information on personality was collected only in 2005, 2009, 2013 and 2017, this couple would not be included in our sample. Moreover, couples that formed between 1984 and 2004 enter our analytical sample only if their relationship has survived until 2006. To account for variations in the likelihood of separation based on the year the union was formed, we included the start year of cohabitation as a control variable in the

analyses. A further way to test whether unions that formed in the 1980s and 1990s drive our results is to estimate analyses for couples that formed only after 2005 (when the Big Five personality items were first included). This did not substantially change the main model results, though the p-value increased, likely due to fewer observations (couples: n = 2,143; relationship-years: n = 8,833). The only exception was dissimilarity in conscientiousness, which had a stronger negative effect on union dissolution than in the full sample (Table 10 in the Appendix, albeit the coefficient is not statistically significant). It remains unclear if this is due to the shorter average relationship length (5.03 years vs. 9.93 years in the full sample) or a period effect. For openness and extraversion, the heterogeneity analyses showed little change, though larger differences in conscientiousness between partners led to a convergence in separation risks by male partner's education (Fig. 8 in Appendix), unlike the weak divergence trend in the full sample. Large confidence intervals reflect low case numbers, and future research should explore potential effects of period and relationship length on the link between personality homogamy and union dissolution.

Conclusion and discussion

This study analysed the effects of couple-level dissimilarities in the "Big Five" personality traits on the risk of dissolution of coresidential unions. First, we expected that more dissimilar couples are more likely to separate. Second, we assumed that this effect is less prominent for the highly educated. Our third hypothesis took into account gender differences: highly educated women, but not men, were expected to be more likely to leave a relationship with a dissimilar partner than those with lower education. In our empirical analyses, the first hypothesis was supported only for one personality dimension: openness. Partners with similar levels of openness had a slightly lower risk of union dissolution, in line with the evidence provided by Rammstedt et al. (2013). This is, on the other hand, contradicting the findings of Spikic (2020), who found no effects of personality heterogamy on union dissolution in any "Big Five" personality traits. These differences in the results can be explained by different methodological decisions taken in the analysis (i.e. the consideration of right-censoring in our analysis). Furthermore, it might also reflect differences in the dependent variable: while Spikic (2020) uses divorce as the outcome variable, we use coresidential separation. For dissimilarity in the other personality traits, we did not find statistically significant main effects on union dissolution, partly contradicting our first hypothesis. In our interaction analyses, we found that the main effect of openness is driven by specific education groups. With regard to extraversion (which was not statistically significant in the main effect), the interaction analyses revealed that increased dissimilarity is associated with a lower probability to separate among those with higher education. The moderating effect of education indicates that partnership behaviours vary over educational groups. We assume that highly educated persons have better communication skills that enable them to solve potential conflicts that arise because of partners' dissimilar personalities more successfully than persons with lower education. Additionally, higher educated individuals might be more considerate in the mate selection processes. Because they tend to take more time before they establish a joint household (Sassler et al., 2018), we assumed that highly educated individuals had more time to evaluate whether they get along with their new partner. In

relationships with strong differences in extraversion and (if considering male education) openness, highly educated individuals might have taken their time to test whether they and their partners are able to cope with these dissimilarities. This might also explain the finding that for some of the education groups, differences in extraversion (among highly educated males and females, and if at least one partner in the relationship is highly educated) and openness (highly educated males, and if both partners are highly educated) even increase the relationship stability. For instance, a more thorough process of deciding on whether or not to enter into coresidence could help them to evaluate whether differences in personality are a burden on their relationship, or if they constitute even a strength of the relationship. Future research should analyse other datasets and investigate whether our findings can be replicated.

With regard to gender, our hypothesis that highly educated women are more likely to leave a relationship of dissimilar partners was not supported. This is in line with more recent studies that show that in general, highly educated women (and men) are less likely to separate than those with lower education (Boertien & Härkönen, 2018; Hogendoorn et al., 2022; Matysiak et al., 2014).

Overall, we did not find a clear pattern of separation risks in couples with dissimilar levels of neuroticism, agreeableness and conscientiousness (regardless of education). That means that our hypotheses were supported merely for the personality traits openness and partly extraversion. How can we explain such differences? On the one hand, our findings might imply that the personality dimensions are of varying importance for union dissolution. This is also shown in the heterogeneous findings of the association between personality dimensions and fertility. Findings of empirical studies indicate that openness and extraversion seem to be the most relevant dimensions for fertility decisions. One argument in the literature is that open individuals are more likely to invest in their career and thus have later and fewer children. Indeed it has been shown that individuals with a high level of openness are less likely to have a child (Jokela et al., 2011; van Scheppingen et al., 2016). At the same time, extraverts are sociable and more likely to fall in love. This is reflected in a higher likelihood to have children (Allen, 2019, for men; Jokela et al., 2011; Peters, 2023, for first childbirth, but lower likelihood of second childbirth among male respondents; van Scheppingen et al., 2016). The other personality dimensions show weaker or no associations with fertility in these studies. (Clearly, fertility might also affect personality, see Bleidorn et al., 2018; Jokela et al., 2009). The insights with regard to specific personality traits and fertility are informative also for our study of separation because partners' childbearing plans and behaviours are important for relationship development. First, having children is a strong barrier to union dissolution (e.g. Knoester & Booth, 2000; Todesco, 2011). The stabilising effect of children has been found in many countries and seems to be somewhat stronger among highly educated parents (Kalmijn & Leopold, 2021). Second, it has been shown that disagreement about fertility is associated with a higher likelihood of union dissolution (Qu, Weston, & Vaus, 2009). From this perspective, partners' dissimilarities in openness (and partly extraversion) might lead to incongruent fertility plans and thus to instable partnerships—which is in line with our results. This mediating role of fertility (plans) in the analysis of personality traits and union dissolution should be further analysed in future studies. In addition to these considerations about fertility plans and behaviours, both traits are also likely

connected to a certain lifestyle. For instance, it has been shown that openness is associated with taking up new hobbies and initiating leisure projects (Little et al., 1992), and people with higher scores on openness are more strongly seeking for personal growth (Schmutte & Ryff, 1997). Following this, partners with dissimilar levels of openness might run into conflicts about the shared use of time and resources. Also, extraversion is consistently linked to a higher variance in daily activities (Lee et al., 2023). This might also relate to the finding that there are differences between the effect of personality dissimilarity in openness and extraversion on union stability of those couples where only one partner is highly educated (Figs. 6 and 7 in the Appendix). For instance, while dissimilarity in openness predicts still increased separation risks for this group (similar as if both partners have low or medium education), dissimilarity in extraversion lowers the separation risk for this group (mirroring the pattern of couples where both partners have high education). Building on the idea that high education comes with higher communication skills (Amato, 1996; Ono, 1998), having only one highly educated partner in the relationship could already balance out the potentially adverse effect of having different approaches to leisure time and childbearing (as predicted by differences in extraversion), while it might not suffice to deal with differences in career-orientation (implied by differences in openness) and the resulting obstacles to fertility (Vitali et al., 2009). At the same time, if both partners are highly educated, they might be able to bridge these differences.

On the other hand, the lack of statistically significant results for the other "Big Five" personality traits could result from dynamics of both the complementary needs hypothesis (Winch et al., 1954) and the spousal discrepancy theory (Kilmann & Vendemia, 2013; Kurdek, 1993) being present in the results. For instance, in case there is both a destabilising (as spousal discrepancy theory suggests) and a stabilising (following complementary needs hypothesis) effect of personality differences on coresidential unions, this would result in a non-effect. The degree to which this potential heterogeneity could be explained by different conditions (e.g. different relationship lengths) should be explored in future studies.

As for the limitations of this research, it has to be noted that information on the "Big Five" personality traits was collected only every four years from 2005 onwards in our data. To increase our sample size, we allowed for "delayed entry" (Hosmer et al., 2008), i.e. couples who had started coresidence before 2006 contribute to the analyses with their respective relationship duration. This might lead to an overrepresentation of more stable couples. In order to test whether our results are driven by this group, we did additional analyses with a reduced sample of only those couples that started to coreside after 2005 (when the Big Five personality items were first included). This did not change the results in the main models substantially.

Lastly, this issue leads us to a broader discussion on the potential overrepresentation of long-term relationships in analyses of separation and divorce. After having focussed on the subject of marital dissolution in the last decades (e.g. Amato, 2000, 2010; Raley & Sweeney, 2020), more recently there is a shift in focus to the separation of coresidential unions (e.g. Krapf & Wagner, 2020) or even living apart together relationships (LAT; see e.g. Krapf, 2018). This is a turn from more stable, committed unions, to also relationships with lower barriers to separation than marriages. By focussing on a sample of cohabiting and married couples, our analysis is contributing to this literature. Future research

should address the links between personality (dis-)similarity and stability also in LAT relationships. This will allow us to improve our understanding of the role of personality in the process of relationship institutionalisation.

In this study, we have considered heterogeneities in the effect of personality heterogamy by individual education and by personality trait. Still, there might be also other heterogeneities in the effect of personality differences on the risk of union dissolution. For instance, it seems plausible that in some contexts (e.g. in more rural, religious areas), the barriers to separation are higher, which could hinder the ability of couples to break up due to personality differences. Considering more context variables would help us better understand the contexts and the conditions under which relationships are more likely to dissolve. Moreover, future studies should use a larger sample in order to replicate our analyses with greater statistical power.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s41118-024-00229-w.

Additional file 1.

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Author contributions
Both EH and SK discussed the conceptual framework, modelling strategy, results and implications. EH has written the literature review and theory part, data and methods, prepared the data and run the empirical analyses, written down most of the results and the discussion part. SK has substantively revised the paper. Both authors have read and approved the final manuscript.

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Availability of data and materials
The data that were used to generate and/or analyse the dataset for the current study are available via https://www.diw.de/en/diw_01.c.601584.en/data_access.html

Declarations

Competing interests
The authors declare that they have no competing interests.

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