Parent – Child Relationship Quality Predicts Offspring Dispositional Compassion in

Adulthood: A Prospective Follow-up Study over Three Decades

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Abstract

Compassion is known to predict prosocial behavior and moral judgements related to harm. Despite the centrality of compassion to social life, factors predicting adulthood compassion are largely unknown. We examine whether qualities of parent – child relationship, namely emotional warmth and acceptance, predict offspring compassion decades later in adulthood. We used data from the prospective population-based Young Finns Study. Our sample included 2,761 participants (55.5% women). Parent-child relationship qualities were reported by the participant's parents at the baseline in 1980 (T0) when participants were from 3 to 18 years old. Compassion was self-reported three times (in 1997 [T1], 2001 [T2] and 2012 [T3]) with the Temperament and Character Inventory. By using age at the assessment as a time-variant variable, we applied multilevel modeling for repeated measurements to examine developmental trajectories of compassion from ages 20 (the age of the youngest cohort at T1) to 50 (the age of the oldest cohort at T3). On average, compassion increased in a curvilinear fashion with age. Higher acceptance ($p = .013$) and higher emotional warmth ($p < .001$) were related to higher compassion in adulthood. After adjusting for childhood confounds (participant's gender, birth cohort, externalizing behavior, parental socioeconomic status and parental mental health problems), only emotional warmth ($p < .001$) remained as a significant predictor of compassion. Quality of the parent-child relationship has long-term effects on offspring compassion. An emotionally warm and close relationship, in particular, may contribute to higher offspring compassion in adulthood.

Keywords: Compassion, parenting, parent-child relationship, warmth, acceptance, longitudinal

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Compassion can be conceptualized as an enduring disposition that centers upon empathetic concern for other's suffering and a desire to help (Goetz, Keltner, & Simon-Thomas, 2010). Empirical studies of compassion find that it is related to increased prosocial behavior (Batson & Shaw, 1991; Eisenberg & Miller, 1987), reduced punitive judgments (Carlsmith & Darley, 2008) and ethical judgments of shared common humanity with others (Oveis, Horberg, & Keltner, 2010). Practicing compassion towards others increases individual's well-being (Klimecki, Leiberg, Ricard, & Singer, 2014; Mongrain, Chin, & Shapira, 2011). Compassion may also help manage interpersonal conflicts and build social harmony, as it is related to enhanced relationship quality (Miller, Kahle, Lopez, & Hastings, 2015; Perrone-McGovern et al., 2014) and more obliging, compromising, and integrating ways of dealing with conflict (Zhang, Ting-Toomey, & Oetzel, 2014).

Recent large-scale meta-analyses (with 13 000 - 50 000 participants) (Konrath, O'Brien, & Hsing, 2011; Twenge & Foster, 2010) have documented an increase in narcissistic traits from 1980s to late 2000s ($d = .35$) and a decline in concern for others from 1979 to 2009 ($d = .65$). Excessive egoism and narcissism, characterized by decreased ability to feel compassion for others, undermine the foundations of civil society as they are associated with exploitation, corruption, and criminal activity (Blickle, Schlegel, Fassbender, & Klein, 2006). For this reason, lack of compassion for others is a timely problem in the present society and information on ways to foster compassion is needed. In this study, we examine the developmental origins of compassion by focusing on the parent – child relationship quality as a potential predictor of offspring compassion in adulthood.

Compassion and its developmental origins

In the empirical literature, little is known about the developmental origins of compassion (Roeser & Eccles, 2015). By contrast, the development of a related concept, empathy, has been examined more extensively (Moore, 1990; Zhou et al., 2002). Compassion is distinguished from empathy by the fact that compassion is characterized by a desire to alleviate the suffering of others, whereas empathy is defined as an ability to feel and understand others' emotions (Hoffman, 1981; Preckel, Kanske, & Singer, 2017; Taylor, Eisenberg, & Spinrad, 2015). Some degree of empathy may be a prerequisite for compassion (Singer & Klimecki, 2014; Strauss et al., 2016). However, in contrast to experiences of empathy, compassion is not accompanied by high levels of anxiety or distress, and more typically is experienced as a positive emotional state (Goetz et al., 2010; Klimecki et al., 2014). Recent research also implies that compassion predicts helping behavior even if it is costly to the helper, whereas empathy is not related to helping independently of compassion (Lim & DeSteno, 2016). Moreover, empathy and compassion are shown to be associated with brain activation in different, non-overlapping neural networks (Klimecki et al., 2014). Research on development of compassion-related traits, such as empathy and prosociality, has documented considerable continuity (Eisenberg et al., 2002; Grühn, Rebucal, Diehl, Lumley, & Labouvie-Vief, 2008) and a genetic component that, according to twin studies, explains a significant part of variation (69% in adulthood) in these traits (Knafo-Noam, Uzefovsky, Israel, Davidov, & Zahn-Waxler, 2015; Knafo, Zahn-Waxler, Van Hulle, Robinson, & Rhee, 2008). There is likely to be gene x environment interactions resulting in partial overlap between the genetic and environmental effects. Thus, both genes and environment are likely to play a significant role in the development of compassion. Regarding environmental effects, and more specifically the parenting context, cross-sectional research has shown that quality of parenting is related to offspring's compassion-related traits in childhood and adolescence:

Mother's higher sensitivity is associated with toddler's higher prosociality (Newton, Thompson, & Goodman, 2016). Furthermore, toddlers, whose parents encourage them to label and explain emotions (e.g. by asking why someone is feeling a certain emotion), act more prosocially as assessed by sharing and helping behaviors in experimental situations (Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013). In preadolescents, parental empathy, restricting child's hurtful emotional expressions, and support for problem focused coping in anxiety inducing situations, are associated with higher empathy (Eisenberg, Fabes, Mark Schaller, Carlo, & Miller, 1991). In adolescents, a combination of maternal involvement and connectedness are associated with empathy (Padilla-Walker & Christensen, 2011).

Some longitudinal findings also are germane to the question of what predicts compassion. A two-year study reported that higher parental warmth in middle childhood predicts higher empathy-related responding (Zhou et al., 2002). Another longitudinal study over three years showed that warm, sensitive, and authoritative parenting predicts effortful control, which, in turn, predicts compassion-related responding (empathy and prosocial behavior) in middle childhood (Taylor et al., 2015). Although the antecedents of compassion have not been investigated, a few studies reaching into adulthood have examined factors in the childhood family environment that could promote the development of compassion-related traits, although the samples of these studies have consisted only a few dozens of participants. A study with 75 participants showed that parenting and childhood family environment predicts adulthood empathetic concern 26 years later (Koestner, Franz, & Weinberger, 1990). In this study, parental warmth did not predict empathetic concern, but maternal role satisfaction and tolerance for child's dependency, limiting child's aggression towards other children, and higher paternal involvement in childcare were prospectively associated with higher empathetic concern. A more recent study in a sample of 32 participants showed that

maternal warmth, support and rational discipline (e.g. using reasoning) in childhood predicts

higher level of compassion-related traits in adulthood up until their 30s (Eisenberg,

VanSchyndel, & Hofer, 2015). Overall, research supports the importance of parenting in the

development of compassion-related traits, but not much is known about the stability of these

effects over developmental transitions and whether they persist into adulthood.

Parenting style

Parenting style forms a wider context or emotional undertone that moderates the

effects of more concrete parenting practices so that certain parenting practice produces

different outcomes depending on the more general context of parenting style (Darling &

Steinberg, 1993). Parenting style manifests itself in parent – child relationship quality that is

of crucial significance for the emotional development of the child (Alink, Cicchetti, Kim, &

Rogosch, 2009; Repetti, Taylor, & Seeman, 2002; Stover et al., 2016). Perhaps the most

significant dimension defining the quality of parent – child relationship is emotional warmth

(alternatively named closeness or connectedness) (Clark & Ladd, 2000), as it is recognized

by most theorists as an important aspect of parenting (Clark & Ladd, 2000; Maccoby, 1980;

MacDonald, 1992; Schaefer, 1959). Warmth can be described as parent – child emotional

bond characterized by emotional availability and positive feelings (Clark & Ladd, 2000;

MacDonald, 1992). Warmth is postulated to be distinct from attachment style although they

often covary (MacDonald, 1992). Another related and important aspect defining the quality

of parent – child relationship is acceptance towards the child (Maccoby, 1980; Schaefer,

1959). In the present study, acceptance refers to tolerance towards the child's ordinary

behavior, whereas low acceptance denotes that the parent finds it irritating to be with the

child and perceives the child as a burden that limits parent's possibility for other activities

(Savelieva, Keltikangas-Järvinen, et al., 2017). Although both warmth and acceptance are

related to the dimension of love vs. hostility as defined by Schaefer's Circumplex Model for

Maternal Behavior (Schaefer, 1959), they seem to form two conceptually distinct subscales in

loading on different factors (Savelieva, Keltikangas-Järvinen, et al., 2017) and in predicting

differing outcomes (Gluschkoff et al., 2017; Hintsanen et al., 2010; Katainen, Räikkönen, &

Keltikangas-Järvinen, 1997; Savelieva, Keltikangas-Järvinen, et al., 2017; Savelieva, Pulkki-

Råback, et al., 2017).

Given specific claims found in attachment theory (Bowlby, 1971, 1975) and

social learning theory (Bandura, 1978), parental warmth has been posited to be important in

the development of compassion (Eisenberg et al., 2015). Parental warmth is associated with

secure attachment (Güngör & Bornstein, 2010), which includes positive working models of

others, i.e. others are seen more positively, as trustworthy, and reliable (Bowlby, 1975, pp.

236-243). Secure attachment, in turn, promotes compassion and helping behavior towards

others (Mikulincer, Shaver, Gillath, & Nitzberg, 2005). According to the principles of Social

Learning Theory, children learn by observing other's behavior (Bandura, 1978). Thus,

observing their parents' warm and accepting interactions is likely to give children a model

that supports the development of compassion.

The Current Study

The current study examines whether positive qualities of parent – child relationship, i.e.

emotional warmth and acceptance, predict offspring compassion in adulthood. We use

prospective population-based data where the same individuals have been followed up over

three decades and include a variety of potential confounds (participant's gender, birth cohort,

externalizing behavior in childhood (Eisenberg, Eggum, & Giunta, 2010), parental

socioeconomic status (SES) and parental mental health problems) and covariates

(participant's SES and depressive symptoms in adulthood) that have been found to be

systematically related to levels of compassion (Steffen & Masters, 2005; Stellar, Manzo,

Kraus, & Keltner, 2012). We controlled for the cohort to take into account the potential birth

cohort related variation in predictors and outcome. We hypothesize that positive parent –

child relationship, characterized by higher emotional warmth and higher acceptance, predicts

higher compassion of the offspring even after controlling for the confounds.

Methods

Participants

Participants were drawn from the ongoing Young Finns Study (YFS) (Raitakari et

al., 2008). The YFS is a prospective population-based study that has, since 1980, followed up

individuals from six different birth cohorts (3, 6, 9, 12, 15, and 18 years old at the baseline).

In the current study, we used data from five waves of the YFS: 1980/1983 (combined to T0),

1997 (T1), 2001 (T2), and 2012 (T3). Parenting was examined at T0. Compassion was first

measured when the youngest participants were 20 years old (T1), then 4 years later (T2), and

finally after another 11 years had passed (T3), when the oldest participants had reached the

age of 50.

The original YFS sample consisted of 3,596 Caucasian individuals. We identified

those participants who had information on compassion at least from a single wave and

excluded those with missing values on compassion on all three waves ($N = 835$). The

analytical sample comprised 2,761 participants (77% of the original sample, 1,533 women

and 1,228 men). The sample characteristics are described in Table 1. Attrition analyses

indicated that in comparison with the excluded participants, the included participants were

more likely to be women (56% vs. 36%; $p < 0.001$), to have higher SES (0.01 vs. -.18; $p <$

0.001), and to have parents reporting higher acceptance in the parent-child relationship (1.58

vs. 1.57; $p < .001$). With regard to the pattern of missing values for compassion, 1,174 (43%)

participants had data on compassion from all 3 waves, 834 (30%) from 2 waves, and 753 (27%) from a single wave. The mean number of compassion measurements was 2.2 waves. Compared to those who had data on compassion from a single wave, participants with 3 waves of compassion data had slightly lower childhood externalizing problems (1.05 vs. 1.07; p=.012) and were more likely to be female (64% vs. 43%; p<.001).

The Young Finns study was approved by local ethic committees of all participating universities in the beginning of the study in 1980 and the follow-ups were approved by the ethical committee of University of Turku (Institution name: Varsinais-Suomen sairaanhoitopiirin kuntayhtymä, Eettinen toimikunta, Meeting number: Nro 9/2010, Study name: "Lasten sepelvaltimotaudin riskitekijät projekti (Laseri) 30-vuotis seurantatutkimus, 25.8.2010"). The study was conducted in accordance with the Helsinki declaration. Written informed consent was obtained either from the participants or their parents (if the participant was under 12 years old).

Measures

All measures were presented as written questionnaires posted to the respondents.

Compassion. Given conceptualizations of compassion that define it in terms of reactions to others' suffering and the inclination to provide help (Goetz et al., 2010), compassion was measured with the Temperament and Character Inventory (Cloninger, Przybeck, Svrakic, & Wetzel, 1994). Compassion (versus Revengefulness) is a subscale of the character dimension Cooperativeness. Compassion was assessed with 10 items. The scale and its validity is described in more detail in the supplementary file. The participants provided their answers on a 5-point scale ranging from 1 (absolutely false) to 5 (absolutely true). Mean scores of compassion were used in the analyses. Cronbach's alphas for

compassion were 0.87 at T1, 0.87 at T2, and 0.85 at T3. Test re-test correlations were high with measurements up to 15 years apart ($r = .68$ for T1-T2, .69 for T2-T3, and .59 for T1-T3).

Parent – child relationship quality. We measured variation in positive parenting in terms of emotional warmth and acceptance. Warmth and acceptance were reported by the participant's parent at T0 using two scales derived from the Operation Family Study (Makkonen et al., 1981) as previously described (Dobewall et al., 2018; Savelieva, Keltikangas-Järvinen, et al., 2017; Savelieva, Pulkki-Råback, et al., 2017). Previously, 97% of the responding parents have been shown to be mothers in the Young Finns data (Savelieva, Keltikangas-Järvinen, et al., 2017). We used data from the first wave (year 1980) with available information, and missing values were filled with data from the subsequent wave (year 1983), when available. For 97% of the respondents acceptance and warmth were assessed in year 1980. Acceptance was measured by three items: "In difficult situations, my child is a burden", "I become irritated when being with my child", and "My child takes too much of my time" (the items were reverse scored). Emotional warmth was measured by four items: "My child is emotionally important to me", "I enjoy spending time with my child", "I am emotionally important to my child", and "My child enables me to fulfill myself". The parents reported the parent-child relationship quality on a 5-point scale ranging from 1 (totally disagree) to 5 (totally agree). Cronbach's alphas for both of the scales were 0.67. Because of negatively skewed distributions, both scales were cubic root transformed for the analyses. The two characteristics of parent-child relationship quality were examined separately because they are conceptually different (Savelieva, Keltikangas-Järvinen, et al., 2017) and they have been shown to have distinct predictive validity (Gluschkoff et al., 2017; Hintsanen et al., 2010). Confirmatory factor analysis confirmed that two factor solution fit the data, whereas one factor solution did not (analyses are reported in the supplementary file).

Covariates. Given relations between socio-economic status and compassion and prosociality (Stellar et al., 2012), parental socio-economic status (SES) was assessed at T0 by two indicators, namely, the average of mother's and father's years in education (from the first wave with available information) and the annual household income. Virtually all responses were from year 1980. For the few missing cases the values came from the 1983 data collection. Participant SES was assessed with self-reported total years of education and income in 2007 (between T2 and T3) which was the first assessment wave that included income. Both SES indices were constructed by transforming income and education variables into z-scores (mean = 0, standard deviation = 1) and subsequently adding them together.

Other covariates included participant age (centered at 20 years, which is the age of the youngest participants at the time of the first compassion assessment, and divided by 5), gender (0 = female; 1 = male), participant's externalizing behavior (Cronbach's alpha 0.80, measured at T0 in 1980 with six item derived from the Health Examination Survey (Wells, 1980)), mother's self-reported depression medication use (yes/no, measured at T0 in 1980), and birth cohort (coded as a dummy variables). Participant's depressive symptoms (as time-varying covariate measured at T1-T3 was assessed using modified Beck Depression Inventory (BDI; Cronbach's alphas from 0.91 to 0.93) (Beck & Steer, 1987)) in which the 21 second mildest statements were responded in a scale from 1 (totally disagree) to 5 (totally agree) (Katainen, Räikkönen, & Keltikangas-Järvinen, 1999). The modified BDI has been shown to capture larger proportion of the variance in depressive symptoms in population-based sample than BDI-II developed for clinical populations (Rosenström et al., 2012).

Statistical Analyses

Prior to conducting the analyses, missing values in all predictor variables were imputed by conducting multiple imputation with chained equations (White, Royston, &

Wood, 2011). Using three waves of longitudinal data, we then applied multilevel modeling

for repeated measurements to examine developmental trajectories of compassion from ages

20 (i.e., the age of the youngest cohort at T1) to 50 (i.e., the age of the oldest cohort at T3).

By using age at the assessment as a time-variant variable, we took advantage of the within

birth cohort variation in age enabling us to model non-linear growth trajectories in

compassion. Multilevel modelling with maximum likelihood estimation further allows for

missing values in the dependent variable (Hox, Moerbeek, & van de Schoot, 2010) and does

not add noise to the data the way other methods, such as, imputing for missing values in the

dependent variable can do (von Hippel, 2007). The analyses were conducted for both genders

together as we found no interactions between gender and the parent-child relationship

qualities in predicting compassion (p-values > .76).

   First, we ran an unconditional growth model (with a random intercept, and a

random slope for age) to analyze growth trajectories of compassion with age and age squared

as the only predictors. Next, we examined the effects of variation in parent-child relationship

quality on the development of compassion by first controlling for potential childhood

confounders (participant gender, birth cohort, externalizing behavior in childhood, parental

SES and parental mental health problems) in participants and their parents and then, by

additionally adding adulthood covariates (participant's SES and depressive symptoms in

adulthood). Separate models were built for the two characteristics of parent-child relationship

quality, that is, emotional warmth and acceptance. To illustrate the effects of parent-child

relationship quality on the development of compassion over time, age-related growth

trajectories of compassion were plotted. We used STATA 13 statistical software (Stata

Corporation, College Station, TX) to conduct the analyses.

Results

Table 1 presents the descriptive statistics of the analytic sample after multiple imputation. The number (percentage) of the participants in birth cohorts aged 3, 6, 9, 12, 15, and 18 at baseline were 450 (16.3%), 452 (16.4%), 488 (17.7%), 485 (17.6%), 475 (17.2%), and 411 (14.9%), respectively. Only 2% of the parents report mental health problems but since these values are self-reported this may be underreported. Values on compassion could be considered to correspond to the means in general population as these values did not differ from the compassion values in those excluded in our population-based sample.

(Insert Table 1 about here)

Table 2 presents the bivariate Pearson correlations between the study variables. The correlations were obtained from the first imputed dataset. Higher emotional warmth correlated with higher compassion at each assessment. Higher acceptance correlated with higher compassion at T1 and T3. Correlations between compassion assessments from different time points (T1-T3) ranged from $r = .59$ to $r = .69$ (p-values < .001).

(Insert Table 2 about here)

The unconditional growth model showed that participants varied (p-values < .001) in their initial level, i.e. intercept (mean [M] = 3.47, standard deviation [SD] = 0.64), and their rate of change, i.e. slope of compassion ($M = 0.10$, $SD = 0.06$) i.e., the variance of the intercept and slope were significant at the individual level. On the average, compassion increased in a curvilinear fashion with age (Figure 1). Results from the multivariate models predicting compassion with parent-child relationship quality are shown in Table 3. In unadjusted analyses, higher acceptance (b = 0.306, 95% CI [0.064 – 0.548], $p = .013$) and higher emotional warmth (b = 0.619, 95% CI [0.310 – 0.928], $p < .001$) were related to higher adulthood mean levels of compassion but not to rate of change in compassion. After adjustments for childhood covariates, the association for emotional warmth was slightly

attenuated (b = 0.523, 95% CI [0.215 – 0.830], p < .001) and was no longer significant for acceptance (b = 0.171, 95% CI [-0.080 – 0.422], p = .18). When adulthood covariates were additionally adjusted, the association between emotional warmth and compassion in adulthood was further attenuated but remained significant (b = 0.315, 95% CI [0.022 – 0.608], p = .035). Adulthood covariates (SES and depressive symptoms) attenuated the association between emotional warmth and compassion by 40%. Because the majority of attenuation was due to depressive symptoms, we additionally examined the potential mediating effects of depressive symptoms by using data from T0 (emotional warmth), T1 (depressive symptoms), and T2 (compassion). We observed a significant indirect effect of emotional warmth on adulthood compassion through depressive symptoms (B = 0.20, 95% CI 0.099 to 0.303, p<.001) which accounted for 38% of the total association. The growth trajectories of compassion for low and high levels (±1 SD above the mean) of emotional warmth, adjusting for potential childhood confounders and adulthood covariates are presented in Figure 1.

We additionally examined the association between parent-child relationship quality and compassion by simultaneously entering both emotional warmth and acceptance in an unadjusted model. Similar to the results from the models in which the parent-child qualities were analyzed separately, only emotional warmth (B = .552, p = .001) but not acceptance (B = 0.010, p = .159) was associated with adulthood compassion. Emotional warmth thus appeared to be predictive of later compassion even when the effects of acceptance were taken into account. Further, we tested how age affected the results by dividing the sample to two groups: Those in three youngest cohorts (aged 3 – 9 at T0 in 1980) and those in three oldest cohorts (aged 12 – 18 at T0). The results on warmth were similar in both age groups but stronger in the younger group. Acceptance was associated with

compassion only in the unadjusted analyses in the older age group (Supplementary Tables 1. and 2.).

(Insert Table 3 and Figure 1. about here)

Discussions

This is the first large-scale prospective longitudinal study examining associations between parent-child processes and adulthood compassion. We examined two essential dimensions of parent-child relationship quality (i.e. parental warmth and acceptance) in relation to the development of compassion in data spanning over three decades. A parent-child relationship characterized by high emotional warmth predicted higher compassion after accounting for a host of possible confounds and covariates. Parental acceptance was not, however, associated with compassion after taking into account childhood confounds. This study suggests that compassion has its developmental roots in early life experiences, particularly in the level of warmth experienced in the parent-child bond.

Although emotional warmth predicted the level of compassion in adulthood, the shape of the compassion trajectory was not affected by warmth. That is, the difference between those who experienced low or high parental warmth seems to remain constant throughout adulthood. The parent – child relationship quality, thus, seems to have long standing consequences. As there is a paucity of research on how childhood factors may affect change later in early and middle adulthood, the findings above are important also in wider context of developmental psychology.

It is also noteworthy that in terms of development of compassion, warmth was relevant for the children as well as for adolescents, as shown by our additional analyses in data divided to two age groups (the 3 – 9-year-olds and the 12-18-year-olds at the time of assessment of warmth). Although adolescents profit from warmth, our results indicated that parental warmth may be somewhat more important in younger children. This is in line with

the fact that in adolescence, the peer group becomes more important than before and simultaneously the parental influence diminishes (Hay & Ashman, 2003).

Parental warmth has previously been associated also with higher pro-sociality and empathy in offspring (Eisenberg et al., 2015; Taylor et al., 2015; Zhou et al., 2002). Even though empathy is conceptually different from compassion and they are related to different neural networks and outcomes (Klimecki et al., 2014; Lim & DeSteno, 2016), our findings suggest that they may share some similar environmental origins. The results of the present study are also in line with research on attachment styles developing in early care-giving interactions. Sensitive parenting promotes the development of secure attachment style (Güngör & Bornstein, 2010), which in turn, has repeatedly been shown to be related to compassion and various forms of prosociality (Shaver, Mikulincer, Sahdra, & Gross, 2016). Furthermore, in line with our findings, it has been proposed that experiences of connectedness or unity (versus separation) are important for the identity development and especially for the development of self-transcendent values like compassion (Cloninger & Cloninger, 2011).

Acceptance was not independently associated with compassion after adjustment for childhood factors. Thus, it seems that this association may be fully explained by confounding factors. We also included some adulthood covariates (SES and depressive symptoms) that may act both as confounds and as mediators. One reason for including these covariates was to gain preliminary information about potential pathways through which parent – child relationship quality may affect compassion in adulthood. Our results showed that these adulthood covariates did not fully explain the association between emotional warmth and compassion although they somewhat attenuated the association. Although adulthood depressive symptoms appeared to mediate the effects of emotional warmth on compassion, there are likely other pathways to explain the association as well.

Although our primary goal was to examine the association between parent-child relationship quality and compassion, having repeated measures of compassion from participants representing different birth cohorts enabled us also to investigate age-related changes in compassion throughout adulthood. Our results indicated that in adulthood, compassion increases in curvilinear and decelerating fashion along with age, which is in line with research on empathy (empathetic concern and perspective taking) showing that empathy increases from young adulthood to the middle age (O'Brien, Konrath, Grühn, & Hagen, 2013). Regarding compassion, it has previously been found that compassion declines from age 12 to age 14 (Bengtsson, Söderström, & Terjestam, 2016). Our results imply that this decline turns into renewed increase among individuals in their 20s. The developmental increase in compassion and empathy over adulthood is in line with the finding that mature personality traits, like compassion, increase along with age possibly due to cultural norms that shape personality towards this direction (Josefsson, Jokela, Cloninger, et al., 2013). Our findings are also in accordance with the previously found decrease in narcissistic features in young adults when growing older (Johnson et al., 2000).

Our study provides information relevant for parents and social service organizations, such as the maternity clinics and child welfare clinics. Parents should be given support and information on the significance of the warmth of parent – child relationship for the development of compassion in their children. However, as this was the first study on this issue, replications would be needed to confirm our findings. It would also be important to investigate what kind of role professional caregivers and teachers play in the development of children's compassion and whether the professional caregiver – child relationship quality affects the development of compassion similarly as the quality of parent – child relationship.

Limitations and Strengths

There are some limitations that should be acknowledged. First of all, we used non-standard measures of parent – child relationship quality. These measures, however, have been shown to have predictive validity; they predict personality development (Josefsson, Jokela, Hintsanen, et al., 2013), a variety of other factors such as work-related well-being (Hintsanen et al., 2010), and depressive symptoms (Gluschkoff et al., 2017). Another limitation is that the parent – child relationship quality was assessed only by one parent, mostly mothers. Additional evaluations by fathers were not collected which was common practice at the time of the measurement in 1980. Furthermore, although we used a well-known and well validated personality scale (e.g. Cloninger et al., 1994; Goncalves & Cloninger, 2010; Vitoratou, Ntzoufras, Theleritis, Smyrnis, & Stefanis, 2015) to assess dispositional compassion, it has not been validated against other measures of compassion. However, there is neither golden standard for assessing dispositional compassion nor a well-validated measure exclusively developed for its assessment corresponding to the definition of compassion (Goetz et al., 2010; Strauss et al., 2016). Compassion and some other measures were assessed with self-reports. The validity could be increased if other informants would be included. Participant age range was rather wide (3 - 18 years) when parent-child relationship quality was assessed. However, we have previously shown that the parenting scales measure rather stable parental characteristics (Katainen, Räikkönen, & Keltikangas-Järvinen, 1997) and when the parenting variables are standardized within each age cohort, their associations remain practically unchanged (Gluschkoff et al., 2017). Furthermore, when we divided our data to two age groups, the results on warmth were similar in both groups although somewhat stronger in the younger group. As a further limitation, it should also be noted that we cannot exclude the possibility that shared genes between parents and offspring could at least partly explain our

findings. There were also selective attrition for which reason our findings may be better generalizable to women and those with higher socioeconomic position, but it should also be noted that our study included 77% of the participants of the original sample which can be considered a very high rate in a study spanning over three decades. Finally, there may be cultural differences in e.g. in how easily individuals tend to feel compassion and what kind of situations evoke compassion but thus far these differences are largely unknown (Goetz et al., 2010). Our study was conducted in a Finnish (Caucasian) population and the extent of generalizability of these findings to other cultures is not clear. In Finland, independence is expected of children at a very young age. For instance, as school days are short and participation of women in full-time work is nearly as high as that of men, it is common that already seven-year-olds spend the afternoon without their parents or even alone at home. Although we can merely speculate, it is possible that in this cultural context warmth might have more pronounced effects.

Our study also had several strengths. These included a long follow-up period, prospective measurement of parent-child relationship 32 years before the outcome, inclusion of a variety of confounders, and a fairly large random sample that was representative of the Finnish population. Another advantage is the use of multiple imputation to replace missing values. Moreover, using multilevel modelling allowed maximal use of data on compassion as it allows missing values in the dependent variable that is assessed several times. Furthermore, the childhood and adulthood factors were reported by different informants, reducing the possibility for common informant bias. Several assessments of compassion years apart increase the validity of the assessment.

Conclusions

In addition to the previously shown genetic underpinnings (Knafo-Noam et al., 2015), our findings suggest that compassion has its developmental roots in early life experiences, particularly in the level of warmth experienced in the childhood family. These results are relevant for parents as well as social service organizations like child welfare clinics. Our findings give novel information on the early factors affecting the development of compassion, a subject scarcely studied so far.

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Table 1

Descriptive statistics

Variable		N	M (%)	SD	Range
Parental characteristics					
SES[a]		2,761	0.00	0.76	-1.96 to 7.74
Mental health problems (yes)		2,761	(2%)	-	0 to 1
Emotional warmth[b]		2,761	1.64	0.07	1.00 to 2.08
Acceptance[b]		2,761	1.58	0.09	1.00 to 2.08
Offspring characteristics					
Gender (female)		2,761	(56%)	-	0 to 1
SES[a]		2,761	-0.01	0.78	-2.08 to 2.83
Externalizing behavior		2,761	1.05	0.11	0.71 to 2.00
Age	at T1	2,761	27.43	5.01	20 to 35
	at T2	2,761	31.43	5.01	24 to 29
	at T3	2,761	42.43	5.01	35 to 50
Depressive symptoms	at T1	2,761	2.15	0.67	0.06 to 4.57
	at T2	2,761	2.07	0.67	0.38 to 4.62
	at T3	2,761	2.06	0.69	0.07 to 4.86
Compassion	at T1	2,102	3.58	0.70	1.00 to 5.00
	at T2	2,095	3.67	0.67	1.00 to 5.00
	at T3	1,746	3.74	0.60	1.10 to 5.00

M = mean; SD = standard deviation; T1 = 1997; T2 = 2001; T3 =2012. [a] Calculated on

standardized variables; [b] Cubic root transformed

Table 2

Pearson correlations between the study variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
Parental characteristics														
1. SES[a]	1.00													
2. Mental health problems (yes)	-.02	1.00												
3. Emotional warmth[b]	.06**	-.04*	1.00											
4. Acceptance[b]	-.00	-.05*	.27***	1.00										
Offspring characteristics														
5. Gender	.11***	-.01	-.03	-.05**	1.00									
6. SES[a]	.23***	-.04	.03	-.01	.01	1.00								
7. Externalizing behavior	-.15***	-.00	-.11***	-.15***	.06***	-.12***	1.00							
8. Age	-.02	.03	-.11***	.29***	.01	-.01	-.10***	1.00						
9. Depressive symptoms T1	-.19***	.04*	-.08***	-.09***	-.14***	-.04*	.01	.00	1.00					
10. Depressive symptoms T2	-.16***	.04*	-.08***	-.07***	-.12***	-.04*	.03	.02	.66***	1.00				
11. Depressive symptoms T3	-.13***	.08***	-.09***	-.04*	-.02	-.07***	.03	.05*	.55***	.60***	1.00			
12. Compassion T1	.06**	.02	.05*	.06**	-.14***	-.00	-.07**	.13***	-.29***	-.20***	-.17***	1.00		
13. Compassion T2	.04	.02	.05*	.02	-.14***	.03	-.10***	.05*	-.24***	-.27***	-.22***	.68***	1.00	
14. Compassion T3	.09***	.01	.06*	.08***	-.18***	.06**	-.07**	.08**	-.19***	-.18***	-.29***	.59***	.69***	1.00

T1 = 1997; T2 = 2001; T3 =2012. [a] Calculated on standardized variables; [b] Cubic root transformed

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

Table 3

Associations of Parent – Child Relationship Qualities (Emotional Warmth and Acceptance) with Offspring Compassion in Adulthood

Variable	Model I		Model II		Model III	
	b	(95% CI)	b	(95% CI)	b	(95% CI)
Age		(0.071,		(0.068,0.1		(0.055,0.10
Age^2	-	(-0.011, -	–	(–0.012,–	–	(–0.010,–
Emotional		(0.310,		(0.215,		(0.022,
Age		(0.068,		(0.068,0.1		(0.055,0.10
Age^2	-	(-0.011,-	–	(–0.012,–	–	(–0.010,–
Acceptance		(0.064,	0.171	(–0.080,	0.025	(–0.214,

$N = 2{,}761$. b = unstandardized beta coefficient; CI = confidence interval. The results are presented separately for emotional warmth and acceptance. Age was centered at 20 years and divided by 5, and the coefficient reflects how growing 5 years older affects the level of compassion. Model I: unadjusted; Model II : adjusted for childhood factors (gender, cohort membership, externalizing behaviour in childhood, parental SES and parental mental health problems); Model III: additionally adjusted for adulthood covariates (offspring SES in adulthood, depressive symptoms in adulthood). * $p < .05$, ** $p < .01$, *** $p < .001$
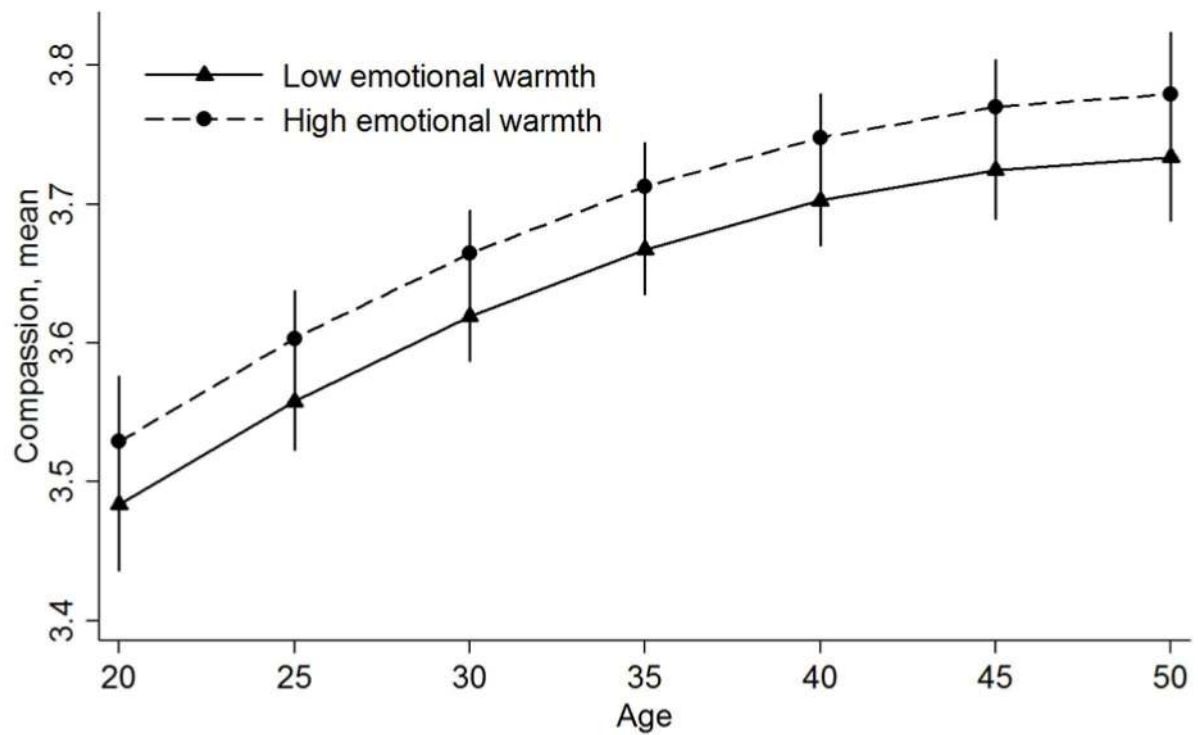
Figure 1.   Growth trajectories of compassion for low and high levels (±1 *SD* above the

mean) of emotional warmth, adjusting for potential childhood confounders and adulthood

covariates. Predicted means with 95% confidence intervals.

Supplementary file

Compassion assessment

Compassion (versus Revengefulness) was assessed with Temperament and character Inventory which has high reliability and validity shown by previous studies (e.g. Cloninger, Przybeck, Svrakic, & Wetzel, 1994; Goncalves & Cloninger, 2010; Vitoratou, Ntzoufras, Theleritis, Smyrnis, & Stefanis, 2015). Compassion is a subscale of the character dimension Cooperativeness which includes four other subscales: Social acceptance, empathy, helpfulness, and fair principles. Compassion was assessed with 10 items (e.g., "It gives me pleasure to see my enemies suffer" [reverse scored], "It gives me pleasure to help others, even if they have treated me badly" [positively scored], "I like to imagine my enemies suffering" [reverse scored] and "I hate to see anyone suffer" [positively scored]). Construct validity of the compassion measure is shown by its correlations with theoretically related constructs. Positive correlations with social warmth, sociability and positive emotions (Garci´A, Aluja, Garci´a, Escorial, & Blanch, 2012) and negative correlations with hostility, anger, verbal and physical aggression (Garci´A et al., 2012; Lee et al., 2012) and narcissistic disorder (De Fruyt, De Clercq, van de Wiele, & Van Heeringen, 2006) have been reported.

Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) with the R package lavaan (Rosseel, 2012) was conducted to assess the structural validity of the parent-child relationship quality measure (data from 1980). Because the answers to the items measuring emotional warmth and acceptance were non-normally distributed, the items were treated as categorical and diagonally weighted least squares (DWLS) method was used for parameter estimation. We fitted two different models: a one-factor model and a correlated two-factor model.

Model fit was assessed using the comparative fit index (CFI), Tucker Lewis index (TLI) and root mean square error of approximation (RMSEA). The values were judged by the criteria of CFI and TLI >0.95 and RMSEA <0.07 to indicate an acceptable model fit (Hu & Bentler, 1999; Steiger, 2007). The results of the CFAs are presented in **Table 1**. Model fit statistics indicated that the one-factor model did not fit the data (CFI = 0.900 , TLI = 0.850, RMSEA = 0.170). The two-factor model fitted the data well (CFI = 0.985 , TLI = 0.977, RMSEA = 0.067). The factor loadings were all moderate to high and significant ($p<0.001$).

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Table 1. Model fit statistics and standardized factor loadings from the two models

Model fit statistics	One-factor model	Two-factor model
Chi-square (d.f.)	1354.309 (14)	207.142 (13)
P-value, chi-square	<0.001	<0.001
CFI	0.900	0.985
TLI	0.850	0.977
RMSEA	0.170	0.067
Factor loadings	General factor	Emotional warmth	Acceptance
My child is emotionally important to me	0.686	0.769	
I am emotionally important to my child	0.496	0.593	

I enjoy spending time with my child	0.750	0.881
My child enables me to fulfill myself	0.551	0.639
I become irritated when being with my child (reversed)	0.745	0.816
In difficult situations, my child is a burden (reversed)	0.759	0.837
My child takes too much of my time (reversed)	0.416	0.475

Note. N=3319. All factor loadings were statistically significant at the p<0.001 level.

Associations of Parent – Child Relationship Qualities (Emotional Warmth and Acceptance) with Offspring Compassion in Adulthood in the youngest age cohorts aged 3 - 9 years at the baseline (T0).

Variable	Model I		Model II
	b	(95% CI)	b
Age	0.133***	(0.083, 0.183)	0.131***
Age2	-0.017**	(-0.028, -0.006)	-0.017**
Emotional warmth	0.782**	(0.257, 1.307)	0.662*
Age	0.131***	(0.081, 0.181)	0.130***
Age2	-0.016**	(-0.027, -0.005)	-0.016**
Acceptance	0.249	(-0.114, 0.612)	0.146

N = 1390. b = unstandardized beta coefficient; CI = confidence interval. The results are presented separately for emotional warmth and acceptance. Age was centered at 20 years and divided by 5, and the coefficient reflects how growing 5 years older affects the level of compassion. Model I: unadjusted; Model II : adjusted for childhood factors (gender, cohort membership, externalizing behaviour in childhood, parental SES and parental mental health problems); Model III: additionally adjusted for adulthood factors (offspring SES in adulthood, depressive symptoms in adulthood). * p < .05, ** p < .01, *** p < .001

Supplementary Table 2

Associations of Parent – Child Relationship Qualities (Emotional Warmth and Acceptance) with Offspring Compassion in Adulthood in the older age cohorts aged 12 - 18 years at the baseline (T0).

Variable	Model I		Model II		Model III	
	b	(95% CI)	b	(95% CI)	b	(95% CI)
Age	0.071	(-0.006, 0.147)	0.072	(-0.004, 0.149)	0.056	(-0.017, 0.130)
Age2	-0.004	(-0.014, 0.005)	-0.004	(-0.014, 0.005)	-0.003	(-0.012, 0.006)
Emotional warmth	0.557**	(0.177, 0.937)	0.428*	(0.046, 0.809)	0.156	(-0.208, 0.521)
Age	0.071	(-0.006, 0.147)	0.072	(-0.004, 0.149)	0.056	(-0.017, 0.130)
Age2	-0.004	(-0.014, 0.005)	-0.004	(-0.014, 0.005)	-0.003	(-0.012, 0.006)
Acceptance	0.352*	(0.011, 0.694)	0.181	(-0.166, 0.528)	0.004	(-0.328, 0.336)

N = 1371. b = unstandardized beta coefficient; CI = confidence interval. The results are presented separately for emotional warmth and acceptance. Age was centered at 20 years and divided by 5, and the coefficient reflects how growing 5 years older affects the level of compassion. Model I: unadjusted; Model II : adjusted for childhood factors (gender, cohort membership, externalizing behaviour in childhood, parental SES and parental mental health problems); Model III: additionally adjusted for adulthood factors (offspring SES in adulthood, depressive symptoms in adulthood). * p < .05, ** p < .01, *** p < .001