



Environmental sensitivity increases susceptibility to resilient contexts in adults with childhood experiences of neglect

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Abstract

Empirical evidence regarding the impact of childhood emotional neglect on later adjustment is mixed, with some studies reporting neglect to predict low psychological well-being, while others reporting a well-adjusted development despite childhood experiences of emotional neglect. This heterogeneity is understood within a resilient framework where individual and contextual factors act as moderators. This is the first study investigating the moderating role of environmental sensitivity and contextual resilience on the association between childhood emotional neglect and psychological well-being. 737 students from the University of Florence with an age ranging from 18 to 30 years ($M = 19.81$; $SD = 1.91$; 87% female) took part in the research. To investigate the effects of childhood emotional neglect on relational well-being, and the moderating role of environmental sensitivity and contextual resilience on the impact of emotional neglect, a series of generalized linear models, including only main effects and then adding interaction terms, were run and compared. Results provided support for a three-way interaction model, with environmental sensitivity and contextual resilience moderating the impact of childhood emotional neglect on relational well-being in young adulthood ($B = .37$, $SE = .11$, $p < .001$). Among those who experienced severe levels of childhood emotional neglect, young adults high in environmental sensitivity were more susceptible to the positive impact of supportive contexts, presenting higher levels of well-being compared to those low in environmental sensitivity. This study suggests that promoting supportive contexts in adulthood might reduce the impact of severe childhood emotional neglect, particularly in individuals with an increased environmental sensitivity.

Keywords Childhood neglect · Environmental sensitivity · Contextual resilience · Well-being

Introduction

Childhood emotional neglect has deleterious consequences on psychological health and well-being (e.g., Green et al., 2019; Humphreys et al., 2020). Yet further empirical evidence suggests that adults who experienced early emotional neglect are overall well-adjusted and not more at risk than others to develop psychological symptoms (Cheung et al., 2017; Folger & Wright, 2013; Luthar et al., 2000). This heterogeneous pattern of findings suggests that a series of variables might act as moderators, contributing

to different pathways of adaptation and maladaptation after traumatic childhood experiences. The identification of such moderating variables can have important applied implication for factors to be targeted in intervention and prevention programs.

Childhood neglect is defined as parental omission of response to the child's needs (Ferrara et al., 2018; Stoltenborgh et al., 2013). Specifically, emotional neglect refers to the failure of caregivers to provide for a child's basic psychological needs, such as love, encouragement, a sense of belonging and support (Bernstein & Fink, 1998; Turner et al., 2019). It is the most frequently reported form of child maltreatment, taking up 76.1% of all children who received a child protection response in 2020 in the USA (U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau (2022); Child Maltreatment 2020), and 18.4% in Europe (Sethi et al., 2013).

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From a developmental perspective, the impact of emotional neglect is not limited to current adjustment, rather it impacts on long-term psychological well-being and socio-emotional development (Beilharz et al., 2020; Hagborg et al., 2017). Specifically, several empirical studies provided evidence that childhood emotional neglect hamper the individual's relational well-being, defined in terms of perceived social support, interpersonal relationships and socio-emotional adjustment (e.g., Beilharz et al., 2020; Berzenski, 2018), and suggest that the impact of early emotional neglect is even higher than that reported for other form of childhood maltreatment and abuse (Beilharz et al., 2020; Berzenski, 2018; Cohen & Thakur, 2021). Furthermore, evidences emphasized that problems are proportional to the severity of neglectful experiences with those who experienced more severe levels of neglect during childhood displaying more symptoms of anxiety and depression in adulthood compared to those who experienced low levels of these adverse experiences (e.g., Evans et al., 2013; Rehan et al., 2017).

However, not all studies reported emotional neglect to have a long-term impact on adjustment, with some empirical evidences reporting adults with childhood experiences of emotional neglect to become well-adjusted individuals (Cheung et al., 2017; Folger & Wright, 2013). This heterogeneity is understood within a resilient framework (Constantine et al., 1999; Luthar et al., 2000; Masten, 2014) where individual and contextual protective factors can act as moderators (e.g., Booth et al., 2015; Cheung et al., 2017; Folger & Wright, 2013; Greven et al., 2019). To identify what specific variables might play a moderating, protective role, can have important applied implications for informing intervention and prevention programs.

Guided by the developmental perspective of *individual by context* (e.g., Rutter, 2014), in the current study we investigated the impact of childhood neglect experiences on adult well-being considering individual and contextual characteristics that can influence one's ability to cope with such negative experiences. Specifically, we considered individual differences in environmental sensitivity (Aron et al., 2012; Pluess, 2015) and contextual resilience (e.g., Masten, 2014). Individuals high in environmental sensitivity, due to their increased susceptibility to stimuli, might present lower levels of well-being growing up if they had experienced emotional neglect in childhood. However, because they are more sensitive to positive stimuli too, an increased environmental sensitivity might allow them to benefit more of a positive supportive environment encountered while growing up, as captured by the notion of contextual resilience.

Environmental sensitivity as a candidate individual moderator

Theoretical reasoning and empirical evidences converge on the notion that some people are more likely to

be more affected than others by the negative effects of adverse childhood experiences, and to benefit more from the positive effects of an enriching contexts, due to their increased sensitivity to environmental stimuli. According to the *Environmental Sensitivity* meta-framework, such differences in response to the environment are captured by the individual trait of Sensory Processing Sensitivity (SPS, Aron et al., 2012; Greven et al., 2019; Pluess, 2015), which is defined as the ability to perceive and process inner and external stimuli. This increased sensitivity and susceptibility to events is deemed to be driven by a more sensitive central nervous system, which perceives and processes experiences more deeply (Aron et al., 2012; Greven et al., 2019). Meta-analytic data (Lionetti et al., 2019a, b) and correlational studies have shown that individuals high in SPS are more prone to negative affect, including anxiety and depression, especially when the quality of the environment is less than optimal (Bakker & Moulding, 2012; Liss, et al., 2008). For example, results of the retrospective study by Aron et al., (2005) showed that individuals high in SPS had a higher tendency to be shy/withdrawn and to express more negative affect in adulthood only when reared in adverse family environments during childhood. Similarly, longitudinal evidences suggested that children high in environmental sensitivity were more at risk of higher levels of externalizing and internalizing behavioural problems (Lionetti et al., 2019b; Slagt et al., 2018), including rumination and depression, up to pre-adolescence (Lionetti et al., 2021), particularly when exposed to negative parenting and permissive parental styles in early childhood. The negative impact of adverse experiences in childhood and of a negative quality of life on adult adjustment has been also reported by Booth et al. (2015), showing that environmental sensitivity did moderate the association between childhood experiences and adult life satisfaction, and emphasizing how young adults who scored high in environmental sensitivity, and reported negative childhood experiences such as being neglected, showed lower life satisfaction.

Yet, individuals with an increased environmental sensitivity have been also reported to benefit more of positive rearing contexts and experiences, including nurturing and supportive parenting (e.g., Slagt et al., 2018), intervention and prevention programs (Nocentini et al., 2018; Pluess & Boniwell, 2015), and video-clip inducing positive emotions in laboratory contexts (Lionetti et al., 2018). From a vantage perspective (Pluess & Belsky, 2013), an increased susceptibility might allow individuals to exceptionally benefit of an enriched environment, with important implications for intervention and prevention programs.

Hence, from the available empirical evidences, we can conclude that differences in environmental sensitivity interact with the quality of the developmental context influencing

adjustment and well-being, currently and longitudinally. Therefore, it is important to consider not only individual characteristics but also contextual factors and their reciprocal interplay as processes potentially able to explain the response to childhood experiences of neglect.

The role of contextual resilience

The notion of *resilient contexts* refers to the quality of family relationships and relationships with peers, and to participation within the community (Constantine et al., 1999; Masten, 2014), that is to contextual variables responsible for individual variability in the adjustment and well-being, and hence potentially able to explain the heterogeneity found after emotional neglectful experiences. Positive relational factors as close relationships with friends, peers, romantic partners, and family members, and an active and fruitful participation within the community, including places of employment, neighborhoods, and schools (e.g., Constantine et al., 1999), can potentially attenuate the impact of adverse childhood events, reducing the symptoms of suffering, and promoting adaptive development and well-being (Afifi et al., 2016; Folger & Wright, 2013). For example, social support from family and friends have been reported to decrease the long-term negative impact of childhood maltreatment (e.g., Folger & Wright, 2013), and being happy living in one's neighborhood and experiencing positive academic achievements are associated with better mental health outcomes in adolescents exposed to childhood maltreatment and neglect earlier in life (e.g., Cheung et al., 2017).

From an *individual by context* perspective (e.g., Rutter, 2014), and in line with the *Environmental Sensitivity* framework (SPS, Aron et al., 2012; Greven et al., 2019; Pluess, 2015), it is reasonable to expect some adults to be more susceptible to the impact of contextual, resilience factors, a hypothesis that has not been investigated yet. Our study aims to deepen our understanding of the interplay between individual traits, and specifically environmental sensitivity as captured by SPS, and resilient contextual environments, in the exploration of childhood emotional neglect on well-being in young adulthood.

The current study

To the best of our knowledge, this is the first study investigating the moderating role of environmental sensitivity and contextual resilience in the association between childhood emotional neglect and current psychological well-being in young adulthood. Understanding the buffering effect of environmental sensitivity and contextual resilience in the association between childhood emotional neglect and current well-being might contribute to explain differences in

response to the severity of childhood neglect, and inform intervention and prevention programs on what variables to target for promoting the individual's well-being.

In line with the *Environmental Sensitivity* meta-framework (Aron et al., 2012; Greven et al., 2019; Pluess, 2015), we hypothesised that young adults with high sensitivity to the environment are more affected by both negative and positive developmental contexts in relation to well-being. More specifically, we expected those with a high sensitivity to the environment to be more vulnerable when exposed to severe experiences of childhood emotional neglect, and therefore to present lower levels of relational well-being. At the same time, we expected those with a high environmental sensitivity to benefit more from the positive, resilient contexts (including family, community and friends as supportive and enriching context factors), despite having experienced severe levels of emotional neglect and to be more at risk of low levels of relational well-being in the context of severe childhood neglect experiences and low levels of contextual resilience. On the other side, we supposed that those with low sensitivity to the environment are less affected by neglectful experiences and by a positive resilient context.

Method

Participants and procedure

Participants were 737 students from the University of Florence with an age ranging from 18 to 30 years ($M = 19.81$; $SD = 1.91$). The majority (59.5%) were from Psychology School, 40.1% from Educational Sciences and the remaining 0.4% did not specify the degree course. About socio-demographic variables, the majority of students were female (86.5%), and Italian (97%). The remaining 3% were of foreign nationality. 362 students (49%) participated in the research during the first semester of University lessons between October and December 2020, and 375 (51%) participated during the first semester between October and December 2021. The survey has been administered via the google form platform and was anonymous, respecting the processing of personal data, and included an informed consent. Students participated on a voluntary basis in the research, having the possibility to accept or not the consent to the processing of personal data.

Measures

Emotional neglect Childhood emotional neglect was assessed with the Childhood Trauma Questionnaire—Short Form (CTQ-SF; Bernstein et al., 2003). This measure

contains items of childhood physical abuse, sexual abuse, emotional abuse, physical neglect, and emotional neglect, with 5 items per scale (and 3 additional “minimization” items, which were not used in the present study). Participants endorsed the frequency with which items occurred when they were growing up, on a 5-point scale from 1 (never true) to 5 (very often true). For the purpose of the current study, we will consider only the Emotional Neglect subscale. Emotional neglect items include “There was someone in my family who made me feel important or special”; “The people in my family took care of each other”; “I felt loved”; “The people in my family were close”; “My family has been a source of strength and support”. Emotional neglect subscale evidenced excellent reliability in this sample ($\alpha = 0.91$).

Environmental sensitivity Environmental sensitivity was assessed with the Italian short version of *Highly Sensitive Person Scale* (Pluess et al., 2020), consisting of 12 items each rated from 0 to 7 (“0” = “Not at All; “7” = “Extremely”). The items measure *Sensory Processing Sensitivity* (SPS), which represents physiological reactivity to stimuli in the environment (e.g., “Are you easily overwhelmed by things like bright lights, strong smells, coarse fabrics, or sirens close by?”; “Do you get rattled when you have a lot to do in a short amount of time?”). Consistent with previous studies on the psychometric properties of the scale with young adults (HSPS) (e.g., Pluess et al., 2020), internal consistency in the current sample had a Cronbach’s alpha of 0.72 and the bifactorial structure of the tested model showed good fit indexes [$\chi^2(43) = 131.388$, $p < 0.0001$, CFI = 0.961, RMSEA = 0.053, confidence interval [CI] 90% 0.043; 0.063; SRMR = 0.036].

Contextual resilience Contextual resilience factors were assessed using items from *Resilience and Youth Developmental Module* (RYDM) (Hanson & Kim, 2007). Originally, the module version for adolescents and young adults includes 51 items designed to measure six internal and 11 external assets of resilience. In this study we used only the external resources. The external resilience assets are defined as the ability of the child to meaningfully participate, to receive support, to experience caring relationships, and to be expected to succeed within home, school, peer and community contexts. In the current study, we assessed the contextual resilience dimension using the external resilience factors through the sum of dimension of experience caring relationships in family, community and peer. The examples of items measure contextual resilience are the follows: “In my family there are those who talk to me about my problems”, “In the community I belong to, there are those who really care about me”, “Among my friends there are those who talk to me about my problems”. The internal consistency in the current sample was good ($\alpha = 0.83$).

Relational well-being Relational well-being was assessed using the Italian version of the *PERMA-Profilier* (Giangrasso, 2021). The Italian version of PERMA-Profilier consists of 23 items: 15 items related to the five main scales (3 items for assessing Positive emotions, 3 for Engagement, 3 for Relationships, 3 for Meaning, 3 for Accomplishment); one item for overall happiness; 3 for negative emotions; one item for loneliness; and 3 items for assessing self-perceived physical health. The response style is a Likert scale ranged from 0 to 10 (0 = not at all—10 = completely; 0 = never—10 = always; 0 = terrible—10 = excellent). At a higher score corresponds the greater presence of the investigated dimension. Relational Well-Being was measured with Positive Relationships subscale which include “To what extent do you receive help and support from others when you need it?”; “In general, to what extent do you feel loved?”; “How satisfied he is with his personal relationships?”. Positive Relationships subscale evidenced good reliability in this sample ($\alpha = 0.78$).

Overview of the analyses

First, bivariate correlations were run to explore the associations among variables. Afterwards, to investigate the effects of childhood emotional neglect on relational well-being, and the moderating role of environmental sensitivity and contextual resilience on the impact of emotional neglect, a series of generalized linear models, including only main effects and then adding interaction terms, were run and compared. More specifically, the following models were tested: (1) Model 1, including emotional neglect, environmental sensitivity and contextual resilience as continuous predictors of relational well-being (main effect model); (2) Model 2, adding the two-way interaction terms emotional neglect X environmental sensitivity, emotional neglect X contextual resilience, and environmental sensitivity X contextual resilience (two-way interaction model); (3) Model 3, adding the three-way interaction term emotional neglect X environmental sensitivity X contextual resilience, to investigate if environmental sensitivity and contextual resilience moderated the impact of emotional neglect on relational well-being in young adulthood (three-way interaction model). To compare the investigated models, we used the Akaike Information Criterion, with lower values representing a better predictive capability of the model, and related Akaike weights, ranging from 0 to 1, and providing a direct measure of the model to predict new data conditional upon models considered (Wagenmakers & Farrell, 2004).

Follow-up and descriptive analyses were conducted to graphically explore the interaction identified, grouping subjects depending on their sensitivity, emotional neglect severity, and contextual resilience levels. More specifically, according to the literature, the following thresholds and cut off scores were considered. For emotional neglect, we

considered three levels of severity based on cut off scores proposed in the CTQ manual of Bernstein and Fink (1998): none or minimal (0) [emotional neglect > = 5 & emotional neglect < = 9] in which there are those who have not experienced childhood emotional neglect or who have experienced it at a minimal level; low (1) [emotional neglect > = 10 & emotional neglect < = 14] in which there are those who have experienced childhood emotional neglect at a low level, meaning that they were victims of neglectful parenting behaviours more consistently than in group 0; moderate/severe (2) [emotional neglect > = 15] in which there are those who have experienced childhood emotional neglect at a moderate and severe level, meaning that they were victims of multiple and severe neglectful parenting behaviours than in group 1. For environmental sensitivity, we followed the most recent literature defining people to fall into three sensitivity groups along a sensitivity continuum (Lionetti et al., 2018; Pluess et al., 2020) and we considered a three-class solution differentiating low (0) [< 30th percentile], medium (1) [30th percentile > = and < 70th percentile] and high (2) [> 70th percentile] sensitive groups. For resilient contexts, we considered three groups differentiating low [< 70th percentile], high [> 70th percentile] and medium [30th > = and < 70th percentile] to define an enriched, medium and low resilient context.

All analyses were conducted via JAMOVI, version 1.6 (www.jamovi.org).

Results

Association between variables and prevalence rates

Emotional neglect was moderately associated with relational well-being ($r = -0.518$) and with contextual

resilience ($r = -0.508$), and no relevant association was found with environmental sensitivity ($r = 0.052$). Contextual resilience was strongly associated with relational well-being ($r = 0.672$), but not with environmental sensitivity ($r = 0.001$). Bivariate associations are reported in Table 1. As regards to the prevalence of emotional neglect severity, 62.8% ($n = 459$) have not experienced childhood emotional neglect or have experienced it at a minimal level; 23% ($n = 168$) have experienced childhood emotional neglect at a low level of severity, and 14.2% ($n = 104$) have experienced it at a moderate and severe level. 6 subjects did not answer some questions about the experiences of childhood neglect and hence were not included in the analyses.

Regression models comparison

In Table 2 are reported AIC and Akaike weights for the comparison of main effect and interaction effect models. Results provided support for Model 3, that is, the model including the three-way interaction term emotional neglect X environmental sensitivity X contextual resilience as predictors of relational well-being (see Table 2). The three-way interaction regression model showed that emotional neglect was significantly and negatively associated with relational well-being ($B = -0.43$; $SE = 0.06$; $p < 0.001$) and contextual resilience was significantly and positively associated with relational well-being ($B = 1.6$; $SE = 0.09$; $p < 0.001$). No significant effects of environmental sensitivity, environmental sensitivity X emotional neglect, environmental sensitivity X contextual resilience and contextual resilience X emotional neglect were found (see Table 3 for more details). Besides, the three-way interaction was significant ($B = 0.37$, $SE = 0.11$, $p < 0.001$), suggesting that environmental sensitivity and contextual resilience moderated the impact of

Table 1 Bivariate correlations between study variables, mean and standard deviation

	1	2	3	4	Mean (SD)	N
1. Relational Well-Being	1	-0.518**	-0.063	0.672**	7.58 (1.66)	737
2. Emotional neglect		1	0.052	-0.508**	1.86 (0.91)	735
3. Environmental sensitivity			1	0.001	5.15 (0.77)	737
4. Contextual Resilience				1	3.26 (0.55)	737

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Table 2 AIC and Akaike weights for the investigated models

	AIC	Akaike Weights
Model 1, emotional neglect, environmental sensitivity and contextual resilience	2333.249	0.05
Model 2, emotional neglect X environmental sensitivity, emotional neglect X contextual resilience, environmental sensitivity X contextual resilience	2337.230	0.01
Model 3, emotional neglect X environmental sensitivity X contextual resilience	2327.323	0.94

emotional neglect experiences on relational well-being in young adulthood.

Follow-up exploration of interaction effects

A follow-up exploration of significant interaction effects (Fig. 1) showed that at low levels of resilience (< 70th percentile of the resilience scale distribution), all three groups of environmental sensitivity showed low levels on relational well-being scores, and this is true in particular for those who experienced neglect at moderate/severe level. At medium levels of resilient contexts (between 30 and 70th percentile of the resilience scale distribution) differences across the three sensitivity groups were very low (see plots in Fig. 1 for more details).

At high levels of resilience, young adults who experienced emotional neglect at severe levels, and who scored low on environmental sensitivity, showed a very low level of relational well-being. On the contrary, young adults who experienced emotional neglect at severe levels but scoring high on environmental sensitivity showed a high level of relational well-being. In particular, findings showed that among those who have experienced severe emotional neglect, there is a large difference in the mean of the well-being score between those with high environmental sensitivity and those with medium environmental sensitivity ($\Delta_{(HSP\ medium-HSP\ high)} = -2.3$), and this difference is even higher

when comparing those with high environmental sensitivity and those with low environmental sensitivity ($\Delta_{(HSP\ low-HSP\ high)} = -4.3$).

Overall, findings showed that, among those who experienced a severe level of emotional neglect, young adults high in environmental sensitivity are more strongly influenced by current enriching and supportive contexts, increasing their level of relational well-being. On the other side, those who experienced a severe level of emotional neglect but are characterized by low levels of environmental sensitivity are less influenced by the enriching and supportive contexts, explaining their low level of relational well-being.

Discussion

The current study provided for the first-time empirical evidences for a differential impact of enriching environment on relational well-being during adulthood on the base of people level of environmental sensitivity. Importantly, the study provided evidence that environmental sensitivity moderates the impact of childhood emotional neglect experiences on adulthood relational well-being, showing that highly sensitive adults who experienced childhood emotional neglect are more affected by the benefit of a resilient context, increasing their level of relational well-being as compared to low sensitive adults.

Table 3 Model 3 regression coefficients

Predictors		B	SE	P	R ²
Relational Well-being	Emotional neglect	-0.428	0.058	<0.001	0.51
	Environmental sensitivity	-0.042	0.059	0.48	
	Contextual Resilience	1.63	0.093	<0.001	
	Emotional neglect X Environmental sensitivity	0.065	0.072	0.36	
	Emotional neglect X Contextual Resilience	0.005	0.079	0.94	
	Environmental sensitivity X Contextual Resilience	0.085	0.109	0.43	
	Emotional neglect X Environmental sensitivity X Contextual Resilience	0.368	0.107	<0.001	

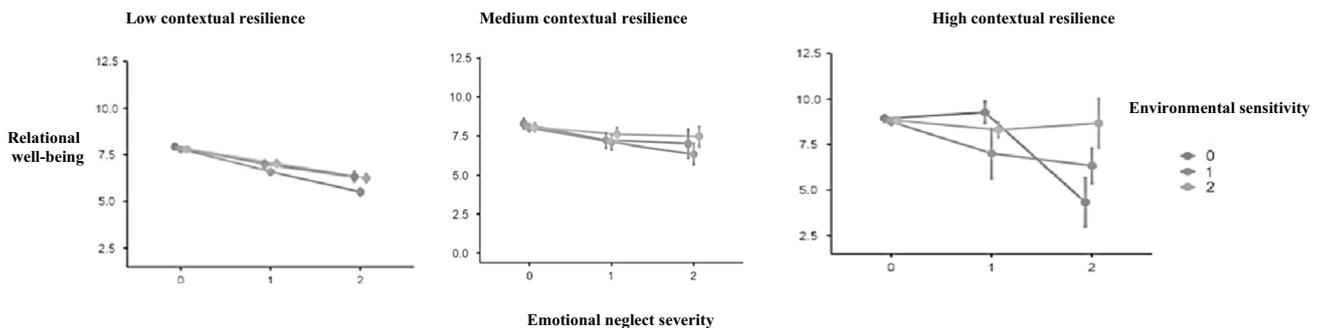


Fig. 1 Interaction patterns between emotional neglect severity, environmental sensitivity groups and contextual resilience

Consistent with the *individual by context* perspective (e.g., Rutter, 2014), the study underscored the interplay between individual differences in environmental sensitivity and resilient contexts defined as social and family support in buffering the impact of childhood experiences of neglect on adulthood relational well-being. In particular, results revealed that at low levels of contextual resilience, all three groups of environmental sensitivity, that is low, medium and high, showed low levels of relational well-being. This means that, when there are no resilience factors such as social and family support, the severity of the traumatic experience negatively affects current well-being, regardless of differences in sensitivity to the environment. However, results highlighted that at medium levels of contextual resilience highly sensitive young adults showed a slightly higher level of relational well-being than those low sensitive, although not sufficiently to underline a statistically significant difference between the sensitivity groups. This finding underlines that environmental sensitivity, alone, is not able to moderate the impact of childhood neglect experiences on current well-being when the social and family context is medium–low supportive, emphasizing the need for high supportive, resilient social and family context. In this case, the main effect of a neglectful experience appeared to be too relevant, a result in line with previous studies providing evidence that when the family and social context is less than optimal early neglect impacts on subsequent adjustment (e.g., Cheung et al., 2017; Folger & Wright, 2013). Contrary to what we expected, highly sensitive adults were not more vulnerable to emotional neglect experiences than low sensitive adults. This finding could be related to the measure adopted for investigating childhood experiences: we used a retrospective self-report of childhood emotional neglect, while environmental sensitivity and contextual resilience were measured by referring to the present time. Even though environmental sensitivity is a partially inherited trait (Assary et al., 2021) and, as such, potentially might tend to a certain degree of stability, changes in sensitivity levels cannot be excluded. We can hypothesize that findings might have been different if environmental sensitivity was measured at the same time of the environmental variable of childhood neglect. Future prospective studies are needed to assess longitudinally how high and low sensitive individuals respond to negative childhood events, such as neglectful experiences.

On the other hand, at high levels of contextual resilience, those who experienced severe levels of emotional neglect, but are high in environmental sensitivity, are more strongly influenced by enriching and supportive contexts, and do not appear to be more affected in the long term by negative childhood neglect experiences compared to low sensitive groups. According to *Environmental Sensitivity* meta-framework, this means that people characterized by a predisposition for the development of heightened sensitivity are more

receptive to the environmental benefits to which they were exposed, such as family support, strong friend relationships and participation in community life, increasing their level of relational well-being.

Important is the finding related to young adults who experienced emotional neglect at severe levels, and who scored low in environmental sensitivity: they showed a very low level of relational well-being even when encountering very resilient family, peer and community contexts. This means that those who have low levels of environmental sensitivity are less influenced by enriching and supportive contexts (e.g., Belsky & Pluess, 2009), and therefore do not benefit from the contextual resilience factors, explaining their low levels of relational well-being. We hypothesize that this could be due to the low reactivity to positive events found in low sensitive people (Lionetti et al., 2018) which can potentially have prevented them to fully benefit of positive and enriched, supportive contexts.

Overall, the current study emphasized that not all people having experienced childhood emotional neglect present low levels of relational well-being in adulthood. In particular, our main results pointed out that individuals with a high environmental sensitivity can importantly benefit of rich and supportive social and family contexts, are, increasing their relational well-being compared to low sensitivity people even when experiencing potentially traumatic events during their childhood. This result is of particular importance if we consider that highly sensitive individuals are overall more prone to negative affect, particularly in late adolescence and adulthood (Booth et al., 2015; Lionetti et al., 2019a, b). It also suggests that a high sensitivity can be considered an individual characteristic of positive adaptation after childhood emotional neglect experiences, when the current social and family environment is optimal. From an applied perspective, our findings pointed out the potential relevance of investigating in the quality of the current social and family environment to reduce the long-term impact of early negative experiences.

Limitations and future directions

These results must be considered in light of certain limitations. First, the sample was composed mainly of females, so it was not representative of the general population. Although this is a bias characterizing the general literature on childhood maltreatment (e.g., Beilharz et al., 2020; Berzenski, 2018), a more representative sample balancing genders should be considered.

Furthermore, because of the low number of males in our sample, we were not able of testing the moderating role of gender and its interaction with environmental sensitivity and the contextual environment. However, previous studies

found that environmental sensitivity is especially able to moderate the effect of the environment in males, compared to females (Dragone et al., 2022; Nocentini et al., 2018). Future studies with samples with a balanced distribution of gender could investigate if the same can be applied to individuals with a history of neglect, that is whether the differential impact of supportive contexts on relational well-being based on environmental sensitivity levels could be more pronounced in males than females.

The retrospective nature of the data is another key limit of the study. Specifically, we used a retrospective measure of childhood neglect experiences, whereas moderators (environmental sensitivity and contextual resilience) were measured by asking the subject to think about the present. The fact that childhood neglect experiences were measured retrospectively and environmental sensitivity have been measured only in adulthood may have potentially influenced the results. However, the *Childhood Trauma Questionnaire* (CTQ- Bernstein & Fink, 1998) is one of the most commonly used retrospective measures to investigate the impact of childhood maltreatment and neglect experiences on well-being (e.g., Beilharz et al., 2020; Hagborg et al., 2017), and it has demonstrated its reliability and validity across various countries and samples (e.g., Bernstein et al., 2003; Sacchi et al., 2018).

The constructs analyzed in the present study are very complex and may be difficult to evaluate. However, for environmental sensitivity construct measure, the self-report scale that we used has demonstrated its reliability and validity across multiple independent studies, both with adults (Aron & Aron, 1997; Pluess et al., 2020) and children and adolescents (Pluess et al., 2018). Finally, to assess the complexity and the multifaceted definition of resilient contexts (Hanson & Kim, 2007), we decided to include a multidimensional scale including contextual resilience dimension. Importantly, the measure has been used before with evidence of construct validity (Constantine & Benard, 2001; Nearchou et al., 2014).

Finally, current psychological well-being was not controlled for current psychosocial factors, such as perceived stressors, that are assumed to have a role in the impact on current psychological well-being (e.g., Mc Elroy & Hevey, 2014). Future studies should consider both past and concurrent protective and risk factors and adopt a truly longitudinal perspective with repeated measures to investigate the processes that characterize the trajectories in relation to the differences in sensitivity to the environment and the severity levels of childhood neglect. Notwithstanding these limitations, findings allowed us to make some reflections related to possible applied implications. More specifically, we propose that to tailor psychological interventions according to the individual differences in environmental sensitivity might allow to better promote well-being and reduce the

long-term impact of family neglect for individuals with high levels of environmental sensitivity who experienced negative childhood events. Close to this, findings also highlight the need to develop prevention programs for individuals low in environmental sensitivity to help them flourish, and suggest, from an empirical perspective, the need to further examining conditions leading to positive health and well-being in individuals low in sensitivity who lived severe childhood experiences of neglect.

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Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

The authors did not receive support from any organization for the submitted work;
The authors have no relevant financial or non-financial interests to disclose;

Ethics approval This research is part of a broader project that investigates the theme of resilience in adverse contexts, with particular attention to childhood experiences in the family context. The study was approved by University Ethics Committees for Research of University of Florence (Prot. n. 0027513 of August 9, 2019).

Consent to participate The survey has been administered via the google form platform and was anonymous, respecting the processing of personal data, and included an informed consent form. Students participated on a voluntary basis in the research, having the possibility to accept or not the consent to the processing of personal data.

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References

- Afifi, T. O., MacMillan, H. L., Taillieu, T., Turner, S., Cheung, K., Sareen, J., & Boyle, M. H. (2016). Individual- and relationship-level factors related to better mental health outcomes following child abuse: Results from a nationally representative Canadian sample. *The Canadian Journal of Psychiatry, 61*(12), 776–788. <https://doi.org/10.1177/0706743716651832>
- Aron, E. N., Aron, A., & Davies, K. M. (2005). Adult shyness: The interaction of temperamental sensitivity and an adverse childhood environment. *Personality and Social Psychology Bulletin, 31*(2), 181–197. <https://doi.org/10.1177/0146167204271419>

- Aron, E. N., Aron, A., & Jagiellowicz, J. (2012). Sensory processing sensitivity: A review in the light of the evolution of biological responsiveness. *Personality and Social Psychology Review, 16*(3), 262–282. <https://doi.org/10.1177/1088868311434213>
- Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*(2), 345–368. <https://www.ncbi.nlm.nih.gov/pubmed/9248053>
- Assary, E., Zavos, H., Krapohl, E., Keers, R., & Pluess, M. (2021). Genetic architecture of environmental sensitivity reflects multiple heritable components: A twin study with adolescents. *Molecular Psychiatry, 26*(9), 4896–4904. <https://doi.org/10.1038/s41380-020-0783-8>
- Bakker, K., & Moulding, R. (2012). Sensory-processing sensitivity, dispositional mindfulness and negative psychological symptoms. *Personality and Individual Differences, 53*(3), 341–346. <https://doi.org/10.1016/j.paid.2012.04.006>
- Beilharz, J. E., Paterson, M., Fatt, S., Wilson, C., Burton, A., Cvejic, E., ... & Vollmer-Conna, U. (2020). The impact of childhood trauma on psychosocial functioning and physical health in a non-clinical community sample of young adults. *Australian & New Zealand Journal of Psychiatry, 54*(2): 185-194. <https://doi.org/10.1177/0004867419881206>
- Belsky, J., & Pluess, M. (2009). Beyond diathesis stress: Differential susceptibility to environmental influences. *Psychological Bulletin, 135*(6), 885. <https://doi.org/10.1037/a0017376>
- Bernstein, D. P., Stein, J. A., Newcomb, M. D., Walker, E., Pogge, D., Ahluvalia, T., ... & Zule, W. (2003). Development and validation of a brief screening version of the Childhood Trauma Questionnaire. *Child Abuse & Neglect, 27*(2), 169-190. [https://doi.org/10.1016/S0145-2134\(02\)00541-0](https://doi.org/10.1016/S0145-2134(02)00541-0)
- Bernstein, D., & Fink, L. (1998). *Manual for the childhood trauma questionnaire*. The Psychological Corporation.
- Berzanski, S. R. (2018). Distinct emotion regulation skills explain psychopathology and problems in social relationships following childhood emotional abuse and neglect. *Development and Psychopathology, 31*(2), 483–496. <https://doi.org/10.1017/S0954579418000020>
- Booth, C., Standage, H., & Fox, E. (2015). Sensory-processing sensitivity moderates the association between childhood experiences and adult life satisfaction. *Personality and Individual Differences, 87*, 24–29. <https://doi.org/10.1016/j.paid.2015.07.020>
- Cheung, K., Taillieu, T., Turner, S., Fortier, J., Sareen, J., MacMillan, H. L., ... & Afifi, T. O. (2017). Relationship and community factors related to better mental health following child maltreatment among adolescents. *Child Abuse & Neglect, 70*, 377-387. <https://doi.org/10.1016/j.chiabu.2017.06.026>
- Cohen, J. R., & Thakur, H. (2021). Developmental consequences of emotional abuse and neglect in vulnerable adolescents: A multi-informant, multi-wave study. *Child Abuse & Neglect, 111*, 104811. <https://doi.org/10.1016/j.chiabu.2020.104811>
- Constantine, N. A., & Benard, B. (2001). *California Healthy Kids Survey Resilience Assessment Module: Technical Report*. Public Health Institute.
- Constantine, N., Benard, B., & Diaz, M. (1999). Measuring protective factors and resilience traits in youth: The healthy kids resilience assessment. In *seventh annual meeting of the Society for Prevention Research, New Orleans, LA* (pp. 3–15).
- Dragone, M., Esposito, C., De Angelis, G., & Bacchini, D. (2022). Equipping Youth to Think and Act Responsibly: The Effectiveness of the “EQUIP for Educators” Program on Youths’ Self-Serving Cognitive Distortions and School Bullying Perpetration. *European Journal of Investigation in Health, Psychology and Education, 12*(7), 814–834. <https://doi.org/10.3390/ejihpe12070060>
- Evans, S. E., Steel, A. L., & DiLillo, D. (2013). Child maltreatment severity and adult trauma symptoms: Does perceived social support play a buffering role? *Child Abuse & Neglect, 37*(11), 934–943. <https://doi.org/10.1016/j.chiabu.2013.03.005>
- Ferrara, P., Michela, P., Annunziata, F., Di Lucia, A., Ianniello, F., & Chiaretti, A. (2018). An epidemiological study of child neglect and abuse in Italy: an undervalued problem of public health but also an unknown reality. *Minerva Psichiatrica, 59*(2), 118–24. <https://doi.org/10.23736/S0391-1772.18.01965-9>
- Folger, S. F., & Wright, M. O. D. (2013). Altering risk following child maltreatment: Family and friend support as protective factors. *Journal of Family Violence, 28*(4), 325–337. <https://doi.org/10.1007/s10896-013-9510-4>
- Giangrasso, B. (2021). Psychometric properties of the PERMA-Profiler as hedonic and eudaimonic well-being measure in an Italian context. *Current Psychology, 40*(3), 1175–1184. <https://doi.org/10.1007/s12144-018-0040-3>
- Green, K., Browne, K., & Chou, S. (2019). The relationship between childhood maltreatment and violence to others in individuals with psychosis: A systematic review and meta-analysis. *Trauma, Violence, & Abuse, 20*(3), 358–373. <https://doi.org/10.1177/1524838017708786>
- Greven, C. U., Lionetti, F., Booth, C., Aron, E. N., Fox, E., Schendan, H. E., ... & Homberg, J. (2019). Sensory processing sensitivity in the context of environmental sensitivity: A critical review and development of research agenda. *Neuroscience & Biobehavioral Reviews, 98*, 287-305. <https://doi.org/10.1016/j.neubiorev.2019.01.009>
- Hagborg, J. M., Tidefors, I., & Fahlke, C. (2017). Gender differences in the association between emotional maltreatment with mental, emotional, and behavioral problems in Swedish adolescents. *Child Abuse & Neglect, 67*, 249–259. <https://doi.org/10.1016/j.chiabu.2017.02.033>
- Hanson, T. L., & Kim, J. O. (2007). *Measuring resilience and youth development: The psychometric properties of the HealthyKids Survey*. (Issues & Answers Report, REL 2007–No. 034). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory West. Retrieved from <http://ies.ed.gov/ncee/edlabs>
- Humphreys, K. L., LeMoult, J., Wear, J. G., Piersiak, H. A., Lee, A., & Gotlib, I. H. (2020). Child maltreatment and depression: A meta-analysis of studies using the Childhood Trauma Questionnaire. *Child Abuse & Neglect, 102*, 104–361. <https://doi.org/10.1016/j.chiabu.2020.104361>
- Lionetti, F., Aron, A., Aron, E. N., Burns, G. L., Jagiellowicz, J., & Pluess, M. (2018). Dandelions, tulips and orchids: Evidence for the existence of low-sensitive, medium-sensitive and high-sensitive individuals. *Translational Psychiatry, 8*(1), 1–11. <https://doi.org/10.1038/s41398-017-0090-6>
- Lionetti, F., Aron, E. N., Aron, A., Klein, D. N., & Pluess, M. (2019a). Observer-rated environmental sensitivity moderates children’s response to parenting quality in early childhood. *Developmental Psychology, 55*(11), 2389. <https://doi.org/10.1037/dev0000795>
- Lionetti, F., Pastore, M., Moscardino, U., Nocentini, A., Pluess, K., & Pluess, M. (2019b). Sensory processing sensitivity and its association with personality traits and affect: A meta-analysis. *Journal of Research in Personality, 81*, 138–152. <https://doi.org/10.1016/j.jrp.2019.05.013>
- Lionetti, F., Klein, D. N., Pastore, M., Aron, E. N., Aron, A., & Pluess, M. (2021). The role of environmental sensitivity in the development of rumination and depressive symptoms in childhood: a longitudinal study. *European Child & Adolescent Psychiatry, 1-11*. <https://doi.org/10.1007/s00787-021-01830-6>

- Liss, M., Mailloux, J., & Erchull, M. J. (2008). The relationships between sensory processing sensitivity, alexithymia, autism, depression, and anxiety. *Personality and Individual Differences*, *45*(3), 255–259. <https://doi.org/10.1016/j.paid.2008.04.009>
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development*, *71*(3), 543–562. <https://doi.org/10.1111/1467-8624.00164>
- Masten, A. S. (2014). Global perspectives on resilience in children and youth. *Child Development*, *85*(1), 6–20. <https://doi.org/10.1111/cdev.12205>
- Mc Elroy, S., & Hevey, D. (2014). Relationship between adverse early experiences, stressors, psychosocial resources and wellbeing. *Child Abuse & Neglect*, *38*(1), 65–75. <https://doi.org/10.1016/j.chiabu.2013.07.017>
- Nearchou, F. A., Stogiannidou, A., & Kiosseoglou, G. (2014). Adaptation and psychometric evaluation of a resilience measure in Greek elementary school students. *Psychology in the Schools*, *51*(1), 58–71. <https://doi.org/10.1002/pits.21732>
- Nocontentini, A., Menesini, E., & Pluess, M. (2018). The personality trait of environmental sensitivity predicts children's positive response to school-based antibullying intervention. *Clinical Psychological Science*, *6*(6), 848–859. <https://doi.org/10.1177/2167702618782194>
- Pluess, M. (2015). Individual differences in environmental sensitivity. *Child Development Perspectives*, *9*(3), 138–143. <https://doi.org/10.1111/cdep.12120>
- Pluess, M., & Belsky, J. (2013). Vantage sensitivity: Individual differences in response to positive experiences. *Psychological Bulletin*, *139*(4), 901. <https://doi.org/10.1037/a0030196>
- Pluess, M., & Boniwell, I. (2015). Sensory-processing sensitivity predicts treatment response to a school-based depression prevention program: Evidence of vantage sensitivity. *Personality and Individual Differences*, *82*, 40–45. <https://doi.org/10.1016/j.paid.2015.03.011>
- Pluess, M., Assary, E., Lionetti, F., Lester, K. J., Krapohl, E., Aron, E. N., & Aron, A. (2018). Environmental sensitivity in children: Development of the Highly Sensitive Child Scale and identification of sensitivity groups. *Developmental Psychology*, *54*(1), 51–70. <https://doi.org/10.1037/dev0000406>
- Pluess, M., Lionetti, F., Aron, E. N., & Aron, A. (2020). People differ in their sensitivity to the environment: An integrated theory and empirical evidence. <https://doi.org/10.31234/osf.io/w53yc>
- Rehan, W., Antfolk, J., Johansson, A., Jern, P., & Santtila, P. (2017). Experiences of severe childhood maltreatment, depression, anxiety and alcohol abuse among adults in Finland. *PLoS One*, *12*(5), e0177252. <https://doi.org/10.1371/journal.pone.0177252>
- Rutter, M. (2014). *Nature–nurture integration*. In Handbook of developmental psychopathology (pp. 45–65). Springer. https://doi.org/10.1007/978-1-4614-9608-3_3
- Sacchi, C., Vieno, A., & Simonelli, A. (2018). Italian validation of the Childhood Trauma Questionnaire—Short Form on a college group. *Psychological Trauma: Theory, Research, Practice, and Policy*, *10*(5), 563. <https://doi.org/10.1037/tra0000333>
- Sethi, D., Bellis, M., Hughes, K., Gilbert, R., Mitis, F., & Galea, G. (2013). *European report on preventing child maltreatment*. World Health Organization. Regional Office for Europe. <https://apps.who.int/iris/handle/10665/326375>
- Slagt, M., Dubas, J. S., van Aken, M. A., Ellis, B. J., & Deković, M. (2018). Sensory processing sensitivity as a marker of differential susceptibility to parenting. *Developmental Psychology*, *54*(3), 543. <https://doi.org/10.1037/dev0000431>
- Stoltenborgh, M., Bakermans-Kranenburg, M. J., & Van Ijzendoorn, M. H. (2013). The neglect of child neglect: A meta-analytic review of the prevalence of neglect. *Social Psychiatry and Psychiatric Epidemiology*, *48*(3), 345–355. <https://doi.org/10.1007/s00127-012-0549-y>
- Turner, H. A., Vanderminden, J., Finkelhor, D., & Hamby, S. (2019). Child neglect and the broader context of child victimization. *Child Maltreatment*, *24*(3), 265–274. <https://doi.org/10.1177/1077559518825312>
- USA (U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2022); Child Maltreatment 2020).
- Wagenmakers, E.-J., & Farrell, S. (2004). AIC model selection using Akaike weights. *Psychonomic Bulletin & Review*, *11*(1), 192–196. <https://doi.org/10.3758/BF03206482>

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