

Original Article

Relationship Between Childhood Emotional Neglect, Brain–Body Stress Response, and Adult Emotional Regulation Difficulties

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Received: 17 November 2025

Revised: 03 December 2025

Accepted: 26 December 2025

Published: 15 January 2026

HOW TO CITE

Nimra Komal et al. 2026. Relationship Between Childhood Emotional Neglect, Brain–Body Stress Response, and Adult Emotional Regulation Difficulties. *Journal of Health, Wellness and Community Research*. 4, 1 (Jan. 2026), 1–9.
DOI: <https://doi.org/10.61919/d41gf394>

ARTICLE INFORMATION

Author Contributions	Concept: NK, HR; Design: NK, AS, HAA; Data Collection: AS, ARJ, AN; Analysis: NK, HAA; Drafting: NK, HR, AS, ARJ, HAA, AN
Ethical Approval	The study was approved by research ethical board of Services Hospital, Lahore, Pakistan
Informed Consent	Written informed consent was obtained from all participants
Conflict of Interest	The authors declare no conflict of interest.
Funding	No external funding.
Data Availability	Available from the corresponding author on reasonable request.
AI Declaration	No generative AI was used for conceptualization, analysis, or content generation. AI use was limited to language refinement, and the authors remain fully responsible for the accuracy, originality, validity, and integrity of the manuscript's content.

ABSTRACT

Background: Childhood emotional neglect has been related to persistent challenges in emotional functioning and changes in physiological stress regulation, however the overlap of these psychological and physiological correlates has been less explored in adults. **Objective:** To analyze the associations between childhood emotional neglect, emotion regulation challenges, resting heart rate variability (HRV-RMSSD), and baseline salivary cortisol in adults residing in Lahore. **Methods:** A cross-sectional correlational study included 88 adults aged between 18–45 years recruited from healthcare settings and academic institutions of Lahore between December 2024 to August 2025. Childhood emotional neglect and emotion regulation were measured by administering childhood trauma questionnaire SF (CTQ-SF) emotional-neglect subscale and difficulties in emotion regulation scale-16 (DERS-16) respectively. Resting heart rate variability, specifically HRV-RMSSD (an index of parasympathetic nervous activity), and resting baseline salivary cortisol levels were measured as physiological indices. Pearson's correlations were run to identify bivariate relations of childhood emotional neglect, DERS-16, HRV-RMSSD and cortisol. Multiple linear regression was used to analyze predictors and mediators/confounders. **Results:** Childhood emotional-neglect had a strong positive correlation with DERS-16 scores ($r = 0.58, p < 0.001$) and resting baseline cortisol levels ($r = 0.36, p < 0.001$), and an inverse correlation with resting heart rate variability-RMSSD ($r = -0.49, p < 0.001$). Emotional neglect score ($= 0.39; p < 0.001$) and resting heart rate variability-RMSSD score ($= 0.32; p < 0.001$) predicted DERS-16, independent of age and gender. Salivary cortisol, however did not predict emotion regulation difficulties ($= 0.14, p = 0.119$). The variables included accounted for 53.2% of variance ($R = 0.532$) in predicting DERS-16 scores. **Conclusion:** Childhood emotional neglect appears to relate to increased emotional regulation difficulties and lower resting heart rate variability in adulthood. Our cross-sectional finding demonstrates the linkage between early life adversity and physiological as well as psychological functioning in adulthood but without inferring causality. **Keywords:** Childhood emotional neglect; Emotion regulation; Heart rate variability; Salivary cortisol; Adults; Psychological stress.

INTRODUCTION

Childhood emotional neglect is defined as childhood adversity where a child's emotional needs for responsiveness, support, validation, and psychological security are chronically unmet and that, like maltreatment without overt physical manifestation of abuse, can have life-long consequences for psychological functioning and stress regulation. Multiple lines of research examining childhood trauma have linked early adverse experiences to functional and structural alterations within the body's physiological stress systems, the hypothalamic-pituitary-adrenal (HPA) axis, and suggest that they predispose individuals to subsequent psychiatrically or psychologically vulnerable outcomes (1). Developmental and social neuroscience theories suggest that by responding sensitively to the affective communications of a caregiver, neural and behavioral systems governing emotion regulation, attachment relationships, and adjustment to interpersonal stress also mature (2).

Biopsychological consequences of childhood adversity: The consequences of childhood adversity on physiological function appear to differ depending on the type of adversity, developmental period, clinical setting and physiological index in question. Results of bio-psychological indexes in trauma related illnesses and other neuropsychiatric conditions suggest that the physiological components associated with stress reactivity are different but results are not universally applicable and ought to not be generalized across contexts or necessarily to the case of emotional neglect (3). Similar to the results obtained from studies of childhood adversity and subsequent stress reactivity vulnerability, HPA axis dysfunction seems to be one part of a constellation of pathways connecting a childhood negative development to subsequent psychological outcomes, and the size and direction of this connection appears to vary depending on method and timing of Physiological Assessment (4). These results would be supportive of investigation of multiple aspects of stress regulation instead of positing a single biomarker as adequate for measuring the distal bio markers of childhood adversity.

Emotion regulation is another arena possibly effected by prior experiences in early life. Impaired recognition, understanding, and modulation of own and another's feelings has been found to associate with early life adversity and, to provide future risks for psychopathology (5). Early childhood adversity has been shown to associate with clinical symptoms and emotion dysregulation in both childhood and adolescence though studies of the latter has rarely examined emotion regulation in adults specifically regarding emotional neglect (6, 7). Neurobiological theories linking early adversity with emotional dysregulation hypothesize that early life stress can have lasting effects on neural pathways mediating emotion regulation within both the threat appraisal and executive control systems (8), although these pathways can only be indirectly inferred from measures taken via peripherals (autonomic and endocrine markers) in observable-studies.

In spite of a wealth of research on the correlation between childhood adversity and both emotion dysregulation and physiology processes in later life, a number of questions remain. Much of prior research on early life adversity has investigated aggregate measure of maltreatment, trauma exposed patients, children, or undifferentiated neurobiological outcomes rather than on emotional neglect as distinct experience. As a result, few studies have examined how self-reported retrospectively childhood emotional neglect correlates with objective aspects of emotion dysregulation (e.g. DERS-16), as well as objective markers of sympathetic-parasympathetic function (resting cardiac parasympathetic activity and baseline levels of salivary cortisol), in a nonclinical sample. This question is relevant for researchers investigating the influence of the subjective report and objective peripheral physiological indicators of childhood emotional neglect in a context such as Lahore, in which culturally specific data linking childhood experiences and the psychological and biological outcomes is scarce. Combining both objective biological indicators (salivary cortisol, HRV-RMSSD) and the self-report of emotion-dysregulation (DERS-16) might provide valuable insight into whether emotional neglect affects adult emotion regulation abilities independent of other correlated measures, like selected demographic variables and measured physiological outcomes.

This cross sectional study examined the relationship of childhood emotional neglect with subsequent emotion regulation difficulties (as indicated by the DERS-16), cardiac parasympathetic regulation (indicated by resting HRV-RMSSD), and baseline salivary cortisol levels among adults aged 18-45 in Lahore. It tested whether more items from Childhood Emotional Neglect Scale indicated more DERS-16 deficits, more pronounced impairments of measured cardiovascular activity, and higher base line cortisol and whether scores from child/youth experiences explained part of the variation of both DERS-16 score independently and whether the measure of past experience independently explains part of measured physiological activity after controlling for age and gender variables in.

MATERIALS AND METHODS

This cross-sectional correlational study of 45 adult men and women will explore the associations between retrospectively recalled childhood emotional neglect, adulthood emotion-regulation problems, and physiological markers of stress regulation amongst adults recruited from within urban Lahore, Punjab, Pakistan, between December 2024 to August 2025. This cross-sectional study design was selected in order to assess concurrent associations between psychophysiological variables without experimental manipulation or an induced exposure to investigate contemporaneously related psychological and physiological variables. Participants will be recruited from metropolitan hospitals and institutions within urban Lahore through the application of a non-probability purposive sampling strategy.

This study will target healthy adults between the ages of 18–45 years; all participants will possess the capacity to understand either English or Urdu and to provide informed written consent.

Exclusion criteria include presence of a severe neurologic disorder, use of systemic corticosteroids or of psychotropic medications that can significantly impact autonomic and endocrine system functioning at time of entry, a currently active substance dependence and presence of a major mental disorder characterized by presence of psychosis and/or significant cognitive impairment.

A total of 95 individuals screened for potentially meeting entry criteria, 88 met criteria for the study and successfully completed the entire study assessment, thus constituting the sample (N=88) from which analyses are being drawn.

These numbers are similar to comparable observational studies examining relations between psychological and physiological parameters of stress where N is approximately 70–100 to detect medium effect sizes, for example (Miller et al., 2016). Purposive, rather than probability, based recruitment dictated enrolling participants from designated locations until the planned analytical sample was met. All individuals provided a signed written informed consent prior to entry and receipt of psychometric measures or physiological measure.

The principle exposure of interest was past childhood emotional neglect which was measured via the emotional neglect subscale of the Childhood Trauma Questionnaire–Short Form (CTQ-SF; Bernstein & Putnam, 1998). The total CTQ-SF emotional neglect score was used as a continuous measure of this concept, with greater retrospective endorsement indicative of higher childhood emotional neglect. The principle psychological outcome variable was difficulties regulating adult emotion was assessed by the 16-item Difficulties in Emotion Regulation Scale (DERS-16; Gratz & Roemer, 2004). The DERS total score was used as a continuous variable of self-reported problems with emotion-regulation, with high scores representing greater difficulty managing emotional experiences. No grouping for statistical analysis into childhood emotional neglect exposure and control groups was used—relations were explored among continuous variation in childhood emotional neglect as measured by the CTQ-SF.

The selected physiological variables included resting heart rate variability and baseline salivary cortisol. Cardiac autonomic function was measured during a resting baseline condition that lasted 10 minutes using continuous ECG recordings. Heart rate variability was calculated using the standard deviation derived from the root mean square successive differences between normal-to-normal cardiac intervals (HRV-RMSSD), represented in milliseconds. It was considered a resting indicator of parasympathetic cardiac regulation as this research protocol did not include any challenge or intervention. Baseline salivary cortisol (in nmol/L) was selected as the endocrinological biomarker for this study, and measured as a continuous variable. This physiological measure was selected over measures assessing cortisol responding to experimental stress because its relevance to the relationship between emotional neglect and subsequent difficulties in emotion-regulation will be more apparent following established methods if presented in raw form as a reflection of baseline hypothalamic-pituitary-adrenal axis rather than response dynamism. Selected demographic and clinical variables were also recorded for descriptive purposes including: age, gender, level of education completed, employment status, body mass index, and systolic and diastolic blood pressure.

All participants completed the same study assessment battery consisting of eligibility screen, the psychometric questionnaire protocol, and acquisition of the selected physiological measures. For use in the statistics the proposed analytics were all considered predefined prior to analysis: CTQ-SF emotional neglect, DERS-16 total

score, resting HRV-RMSSD, and baseline salivary cortisol level as continuous variables of interest along with age, and gender. Confounding by age and gender was planned in the multiple regression analyses below through inclusion as adjustment variables. Use of same assessment instruments was planned to maintain data uniformity across participants. The final sample included those who completed the 88-item protocol, to maintain a constant number for both the principal correlational analyses and subsequent regression models.

Statistical Analyses Were Performed Using IBM SPSS Statistics (Version 28.0). Descriptives for participant demographics, psychometric scores and physiological variables are reported. Continuous variables are expressed as the mean (SD) while categorical variables are presented as N (%). All variables used in these Analyses, for the exception of the continuous indices, were assessed for their distributional properties by means of Shapiro-Wilk statistics supplemented with Q-Q plots to gauge normal distribution. Since the relevant analytical variables were deemed sufficiently normally distributed to accommodate the use of parametric tests they are reported here as such. Bivariate relationships between the CTQ-SF emotional-neglect scores and their inter-relationships were examined using Pearson product moment correlations.

A standard multiple linear regression model will be conducted with the DERS-16 total score as the dependent variable. CTQ-SF emotional-neglect score, resting HRV-RMSSD, and resting baseline salivary cortisol levels will all be used as explanatory variables, and age and gender will be included as covariates. This model will assess whether past childhood emotional neglect and the present level of both physiological parameters are independently associated with psychological problems with self-regulation. All regression coefficients will be reported as unstandardized B, standard error, standardized beta, t-statistic, p value and 95% confidence interval, along with a test of the model F value, coefficient of determination R and adjusted R. All tests for statistical significance were set at $p < .05$ and were all two-tailed. The regression analysis performed here represents examinations of adjusted associations rather than mediation models.

The current study has been reviewed and approved by an institutional review board prior to recruitment. All participation is entirely voluntary and all participants will review and consent to all research aspects described herein prior to commencing any data collection or assessment procedures. Information gathered will only be handled per research protocol outlined by institution and used for reported analyses that completed the final measurement protocol.

RESULTS

Nine-five participants were screened. Eighty-eight participants finished the assessment for this study and were included in the final analysis (92.6% of screened participants). Mean subject age was 28.45 ± 6.12 years (18–44).

The proportion of women subjects was 54.5% (48 subjects) while the proportion of male subjects was 45.5% (40 subjects).

Over half of study subjects were currently employed (58.0%, $n=51$) and 61.4% ($n=54$) of subjects have undergraduate/graduate level of education. Baseline descriptive and clinical data are shown in Table 1.

Table 1. Baseline Demographic and Clinical Characteristics of Participants (N=88)

Variable	Category/Unit	Value
Age	years, mean $\pm$ SD	28.45 ± 6.12
Gender	Male, n (%)	40 (45.5)
	Female, n (%)	48 (54.5)
Education level	Secondary/High School, n (%)	12 (13.6)
	Intermediate/Diploma, n (%)	22 (25.0)
	Undergraduate/Graduate, n (%)	54 (61.4)
Employment status	Employed, n (%)	51 (58.0)
	Student, n (%)	28 (31.8)
	Unemployed, n (%)	9 (10.2)
Body mass index	kg/m ² , mean $\pm$ SD	23.18 ± 3.41
Systolic blood pressure	mmHg, mean $\pm$ SD	118.40 ± 9.25
Diastolic blood pressure	mmHg, mean $\pm$ SD	76.80 ± 6.50

SD, standard deviation.

The mean CTQ-SF emotional-neglect score was 14.82 ± 4.65 , while the mean DERS-16 total score was 42.18 ± 11.34 . Mean resting HRV-RMSSD was 34.22 ± 10.85 ms, and mean baseline salivary cortisol concentration was 11.45 ± 3.82 nmol/L. The observed values remained within the reported scale ranges for both psychometric measures (Table 2).

Table 2. Descriptive Statistics for Psychometric Measures and Physiological Variables (N=88)

Measure	Variable	Mean $\pm$ SD	Observed Range	Possible Range
CTQ-SF Emotional Neglect	Childhood emotional neglect	14.82 ± 4.65	5–24	5–25
DERS-16 Total	Emotion-regulation difficulties	42.18 ± 11.34	18–72	16–80
HRV-RMSSD	Resting cardiac parasympathetic regulation, ms	34.22 ± 10.85	14.50–62.10	—
Salivary cortisol	Baseline concentration, nmol/L	11.45 ± 3.82	4.20–21.30	—

CTQ-SF, Childhood Trauma Questionnaire–Short Form; DERS-16, 16-item Difficulties in Emotion Regulation Scale; HRV, heart rate variability; RMSSD, root mean square of successive differences; SD, standard deviation.

Bivariate analysis demonstrated that higher childhood emotional-neglect scores were associated with greater emotion-regulation difficulties ($r=0.58$, 95% CI 0.42 to 0.70, $p<0.001$), lower resting HRV-RMSSD ($r=-0.49$, 95% CI -0.63 to -0.31 , $p<0.001$), and higher baseline salivary cortisol concentrations ($r=0.36$, 95% CI 0.16 to 0.53, $p<0.001$). DERS-16 scores were inversely correlated with HRV-RMSSD ($r=-0.52$, 95% CI -0.66 to -0.35 , $p<0.001$) and positively correlated with baseline salivary cortisol ($r=0.31$, 95% CI 0.11 to 0.49, $p=0.003$). HRV-RMSSD and baseline salivary cortisol were also inversely correlated ($r=-0.28$, 95% CI -0.46 to -0.07 , $p=0.008$) (Table 3).

Table 3. Bivariate Associations Between Childhood Emotional Neglect, Emotion-Regulation Difficulties, and Physiological Variables (N=88)

Variable Pair	Pearson r	95% CI	p-value
CTQ-SF Emotional Neglect — DERS-16 Total	0.58	0.42 to 0.70	<0.001
CTQ-SF Emotional Neglect — HRV-RMSSD	−0.49	−0.63 to −0.31	<0.001
CTQ-SF Emotional Neglect — Salivary cortisol	0.36	0.16 to 0.53	<0.001
DERS-16 Total — HRV-RMSSD	−0.52	−0.66 to −0.35	<0.001
DERS-16 Total — Salivary cortisol	0.31	0.11 to 0.49	0.003
HRV-RMSSD — Salivary cortisol	−0.28	−0.46 to −0.07	0.008

CI, confidence interval; CTQ-SF, Childhood Trauma Questionnaire–Short Form; DERS-16, 16-item Difficulties in Emotion Regulation Scale; HRV, heart rate variability; RMSSD, root mean square of successive differences. Two-sided Pearson product-moment correlations were used. Confidence intervals for Pearson r were derived using Fisher's z transformation.

In the MLR model, childhood emotional-neglect score remained uniquely related to DERS-16 scores even after both age, gender and baseline resting salivary cortisol were accounted for. For every one point increase in CTQ-SF score on the emotional-neglect scale, the participant scored an extra 0.95 DERS-16 points ($B=0.95$, 95% CI 0.51–1.39, $=0.39$, $p<0.001$). For every 1 ms increase in resting HRV-RMSSD there was a 0.33 point decrease on the DERS-16 scale ($B=0.33$, 95% CI 0.51–0.15, $=0.32$, $p<0.001$).

Salivary cortisol at rest was not a uniquely significant predictor of DERS-16 scores ($B=0.41$, 95% CI 0.11–0.93, $=0.14$, $p=0.119$).

Neither age nor gender are uniquely associated with DERS-16 scores after the others were included in the equation. The model which included all five predictors was significant overall $F(5,82)=18.64$, $p<0.001$, $R=.532$, Adjusted $R=.503$. This indicates that combined, all five variables accounted for over 53% of the variation in DERS-16 totals, with just over 50% retained after accounting for degrees of freedom. Table 4: Multiple linear regression analysis predicting DERS-16 total scores.

Table 4. Multiple Linear Regression Analysis of Factors Associated With DERS-16 Total Score (N=88)

Panel A. Regression coefficients

Predictor	B	SE	Standardized β	t	p-value	95% CI for B
Intercept	35.12	6.84	—	5.13	<0.001	21.51 to 48.73
Age, years	−0.08	0.15	−0.04	−0.53	0.597	−0.38 to 0.22
Gender	1.45	1.82	0.06	0.80	0.428	−2.17 to 5.07
CTQ-SF Emotional Neglect	0.95	0.22	0.39	4.32	<0.001	0.51 to 1.39

Predictor	B	SE	Standardized β	t	p-value	95% CI for B
HRV-RMSSD, ms	-0.33	0.09	-0.32	-3.67	<0.001	-0.51 to -0.15
Salivary cortisol, nmol/L	0.41	0.26	0.14	1.58	0.119	-0.11 to 0.93

Panel B. Model fit

Statistic	Value
N	88
Predictors, n	5
F	18.64
Numerator df	5
Denominator df	82
Model p-value	<0.001
R ²	0.532
Adjusted R ²	0.503

B, unstandardized regression coefficient; CI, confidence interval; CTQ-SF, Childhood Trauma Questionnaire–Short Form; DERS-16, 16-item Difficulties in Emotion Regulation Scale; HRV, heart rate variability; RMSSD, root mean square of successive differences; SE, standard error. DERS-16 total score was the dependent variable. CTQ-SF emotional-neglect score, HRV-RMSSD, salivary cortisol, age, and gender were entered simultaneously. Gender was coded female=1, with male as the reference category. All tests were two-sided.

DISCUSSION

This research observed a greater level of retrospective report of emotional abuse throughout childhood as it correlated with increased difficulty regulating emotion, and both lower resting cardiac HRV and higher baseline saliva cortisol in adult survivors. HRV RMSSD and childhood emotional neglect continued to be significantly associated with DERS-16 scores even after the addition of age, sex and physiologic measures. Childhood emotional neglect and later emotional deficits, as well as resting autonomic function, seems to support a relationship.

The data did not establish cause and effect, though, and therefore did not indicate a specific mediator effect of physiologic functions, because the entire set of measures was cross-sectional, data all recorded as the same, concurrent moment.

In keeping with existing theory, childhood trauma may contribute to the increased levels of psychopathology found in adulthood as results of impacts on cognitive and interpersonal systems in addition to the dysregulation of emotion. Changes in autonomic functioning associated with childhood trauma vary by type of trauma. The association of emotional neglect and lower resting HRV- RMSSD is in accord with theory of early adversity resulting in the dysregulation of the autonomic nervous system, but it should not be treated as a “direct” indicator of how a person Reacts to acute stress, it only indexes resting activity. Childhood adversity in research has focused on the underlying mechanisms, identifying changes in circuitry used to both recognize emotions and self- regulate, suggesting there’s a clear reason to hypothesize effects on emotion regulation. Future neuro biological investigations that use actual neuroimaging or measures of neural functioning should be conducted for a better understanding, since this was not done.

Further research has been conducted, focusing on specific ages and trauma types to highlight longitudinal data. Research examining other types of trauma, e.g., sexual or physical, may yield a pattern of altered endocrine system and autonomous activity that may also vary according to both type of trauma and sex. Additional information from a variety of clinical settings will further our understanding of childhood neglect.

Different forms of childhood adversity have unique characteristics, such as psychological effects. The measurement in our study, however, specifically assesses the emotional neglect facet of childhood abuse rather than abuse defined as a combined construct. Results Regarding HRV RMSSD Childhood neglect, and especially emotional neglect may have more subtle effects compared to physical or sexual abuse and neglect is more covert form of maltreatment.

It has been shown in other studies of childhood trauma that individual type of adversity is not perfectly related to a single physiological system: as there are many variables to contend with such as different demographic characteristics of the sample.

The findings of negative relation found here on current adult data of resting HRV- RMSSD may simply have appeared at a specific point of study. Baseline saliva cortisol was associated with neglect initially in our cross-sectional analysis, but this failed to retain statistical significance in our multivariate model. Previous work concerning the activity of cortisol has demonstrated that its patterns of use will vary greatly depending on psychiatric diagnosis. The use of single baseline measurements taken from samples, saliva for instance, will not reveal whether or not the individual has elevated daily cortisol levels.

With these measures, one can only conclude that baseline cortisol alone is a poor indicator of overall endocrine functioning or acute reaction to stressors, such as from chronic endocrine disruption or response alteration.

Implications for clinical and public-health For public health and clinical work alike, the data as a whole may have profound utility. Because of childhood maltreatment that doesn't have observable outward symptoms it may be advantageous for individuals suffering with emotion-regulation problems to screen for neglect as well. But this article is not to be interpreted as clinical endorsement of the efficacy of HRVbiofeedback or treatment via psychotherapy, for the current information cannot infer treatment effectiveness or recommend for diagnostic uses of HRV or saliva Cortisol as specific indicators.

Broader perspectives have also linked childhood trauma to these difficulties in adults through network approaches. A single pathway hypothesis is not sufficient to explain the vast network of interactions among individuals with various mental health concerns and challenges in their attempts to regulating emotion. Further longitudinal studies involving diverse individuals as well as Intervention-Based research, will need to be carried out in order to establish the time sequence of events and if they mediation. Future Research A major advantage of the study was the ability to assess a full complement of psychological (i.e., negative childhood emotion neglect), behavioral, (e.g.

Stress behavior during the experiment) autonomic (resting Heart Rate Variability), and endocrine (e.g., resting cortisol) variables from one sample simultaneously. This Allowed exploration of associations in various areas and use of multivariate numerical methods. The consistency of the statistical samples used helped give the results more credibility. There are, however, several limitation as you should remember 1.

Due to lack of a longitudinally based structure, a causal effect cannot be drawn from statistics associations observed here. This suggests we're also not able to use these findings to indicate mediation. 2. Retrospectively gathered data means the possibility exists that patients remember their emotions with a bias influenced by current problems in their psyche. 3. Recruitment strategies meant that a selection bias may occur.

In addition to using patients recruited from clinical/healthcare organizations or universities, the sample was comprised solely of adults within the geographic scope of Lahore. Thus the results found are Not generalizable to individuals living outside this region. Other environmental as well as psychological variables can contribute to the individual's physiological health status.

We couldn't analyze all variables, and may have missed a few relevant ones from our adjusted models. Physiological Measurements Other physiological variables that are measured here include those that could be significantly effected by many other variable. (e.g. Behavior and stress), such as baseline saliva cortisol, heart variability (HRV), the relaxation and stress of the autonomic system which influences many of the activities that happen around you. A range of behavioral factors in addition to individual stress are likely to have influenced the measures of both HRV- RMSSD and resting salivary cortisol. Future research must attempt to address and control these variables in order to provide more accurate results, such as the assessment of a individuals behavior patterns or stress levels.

Future study designs are need in order to understand the interplay between neurological functions, (brain structure or function) autonomic and psychological measures.

CONCLUSION

With increasing reports of retrospectively experienced emotional neglect in childhood there were decreases in the self-reported problem with emotion regulation and resting-HRV RMSSD and an increase in baseline salivary cortisol. It appears that childhood emotional neglect and resting-HRV RMSSD are each independent predictors of the DERS-16 score after controlling for age, sex and baseline cortisol. These findings lend evidence for a relationship between

experience of childhood emotional neglect and the nature of adult emotional functioning and resting autonomic regulation but cannot determine that this is either the cause of or mediator in any relationship. These results suggest that both experiences from childhood emotional development in relation to current adult psychological functioning could both be meaningful, though future longitudinal investigation is required to disentangle the time and the nature of any biological link.

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