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## Childhood maltreatment and late-life generalized anxiety disorder: are personality and attachment characteristics mediators?

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**UNIVERSITE DE LAUSANNE - FACULTE DE BIOLOGIE ET DE MEDECINE**

Département de Psychiatrie

Service de Psychiatrie de l'Âge Avancé (SUPAA)

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Childhood maltreatment and late-life generalized anxiety disorder: are  
personality and attachment characteristics mediators?

THESE

préparée sous la direction du Professeur Armin von Gunten

et présentée à la Faculté de biologie et de médecine de  
l'Université de Lausanne pour l'obtention du grade de

DOCTEUR EN MEDECINE

par

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La Faculté de biologie et médecine de l'Université de Lausanne, sur proposition du jury, autorise l'impression de la thèse de doctorat rédigée par

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*Childhood maltreatment and late-life generalized anxiety disorder:  
are personality and attachment characteristics mediators ?*

sans se prononcer sur les opinions exprimées dans cette thèse.

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Lausanne, le 10.10.2023



pour Le Doyen  
de la Faculté de Biologie et de Médecine

Monsieur le Professeur John Prior  
Vice-Directeur de l'Ecole doctorale

## Maltraitance durant l'enfance et trouble d'anxiété généralisée tardif :

### Les traits de personnalité et le style d'attachement en sont-ils des médiateurs ?

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#### Résumé

**Contexte :** Il existe un lien entre la maltraitance durant l'enfance et le trouble d'anxiété généralisée (TAG) à l'âge adulte. Cette association n'est pas claire chez les personnes âgées. Ce travail vise à étudier le possible rôle du style d'attachement de l'adulte et des traits de personnalité dans l'association entre la maltraitance infantile et le TAG tardif.

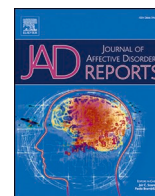
**Méthode :** L'échantillon a été composé de 260 patients recrutés dans le programme de vieillissement cérébral de la ville de Porto Alegre (Brésil), patients évalués entre juillet 2015 et juillet 2016. Un entretien clinique utilisant le Mini International Neuropsychiatry Interview 5.0 (critères DSM-5) a été administré afin d'obtenir les diagnostics psychiatriques. Les patients ont rempli le questionnaire sur les traumatismes / maltraitance pendant l'enfance, le CTQ, le questionnaire des échelles de relation pour le style d'attachement de l'adulte, le RSQ, ainsi que la version brésilienne de 60 items de l'inventaire NEO-Five Factor, le NEO-FFI, pour les caractéristiques de la personnalité. L'objectif a été d'examiner, à l'aide d'une analyse de multi-médiation séquentielle, si l'attachement et les styles de personnalité pouvaient être des médiateurs entre la maltraitance infantile et le TAG tardif.

**Résultats :** 20% des sujets ont présenté un TAG tardif (n=52), dont 29% avaient été maltraités. Le neuroticisme a médié positivement et l'extraversion a médié négativement la relation entre la maltraitance infantile et le TAG tardif. Le style d'attachement anxieux a médié cette relation de manière séquentielle, suggérant un cheminement allant du traumatisme de l'enfance vers le type d'attachement et ensuite via les traits de personnalité jusqu'au TAG tardif.

**Limites :** Le petit échantillon et la conception rétrospective et transversale de l'étude signifient que les conclusions causales doivent être interprétées avec prudence.

**Conclusions :** Nos résultats suggèrent un cheminement chronologique depuis la maltraitance infantile jusqu'au TAG tardif, en passant par l'attachement anxieux prédisant des niveaux plus élevés de neuroticisme et des niveaux plus faibles d'extraversion prédisant à leur tour le TAG tardif.

**Mots-clés :** maltraitance durant l'enfance, TAG tardif, personnalité, attachement.



## Research Paper

# Childhood maltreatment and late-life generalized anxiety disorder: Are personality and attachment characteristics mediators?

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## ABSTRACT

**Background:** Childhood maltreatment and generalized anxiety disorder (GAD) are related in adulthood. This association is not clear in the elderly. This work aims to investigate the role of adult attachment style and personality traits in the association between childhood maltreatment and late-life GAD.

**Method:** Our study sample consisted of 260 patients recruited into the Cerebral Aging Program of the city of Porto Alegre (Brazil) assessed between July 2015 and July 2016. A clinical interview using the Mini International Neuropsychiatry Interview 5.0 (DSM-5 criteria) yielded psychiatric diagnoses. Patients completed the childhood trauma questionnaire (CTQ) for maltreatment, the relationship scales questionnaire (RSQ) for adult attachment style and the Brazilian 60-item version of the NEO-Five Factor Inventory (NEO-FFI) for personality characteristics. We aimed to examine, using sequential multimediation analysis, if attachment and personality traits style could be mediators between childhood maltreatment and GAD.

**Results:** 20% presented late-life GAD ( $n = 52$ ), 29% of whom had been maltreated. Neuroticism positively mediated and extraversion negatively mediated the relation between childhood maltreatment and late-life GAD. Attachment anxiety mediated this relation in a sequential way suggesting a path from childhood trauma through attachment and personality traits towards late-life GAD.

**Limitations:** The small sample and the retrospective and cross-sectional study design mean that causal conclusions must be interpreted with caution.

**Conclusions:** Our results suggest a chronological path from childhood maltreatment to late-life GAD, passing through attachment anxiety predicting higher levels of neuroticism and lower levels of extraversion predicting late-life GAD.

## 1. Introduction

Childhood maltreatment is a strong predictor of mental health conditions in both younger (Clark et al., 2010; Hovens et al., 2012; Kessler et al., 2010) and older adults (Gomes Jardim et al., 2019; Henchoz et al., 2019; Raposo et al., 2014). Adult life events and experiences may either attenuate or worsen psychopathology in those who have been maltreated as children (Clark et al., 2010; Hengartner et al., 2015; Hovens et al., 2015; Raposo et al., 2014). Childhood maltreatments vary considerably in nature and include emotional, physical abuse, and sexual abuse as well as emotional or physical neglect (Bernstein et al., 2003).

Generalized anxiety disorder (GAD) may start in early or later life and its prevalence estimates range from 0.8 to 7.3%. This large variation may be due to different clinical definitions or measurements, or different clinical manifestations in late-life GAD (Nilsson et al., 2019), which possibly contribute to frequent under-diagnosis (Andreescu and Varon, 2015).

Early anxiety disorders increase distress, comorbidity, chronic and disabling conditions and mortality risk in late life (Hovens et al., 2012; Pary et al., 2019). However, while studies on anxiety disorders in adulthood do occasionally include patients over 65 years (Benjet et al., 2010; Hovens et al., 2015; Hovens et al., 2016, 2012; McLaughlin et al., 2010; K. A. McLaughlin, L. D. Kubzansky, et al., 2010; Witt et al., 2019),

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only very few consider specifically older patients (Gomes Jardim et al., 2019; Raposo et al., 2014).

Childhood maltreatment may increase the risk of both anxiety and mood disorders (Benjet et al., 2010; Hovens et al., 2015, 2016; K. A. McLaughlin, K. J. Conron, et al., 2010, 2010; Raposo et al., 2014; Verdolini et al., 2015; Witt et al., 2019). It was associated with recurrence and chronicity in the course of anxiety and depressive disorders in adulthood and persistence in the elderly (Hovens et al., 2015).

To the best of our knowledge, there are no studies looking into the possible link between childhood maltreatment and late-life GAD, although the link between childhood maltreatment and late-life anxiety disorders in general suggests that GAD may not be an exceptional occurrence.

Cumulative or chronic exposure to stress in childhood may be associated with lifelong distress via social and biological mechanisms (Sheikh, 2018; Witt et al., 2019). Thus, sensitization to stress may predispose children suffering adversities to higher levels of distress and anxiety later in life (Marackova et al., 2016; K. A. McLaughlin, K. J. Conron, et al., 2010).

Following attachment theory, negative interactions patterns with caregivers in childhood are related to insecure attachment style (Bowlby, 1969). Additionally, high levels of insecure attachment in maltreated children were a risk factor for adverse adult mental and physical health outcomes (Cohen et al., 2017; Widom et al., 2018). Child neglect and physical abuse were associated with anxious attachment style in adulthood and neglect with an avoidant style. Insecure attachment style influenced the development of dysfunctional personality traits. Moreover, both anxious and avoidant attachment styles were predictors of anxiety and depression indicating indirect links between childhood neglect and depression and anxiety (Bifulco et al., 2006; Widom et al., 2018) and between personality characteristics and anxious attachment style (Cohen et al., 2017). The effect of childhood trauma on personality dysfunction was indirect and mediated by adult anxious attachment style (Cohen et al., 2017).

As in earlier stages, secure attachment in late life seems to contribute to a better quality of life (Bodner and Cohen-Fridel, 2010) and the level and the quality of attachment appear to change during the aging process with a decrease in anxious attachment but not in avoidance style (Chopik et al., 2013; Van Assche et al., 2013). However, attachment as it was forged during both childhood and adulthood may have influences lasting into later life (Walsh et al., 2019).

Childhood maltreatment influences all personality traits and predicted pathological personality traits (Choi and Park, 2018; Hovens et al., 2015, 2016; Raposo et al., 2014). Higher levels of neuroticism and lower levels of extraversion are associated with anxiety (Hengartner et al., 2015). Thus, childhood maltreatment may increase the risk of developing non-adaptive personality characteristics (Benjet et al., 2010; Hovens et al., 2015, 2016; K. A. McLaughlin, K. J. Conron, et al., 2010, 2010; Raposo et al., 2014; Verdolini et al., 2015; Witt et al., 2019). Following this line of thought, personality characteristics may be mediators between maltreatment and GAD later in life.

Overall, we hypothesize that attachment style and/or personality traits may be mediators between childhood maltreatment and late-life GAD. Thus, we wished to evaluate whether childhood maltreatment is associated with late-life GAD and whether this link is mediated by attachment style and/or personality characteristics. To do so, we explored whether the mediation path had sequential chains between childhood maltreatment and late-life GAD, passing first through attachment styles and then personality traits.

## 2. Methods

This cross-sectional study included a subgroup of the outpatients recruited into the "Cerebral Aging Program" (PENGE, Programa de Envelhecimento Cerebral) of the city of Porto Alegre (Brazil). The PENGE was developed from the EMI-SUS (Estudo Multidimensional dos

Idosos do Sistema Único de Saúde do Brasil) (Gomes et al., 2013), a transverse epidemiological study on elderly people randomly selected from the Family Health Strategy in Porto Alegre (Rio Grande do Sul, Brazil). It consisted of three key dimensions: epidemiological, clinical and basic sciences seeking synergy between research and care. Psychiatric disorders were one of the explored clinical dimensions. This program aimed to examine mental health in a socioeconomically disadvantaged sample of older adults ( $\geq 60$  years). The data collection was conducted between July 2015 and July 2016 in collaboration with the Family Health Strategy (FHS).

### 2.1. Participants

346 subjects were selected and 260 were included in the final sample according to the inclusion and exclusion criteria. Inclusion criteria were an age of 60 years or older, and the ability to travel to at the hospital. Exclusion criteria were diagnosis of bipolar disorder, major cognitive impairment, drug or alcohol abuse, a history of neurological disease including tumors, cerebral ischemia, or epilepsy, or any serious or incapacitating clinical disease such as cancer or visual defects that might interfere with the assessment or the inability to understand the questions (based on clinical judgment).

General practitioners in family health facilities and health care workers in the PENGE program recruited the subjects. Assessment took place at the São Lucas hospital of the Pontifícia Universidade Católica do Rio Grande do Sul in Porto Alegre. Experienced medical doctors and psychologists working in psychiatric care for elderly patients were trained to collect data for the study.

### 2.2. Assessment

Assessment was done through a structured interview and comprised sociodemographic data, i.e., age, sex, educational level, and income, the Mini International Neuropsychiatry Interview, the Childhood Trauma Questionnaire (CTQ), the Relationship Scales Questionnaire (RSQ), and the NEO-Personality Inventory (cf. below). Data were gathered retrospectively with maltreatment temporally referring to childhood events, attachment to early adulthood, personality to adulthood and GAD assessment to later life.

#### 2.2.1. Psychiatric diagnostics including diagnosis of GAD

Diagnosis was based on the Portuguese version of the Mini International Neuropsychiatry Interview 5.0 (DSM-5 criteria), which is a validated tool with a high rate of accuracy (Amorim, 2000; Lecrubier et al., 1997). Late-life GAD diagnosis was defined as the presence of this diagnosis at the time of or within the 6 months before the study.

#### 2.2.2. Childhood maltreatment

Childhood Maltreatment was assessed using the Brazilian version of the shortened Childhood Trauma Questionnaire (CTQ) (Grassi-Oliveira et al., 2014). This is a 28-item questionnaire aiming to detect five subtypes of negative childhood experience, i.e. emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The questions allow the respondent to indicate the type of abuse and its intensity on a five-point Likert scale ranging from 1 (total disagreement with the statement) to 5 (total agreement). Maltreatment was defined by a cut-off above "none or minimal" as suggested by the CTQ manual (Bernstein et al., 2003). Cutoffs higher than 10 for emotional neglect, higher than 9 for emotional abuse, higher than 6 for sexual abuse, higher than 8 for physical abuse and higher than for physical neglect. This cut-off has a sensibility and specificity of 0.85. Normative data support its reliability and validity as a retrospective measure for childhood maltreatment (Spinhoven et al., 2014).

#### 2.2.3. Attachment style

We use the Relationship Scales Questionnaire (RSQ) that is based on



a two dimensional self and other attachment model for adults (Griffin D, 1994). This tool presents 30 declarative statements that express feelings and thoughts related to close relationships. Answers to each statement are given according to a /one to 5-point Likert scale. This construct shows consistency in evaluating these two continuous dimensions of attachment styles (Kurdek, 2002). It reflects the internal working model of secure and insecure attachment patterns. The insecure pattern reflects high anxiety, the anxious attachment style (e.g. "I worry that others don't value me as much as I value them") and/or high avoidance levels, the avoidant style (e.g. "It is very important to me to feel self-sufficient.") (Griffin D, 1994). We used the translated, culturally adapted and later published Brazilian version (de Assis et al., 2019).

#### 2.2.4. Personality characteristics

The Big Five Personality factors model was chosen as it is a validated and comprehensive model of general personality traits. It is widely used in different cultures and in the elderly (P. T. Costa, Jr. and McCrae, 1995). We used the Brazilian 60-item version of the NEO-FFI inventory, a questionnaire that assesses the five main personality factors, i.e. neuroticism (emotionally unstable, susceptible to psychological stress, maladjusted and emotionally negative), extraversion (energetic and assertive), openness to experience (imaginative, independent-minded, intellectual curiosity), conscientiousness (responsible, dependable, orderly), and agreeableness (empathetic, cooperative) (P. T. Costa, McCrae R.R., 2007).

#### 2.3. Statistical analysis

Descriptive statistics were used to characterize the sample. The NEO-FFI, RSQ, CTQ scores and other characteristics were compared between the groups with and without GAD using chi-square, Wilcoxon rank-sum test, and Fisher Exact tests as appropriate.

The chi-square and Fisher Exact tests are used to compare the categorical variables in two subgroup of GAD (yes-no). They test the independence of the two categorical variables. The chi square is used where the data is distributed homogeneously between the categories and the Fisher Exact is more appropriate where there is small sample size in some categories. The t-tests are replaced by Wilcoxon rank-sum test to avoid the problem of normality. To assess the possible mediating role of attachment style and personality traits in the associations between childhood maltreatment and GAD, two possible mediation structures were considered. First, the multiple mediation structure attachment style and personality traits; second, the sequential mediation path that goes through attachment style and then personality traits. The concept of structural equation modeling (SEM) was used to construct and compare these models. Each model was controlled for age, sex, educational level, and a diagnosis of past major depression as confounders. This approach could therefore determine the direct and indirect influences of childhood maltreatment on GAD and whether or not the mediators transmitted the effect of the independent to the dependent variable. The mediation models were fitted using Diagonally Weighted Least Square (DWLS) (Rhemtulla et al., 2012) considering the outcome as binary and used a large number of bootstrap iterations (1000) to measure the uncertainty of estimated parameters (total effect, indirect and direct effects) (Preacher and Hayes, 2008).

The statistical significance threshold was fixed at  $p < 0.05$ . All calculations were performed using the R environment for the statistical computing version 4.1.0. The mediation analysis were done using the function *sem* from "lavaan" package in R (Rosseel, 2012).

Even though this study is cross-sectional and data retrospectively collected, justifications for the use of mediation models are provided by the logical chronology of the variables, which allowed us to run mediation analysis and to reveal a potentially existing path from maltreatment to GAD (Fairchild AJ, 2017). Indeed, CTQ scores refer to an event during childhood while GAD is the late life diagnosis for the same subject. In sequential mediation analysis we hypothesize that the

attachment style and personality traits manifested in adults are developed in between them, with the latter following the former (Choi and Park, 2018; Hovens et al., 2015, 2016; Raposo et al., 2014).

#### 2.4. Ethics and informed consent

Both the research ethics committees of PUCRS and the Public Health Secretary of the City of Porto Alegre approved the research protocol. All participants or their legal representatives gave written informed consent.

### 3. Results

Late-life GAD prevalence was 20.6% ( $n = 52$ ) and 29% of those late-life GAD had suffered maltreatment in childhood. The groups with GAD and without GAD were similar as to age and education level. There was no significant difference in the total CTQ score between the groups. However, a higher score of physical abuse and attachment anxiety were observed in the GAD group. The group with GAD had a higher score in the neuroticism and a lower score in the extraversion domain. No group differences were found for any other personality trait. (Table 1).

Results from logistic regression showed that being a woman was associated with GAD (OR 4.11, CI: 1.54–14.29 ( $p = 0.01$ )), contrary to age and any types of maltreatment evaluated by dichotomized CTQ (Table 2).

The multi mediation models between CTQ total score and GAD

**Table 1**  
Descriptive statistics: associations with GAD.

Variables	Total (260)	GAD No (208)	Yes (52)	P-value
Socioeconomic Variables				
Age (years)	72.22 (7.11)	72.49 (7.11)	71.15 (7.10)	0.2
Female	200 (77%)	152 (73%)	48 (91.07) **	0.003
Male	60 (23%)	56 (27%)	5.13(3.65)	
Education levels (years)	4.72 (3.75)	4.62 (3.78)	5.13 (3.65)	0.3
MINI diagnostics				
Past Depression	77 (33%)	60 (29%)	17 (33%)	0.6
Big Five Personality				
Neuroticism	37.64 (09.25)	36.10 (8.97)	43.81 (7.73) ***	<0.001
Extroversion	37.99 (6.68)	38.66 (6.54)	35.29 (6.65) **	0.002
Openness to Experience	34.92 (3.92)	34.96 (3.99)	34.77 (3.66)	0.5
Agreeableness	40.88 (3.82)	40.96 (3.82)	40.56 (3.85)	0.4
Conscientiousness	45.47 (4.89)	45.60 (5.06)	44.98 (4.10)	0.3
RSQ Attachment				
Avoidant Attachment	22.24 (4.32)	22.06 (4.18)	22.96 (4.85)	0.10
Anxious Attachment	11.76 (4.31)	11.48 (4.33)	12.87 (4.06)	
CTQ Childhood maltreatment				
Total CTQ Score	45.42 (10.78)	44.98 (10.76)	47.17(10.80)	0.061
Physical neglect	8.55 (3.66)	8.54 (3.72)	8.56 (3.42)	0.7
Physical abuse	7.45 (3.87)	7.28(3.88)	8.13 (3.82)*	0.018
Emotional neglect	15.77 (1.99)	15.79 (1.99)	15.71 (2.00)	0.9
Emotional abuse	7.97 (4.43)	7.80 (4.29)	8.65 (4.94)	0.4
Sexual abuse	5.67 (2.65)	5.56 (2.40)	6.12 (3.48)	0.061
CTQ high	57 (22%)	42 (20%)	15 (29%)	0.2

Mean (S.D), n (%).

Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's exact test compare depression groups.

**Table 2**

Binary logistic regression analysis of generalized anxiety disorder and childhood trauma predictors.

Predictors	GAD		
	OR	CI	P
Age	0.91	0.64 – 1.27	0.576
Scolarity	1.13	0.82–1.54	0.462
Female	4.11	1.54 – 14.29	0.011
Past Depression	0.96	0.96 – 1.88	0.910
CTQ high	1.30	0.62–2.63	0.471

showed an indirect effect for neuroticism (Estimate 0.130, SE: 0.38, CI: 0.038, 0.60) and extraversion (Estimate 0.063, SE: 0.028, CI: 0.20, 0.131) after controlling for depression. Neither anxious nor avoidant attachment was a direct mediator in the path between childhood maltreatment and late life GAD.

The sequential mediation model revealed a significant path from CTQ to GAD which passed through attachment anxiety and then neuroticism as well as through attachment anxiety and then extraversion, the former being stronger than the later.

The indirect total effect of CTQ on GAD was mainly mediated by neuroticism (Estimate 0.018, SE: 0.038, CI: 0.054, 0.208). The sequential indirect effect was significant when passing through attachment anxiety first and then through neuroticism (Estimate: 0.114, SE: 0.033, CI: 0.059, 0.189) and when passing through attachment anxiety first and then through extraversion (Estimate: 0.027, SE: 0.014, CI: 0.006, 0.065).

Exploring the nature of this relation, neuroticism was significant and positively related to GAD ( $p < 0.001$ ), while extraversion was significantly and negatively related to GAD ( $p < 0.05$ ).

The model comparison between the mediation structures assumed showed that the sequential mediating path is the preferred model to explain the data at hand.

#### 4. Discussion

The primary findings of this study relating childhood maltreatment to late-life GAD are i) a mediator effect through attachment anxiety first and then higher levels of neuroticism with the last being the predictor of late-life GAD, and ii) a mediator effect through attachment anxiety first and then lower levels of extraversion.

We have fitted and compared two different mediation structures and our results show that a sequential mediation of attachment and personality was the best fit. It sustained a chronological relation between maltreatment, attachment anxiety, neuroticism, and late-life-GAD.

This temporal chain is in line with the original theory of attachment suggesting that the negative experiences of relationship between a child and their caregivers predispose to insecure attachment style in adolescence or in adulthood (Bowlby, 1969), but also, as shown by our study, in the elderly.

##### 4.1. Childhood maltreatment and GAD

Various studies report different forms of childhood maltreatment to be related to anxiety or anxiety disorders in adulthood and across ages (Bahk et al., 2017; Benjet et al., 2010; Hovens et al., 2016; K. A. McLaughlin, K. J. Conron, et al., 2010, 2010; Raposo et al., 2014; Rehan et al., 2017; Verdolini et al., 2015). Others studies have found childhood maltreatment to be related specifically to GAD or anxiety disorders across ages, but none of those studies looked specifically into old age (Bahk et al., 2017; Benjet et al., 2010; Hovens et al., 2012; K. A. McLaughlin, K. J. Conron, et al., 2010, 2010; Rehan et al., 2017; Verdolini et al., 2015). We found that the elderly with GAD were more often physically maltreated in childhood than those without GAD. This is in agreement with other reports regarding anxiety in older adults (Gomes Jardim et al., 2019; Hovens et al., 2015, 2016).

Differentiating childhood maltreatment types and how these types

are defined are also issues. In our study, only physical abuse was more frequent in those with GAD. Physical abuse predicted anxiety in a series of other studies (Bahk et al., 2017; Benjet et al., 2010; Hovens et al., 2016; K. A. McLaughlin, K. J. Conron, et al., 2010, 2010; Verdolini et al., 2015; Witt et al., 2019), while still others found emotional or sexual abuse or neglect to predict anxiety (Hovens et al., 2012; Katie A. McLaughlin et al., 2010; Rehan et al., 2017; Witt et al., 2019). Similarly, emotional neglect or abuse were the most important predictors of anxiety in some studies with no stated link specifically with GAD (Hovens et al., 2016; Poole et al., 2017; Shahar et al., 2015). However, these studies did not consider GAD specifically.

##### 4.2. Attachment and GAD

Our analysis showed an association between attachment anxiety and late-life GAD. This finding is consistent with studies in younger populations where insecure attachment had a positive association with anxiety and GAD (Cassidy et al., 2009; Marganska et al., 2013). One study reported that the risk for GAD increased as indices of insecure attachment experiences increased (Cassidy et al., 2009). Additionally, attachment anxiety (fearful-avoidant and preoccupied attachment) as opposed to dismissive-avoidant attachment was a predictor of GAD in some studies (Kurdek, 2002). Conversely, a high level of avoidant attachment was associated with GAD in another study (Bifulco et al., 2006). Considering or not sub-categories of avoidant attachment style, methodological differences in sample size or measures of GAD may account for such discrepancies. Thus, Marganska et al. (2013) (Marganska et al., 2013) and ourselves used a self-report interview whereas Bifulco et al. (2006) used an investigator-based interview (Bifulco et al., 2006). Those two forms of interviews may capture different elementary attachment dimensions (Marganska et al., 2013).

##### 4.3. Personality and GAD

A higher level of neuroticism and lower levels of extraversion were associated with GAD in this study. This result reinforces the idea that life-long personality characteristics influence mental conditions in late-life suggesting a chronological relation between childhood maltreatment and later personality dysfunctions. Childhood maltreatment predicted personality disorders (Choi and Park, 2018; Hovens et al., 2015, 2016, 2012; K. A. McLaughlin, K. J. Conron, et al., 2010; Katie A. McLaughlin et al., 2010; K. A. McLaughlin, L. D. Kubzansky, et al., 2010; Raposo et al., 2014; Verdolini et al., 2015). Higher levels of neuroticism and lower levels of extraversion were associated with anxiety (Hengartner et al., 2015) and negatively mediated the relationship between childhood maltreatment and remission from depression and anxiety disorders (Hovens et al., 2016).

##### 4.4. Personality or attachment as mediators between childhood maltreatment and GAD

Our findings are consistent with the hypothesis that higher levels of neuroticism mediate the association between childhood maltreatment and late-life GAD. They are in line with studies assuming a link between childhood maltreatment and anxiety mediated by personality characteristics (Hovens et al., 2016; Poole et al., 2017; van Dijk et al., 2016). Thus, neuroticism was a mediator between childhood maltreatment and non-remission of depressive and anxious symptoms (Hovens et al., 2016). This relationship may be grounded on altered sensitivity to stress (Witt et al., 2019; MacLaughlin et al., 2010). Features of neuroticism may result from the relation between higher levels of stress, negative affect and the hypothalamic-pituitary-adrenal (HPA) axis activation (Dewitte et al., 2010).

We have shown an association between attachment anxiety and late-life GAD, although attachment anxiety style did not directly mediate the relation between childhood maltreatment and GAD. Our results are



partially consistent with research carried out in younger populations where the mediation effect of anxious attachment style disappeared after adjusting for difficulties in emotional regulation (Hankin et al., 2005; Marganska et al., 2013). Marganska et al.'s study (Marganska et al., 2013) may be the only study examining mediation effects between attachment and GAD and suggests a complex interplay between different regulatory mechanisms. Thus, insecure attachment may contribute to maintaining anxiety levels in GAD via emotional dysregulation (Cassidy et al., 2009; Marganska et al., 2013).

Our results using sequential mediation analysis are in line with studies assuming a possible path from childhood maltreatment to GAD, passing first through the development of attachment styles and secondarily personality dimensions. More specifically, our findings suggest a chronological path from maltreatment during childhood through attachment anxiety and later neuroticism towards late-life GAD.

4.5. Strengths and limitations

Sequential mediation analysis is a strength of this study although retrospective data collection does not allow for definite causal attributions. The retrospective assessment of childhood events and self-report of attachment may predispose to memory bias, which would, however, rather lead to underreporting of childhood maltreatments and attenuation of the association between childhood maltreatment and late-life GAD. Finally, the small size and the social characteristics of our sample limit the representativeness of the findings. However, studies on the elderly in socioeconomically disadvantaged context are rare. Indeed, our study may be the only one examining childhood maltreatment and late-life GAD specifically and their possible multiple and sequential mediators in a socioeconomically disadvantaged-population-based sample in a medium-income country. Finally, controlling of the sample for past depression enhanced the power of our findings concerning late-life GAD.

5. Conclusion

The finding of a sequential path from childhood maltreatment through early attachment anxiety and life-course neuroticism towards late-life GAD suggests a possible causal chain that requires, however, prospective research to confirm it.

Our results suggest an impact of childhood maltreatment on late-life GAD via attachment anxiety and both neuroticism and extraversion, where neuroticism may favor late-life GAD and extraversion protect from GAD.

If confirmed, screening older patients with GAD for maltreatment in childhood may prompt clues for individualized treatment strategies to

relieve GAD-related symptoms. Fig. 1, Table 3, Table 4.

Description of authors' contributions

M Antunes Santos: formulated the research questions, analyzed the data and wrote the first draft of the paper, G Behr Jardim: collected the data, M Gholam: responsible for the statistical design and carried out the statistical analyses and S Ranjbar: responsible for the statistical design and carried out the statistical analyses, JP Schuster: read and commented the article contributing to enhance the paper writing, I Gomes: participated in the study program design and supervised data collection, A von Gunten: prepared the overall study program design, supervised the role process of formulating the research questions, the analyses and writing of the paper.

Table 3 Multiple mediations models between childhood maltreatment and GAD .

Variable	Estimate	SE	LLCI	ULCI
<b>Model 1: Attachment</b>				
Direct effect	0.008	0.100	-0.195	0.186
Indirect effect	0.054	0.039	-0.013	0.141
Indirect. Avoidant attachment	0.012	0.013	-0.005	0.056
Indirect. Anxious attachment	0.042	0.033	-0.013	0.114
<b>Model 2: Personality</b>				
Direct effect	-0.142	0.100	-0.360	0.046
Indirect effect	0.204	0.061*	0.101	0.337
Indirect Neuroticism	0.130	0.038*	0.060	0.207
Indirect Extraversion	0.063	0.028*	0.020	0.131
Indirect Openness	0.001	0.008	-0.010	0.028
Indirect Agreeableness	0.005	0.013	-0.013	0.048
Indirect Consciousness	0.005	0.010	-0.006	0.042
<b>Model 3: Attachment and Personality</b>				
Direct effect	-0.196	0.113	-0.423	0.014
Indirect effect	0.258	0.081*	0.112	0.428
Neuroticism	0.130	0.038*	0.060	0.207
Extraversion	0.063	0.028*	0.020	0.131
Openness	0.001	0.008	-0.010	0.028
Agreeableness	0.005	0.013	-0.013	0.048
Conscientiousness	0.005	0.010	-0.006	0.042
Avoidant Attachment	0.012	0.013	-0.005	0.056
Anxious Attachment	0.042	0.033	-0.013	0.114

Notes. ULCI = upper-level confidence interval. LLCI = Lower-level confidence interval.

All analyses were controlled for age, sex, education level and past depression.

\*Being significant using the bootstrapped confidence intervals.

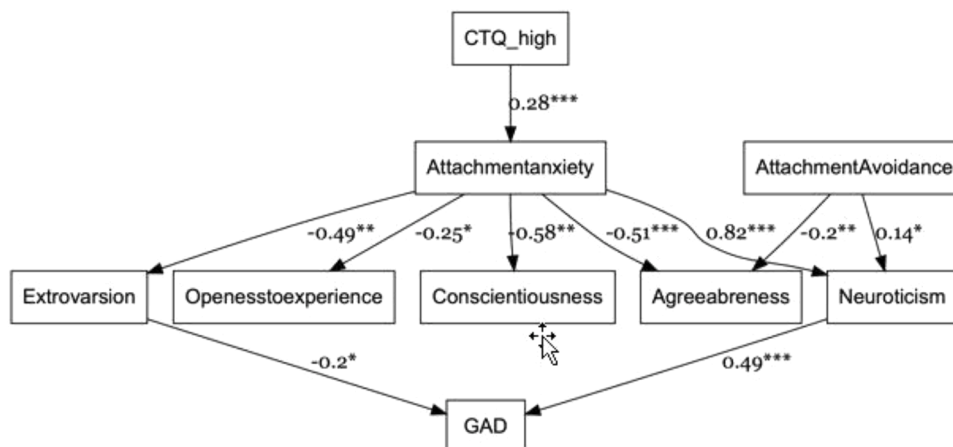


Fig. 1. Note: \*p<0.05, \*\*p<0,01, \*\*\*p<0.001.

**Table 4**  
Sequential chain mediations models between childhood maltreatment, attachment, Personality and GAD.

Effect Model 4	Estimate	SE	LLCI	ULCI
<i>Direct effect</i>	-0.057	0.096	-0.261	0.112
<i>Indirect effect total</i>	0.118	0.038*	0.054	0.208
Indirect. Avoidant.Neuroticisme	0.006	0.007	-0.001	0.029
Indirect. Avoidant.Extraversion	0.000	0.002	-0.004	0.005
Indirect. Avoidant.Openess	0.000	0.001	0.000	0.006
Indirect. Avoidant. Agreeableness	-0.001	0.002	-0.011	0.001
Indirect. Avoidant. Consciouness	0.000	0.001	-0.005	0.001
Indirect.Anxious.Neuroticism	0.114	0.033*	-0.059	0.189
Indirect.Anxious.Extraversion	0.027	0.014*	0.006	0.065
Indirect.Anxious.Openess	-0.003	0.008	-0.024	0.008
Indirect.Anxious.Agreeableness	-0.011	0.014	-0.040	0.016
Indirect.Anxious.Consciouness	-0.014	0.017	-0.060	0.012

Notes. ULCI = upper-limit confidence interval. LLCI = Lower-limit confidence interval.

All analyses were controlled for age, sex, education level and depression. \*Being significant using the bootstrapped confidence intervals.

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### Declaration of Competing Interest

None.

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