

## Childhood trauma increases vulnerability to attempt suicide in adulthood through avoidant attachment

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### ABSTRACT

**Background:** Childhood trauma and affective disorders are known risk factors for adult suicidal behavior. Studies have shown a mediating effect of insecure attachment on the effect of childhood trauma and suicidal behavior but so far it is not clear whether this effect is related to an attachment dimension (anxiety, avoidance).

**Aim:** The present study sought to examine the mediating effect of attachment anxiety and avoidance on suicidal behavior.

**Methods:** We analyzed data on childhood trauma, attachment style, depression severity, presence of prior suicide attempts and current suicide ideation from 96 patients diagnosed with an affective disorder. Two mediation analyses were conducted to assess the effect of childhood trauma on 1) prior suicide attempts and 2) current suicidal ideation through its effect on attachment.

**Results:** We found that childhood trauma had a complete mediated effect on the presence of prior suicide attempts through its effect on avoidant attachment ( $a_1b_1 = 0.0120$ , 95%-CI [0.0031, 0.0276]). However, only emotional abuse had a direct influence on suicidal ideation ( $c' = 0.0273$ ,  $p < 0.01$ ) without any indirect effect of anxious or avoidant attachment.

**Limitations:** Variables were not assessed in a prospective way and sample size was small.

**Conclusions:** Our findings suggest that individuals with avoidant attachment and childhood trauma are likely to present a high suicide risk. Since avoidant attachment is associated with altered perceptions and eventual rejection of social support, we recommend to screen for attachment early and to engage patients in therapeutical approaches focusing on the client-therapist alliance.

### 1. Introduction

Suicidal behaviors (suicidal ideation, suicide attempts and completed suicides) continue to be one of the greatest public health problems of our time. Death by suicide ranks as the 17th leading cause of death generally and the 4th leading cause of death among young people (15–29-year-olds) worldwide in 2019 [1]. Particularly high numbers are recorded in association with psychopathology [2,3]. Suicide risk is

especially elevated during depressive episodes [1,4]. The lifetime risk to attempt suicide is estimated to be 25–30% in Major Depressive Disorder [5,6], and 20–60% in bipolar patients [7,8].

Next to proximal factors, suicidal behaviors are influenced by distal factors, in particular childhood trauma (CT) [9–13]. CT describes any act or speech that is targeted to degrade a child. Early maltreatment in life is widespread: approximately one third of the North American population had experienced a form of physical, emotional, or sexual

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abuse or physical and emotional neglect [14,15]. CT is not only linked to the pathogenesis of several mental disorders [16,17], more severe clinical courses, early onset, higher number of comorbidities, and lower treatment response [18] but also to a two-to-three-time higher risk to attempt suicide in adulthood [19]. However, the effect of CT on suicidal behavior in adulthood is most likely explained by intermediate developmental factors [13] rather than by the development of mental illness [20,21]. Consequently, attachment insecurity is proposed as such a factor [9,13].

The neurobehavioral attachment system develops in the relationship to the primary caregiver in early childhood [22,23]. Secure attachment is represented in trustful cognitive and affective representations (working models) about oneself and others, thus adaptive emotion regulation skills and an inner sense of security [24]. The experience of CT interferes in this developmental process and leads to an insecure attachment characterized by a) working models that are marked by more pessimism, low – self-esteem, hopelessness, and mistrust [9,25,26] and b) an interpersonal behavior characterized by avoidance and/or anxiety [27]. The attachment patterns transfer to close relationships, such as romantic partnerships in adulthood [28–30] and shape the way social relationships are understood as a source of support against life adversities throughout life [22,23,31]. Thereby, high avoidance rates are manifested in increased independence and mistrust towards others and interpersonal behavioral strategies that intend to deactivate the attachment system, e.g., distancing behavior and detachment. High levels of relationship anxiety, however, translate to perceived reduced self-efficacy and hyperactivation behavior, such as clinginess and overdependence [28]. Concretely this implies that when under extreme stress, avoidantly attached subjects try to regulate their arousal through distancing themselves from others and emotion suppression [32] while anxiously attached subjects would explicitly reach out to loved ones and overexpress their emotions [28]. Subjects with both high avoidance and anxiety exhibit both strategies.

Empirical studies have proven the link between insecure attachment and affective disorders [33,34], suicidal ideation [35–38], and CT [39,40] respectively. Also, recent studies report a mediating effect of anxious and avoidant attachment strategies on the effect of CT on depression severity [41], resilience [42] or suicide ideation and attempt [44,45].

Concerning the latter, to the best of our knowledge, only two studies focused on the relationship of insecure attachment, CT, and suicidal behavior: Stagaki and colleagues [44] found a partially mediating effect of insecure attachment (assessed by the Experience in Close Relationships Inventory – Revised, ECR-R [46]) on the relationship of childhood maltreatment (assessed by the Childhood Trauma Questionnaire, CTQ [47]) on self-harm and suicidal behavior (latent construct of three items of the Brief Symptom Inventory). They tested a clinical sample of 903 patients with borderline or antisocial personality disorder, mood, or anxiety disorder and 258 healthy controls. Their results are supported by Touati and colleagues [45] who assessed retrospective data on 77 adults who were separated from their biological families as children and grew up in foster families. Attachment to the biological mother (assessed by the Attachment Multiple Model Interview) mediated the relationship between childhood abuse (assessed by the CTQ) and suicide risk (assessed by the Mini International Neuropsychiatric Interview). However, Stagaki et al. [44] as well as Touati et al. [45] calculated structural equation models where insecure attachment was included as latent construct of different attachment strategies (anxious vs avoidant). The very nature of the models prevented conclusions on whether one attachment tendency predicted suicidal behavior more efficiently than the other. So, while early evidence suggests a mediating effect of attachment strategies on the relationship between CT and suicidal behavior, further research is needed to determine the mechanisms through which CT affects current and lifetime vulnerability for suicidal behavior and to determine whether attachment tendencies might have a different influence on this mechanism.

The present study aims to address this question by investigating the impact of CT on I) prior suicide attempts and II) current suicidal ideation in a cohort of patients suffering from affective disorders. Specifically, we hypothesized that avoidant and anxious attachment tendencies mediated the effect of CT on I) history of suicide attempts and II) current suicidal ideation.

In a first step, we estimated the burden of CT through the total trauma score (added up scores for all subtypes of CT) and did not formulate a hypothesis in favor of any attachment tendencies. In an additional secondary analysis (results not shown in article), we analyzed the same mediation analysis for each CT subtype. Since there is evidence in the literature for the role of sexual and physical [48–50] as well as emotional abuse [51] on suicidal behavior and attachment [39,41], we chose an exploratory approach and calculated models for each subtype separately.

## 2. Method

### 2.1. Study design

We analyzed data from a multicenter study involving eight academic departments of psychiatry as previously described [52]. In total, each participant attended four evaluation visits during a 30-week period. Socio-demographic data was evaluated at the first visit (week 0), while CT, attachment, depression scores and suicidal ideation were assessed at the last visit (week 30).

### 2.2. Participants

Inclusion and exclusion criteria for patient acquisition were previously described [52]: The diagnosis of a Major Depressive Episode (MDE) according to DSM-IV criteria [53] made by a trained psychologist or psychiatrist, recent inpatient, or outpatient treatment for this diagnosis, and a total score of 19 or higher on the 17-item Hamilton Depression Rating Scale (HDRS-17) [54]. Exclusion criteria were a history of substance use disorder in the past 12 months, a diagnosis of schizophrenia, psychotic, or schizoaffective disorder according to DSM IV, a severe progressive medical disease, pregnancy, vaccination within a month before the inclusion in the study and patients that were under 18 years old. Of initially 148 included patients, six were excluded based on the exclusion criteria during the study (diagnosis of severe medical conditions, consent withdrawal) and 46 patients had to be excluded from the analysis due to missing data concerning CT (CTQ), attachment (ECR-R) and/or data on suicide attempts. Ultimately, data from 96 patients were included in the analysis. Participants who were excluded from the analyses based on the exclusion criteria or early drop-out showed no difference in expected probability concerning their gender ( $\chi^2(1) = 2.721, p = 0.099$ ), level of education ( $\chi^2(3) = 3.118, p = 0.374$ ), psychiatric diagnoses (unipolar disorder, bipolar disorder, and bipolar spectrum disorder;  $\chi^2(2) = 1.113, p = 0.573$ ), age ( $U = 1003.00, p = 0.289$ ), and whether they attempted suicide or not ( $\chi^2(1) = 0.035, p = 0.851$ ) in comparison to patients included in the analyses. Patients were fully informed about the study procedure and their written and signed consent was obtained before their participation. This study received an ethical committee approval (CPP Sud Méditerranée II, Marseille, France, study registered under number 2011-A00661–40).

### 2.3. Clinical assessment

#### 2.3.1. Childhood trauma

The French short version (28 items) of the self-rated Childhood Trauma Questionnaire, CTQ [47,55] was used to assess information on CT in retrospective. Subjects were asked to rate the frequency of abusive or neglectful behaviors from caregivers towards them as a child on a five-point Likert-scale reaching from 1 (“never true”) to 5 (“very often true?”) on five subscales: emotional, sexual, and physical abuse and

emotional and physical [48]. Emotional abuse refers to the exposure to verbal attacks to the child's self-worth that intend to humiliate, threaten, or degrade the child (e.g., "People in my family called me things like 'stupid', 'lazy', or 'ugly'."). The term physical abuse sums up any physical attack that the subject has experienced throughout childhood and that was executed by an older person and or caretaker (e.g., "I got hit so hard by someone in my family that I had to see a doctor or go to the hospital."). Likewise, sexual abuse is defined as any sexual contact between the child and an older person, regardless of whether the child was forced or not (e.g., "Someone tried to touch me in a sexual way or tried to make me touch them."). Emotional neglect defines family circumstances in which the emotional needs - for love, encouragement, acceptance, etc. - of the child are not met (e.g. "There was someone in my family who helped me feel that I was important or special."), whereas physical neglect sums up malnourishment, lack of supervision in matter of health and security or lack of a safe home (e.g. "I didn't have enough to eat.") [47]. Items of each trauma subtype are summed up and scales range from 5 to 25. Furthermore, we calculated a total trauma score by summing up the total scores of each subscale, scoring from 25 to 125. The CTQ offers a good internal consistency, with alpha reliabilities ranging from 0.70 to 0.93 and retest reliabilities ranging from 0.66 to 0.94 [74].

### 2.3.2. Attachment

The French version of the Experience in Close Relationships Inventory - Revised (ECR-R) was used to measure the attachment tendencies on the subscales: anxiety and avoidance [46,56]. The questionnaire comprises 36 items focusing on behavior and beliefs towards a romantic partner. 18 items inquire attachment anxiety (e.g. "I often worry that my partner doesn't really love me.") and avoidance (e.g. "I prefer not to show a partner how I feel deep down.") each. The response format is a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Subscales scores are calculated by the sum of respective items. ECR-R represents high internal consistency with alpha reliabilities ranging from 0.89 to 0.93 for the avoidance subscale and 0.88 to 0.94 for the anxiety subscale [56,57].

### 2.3.3. Suicide attempts

The total number of suicide attempts were assessed at the last visit, 30 weeks after the initial assessment. As suicide attempts are a rare event and therefore must be assumed not to have a normal distribution - which was also the case in our sample- a categorical variable was built by dividing the group of patients into those who have attempted suicide and those who have not.

### 2.3.4. Depression

The severity in depressive symptoms were assessed by a clinician rated assessment tool, the French version of Hamilton Depression Rating Scale with 17 items HDRS-17 [54].

### 2.3.5. Suicidal ideation

We measured suicidal ideation with the 12th item ("Thoughts of Death or Suicide") of the Quick Inventory of Depressive Symptomatology-Self Report with 16 items, QIDS-SR16 [58]. It is widely accepted in the literature to measure suicidal ideation by a single item; self-rating questionnaires are thereby equally or slightly more efficient to a clinician's evaluations [59–61].

## 2.4. Statistical analyses

Patients who attempted suicide and patients who did not attempt suicide were compared regarding clinical and demographical characteristics using univariate analyses. As visual examination of the histograms and boxplots and Shapiro-Wilk test revealed normal distribution was only given for the attachment subscales anxiety and avoidance, group values were compared using *t*-test for attachment variables, chi-

square test for categorical variables and Mann-Whitney-*U* test for other metric variables. Post-hoc tests were corrected for multiple comparisons via the Bonferroni method ( $p/n$ ). Additionally, we calculated Spearman's Rho correlation coefficients to further investigate the relationship between metric variables CT, attachment, and number of suicide attempts.

First, we tested the mediating effect of attachment tendencies on the effect of CT (total trauma score) on suicide attempts by using the SPSS Macro PROCESS Version 3.5. by Hayes [62], model 4. As we measured past suicidal behavior in a categorical way each mediation analysis comprised three regression models: Two ordinary least square regressions were conducted to calculate unstandardized path coefficients for total, direct, and indirect effects of CT on 1) avoidant and 2) anxious attachment tendencies and a third, a logistic regression model was calculated to determine the unstandardized path coefficients of anxious and avoidant attachment tendencies and childhood trauma on whether patients attempted suicide or not (categorical variable, coded with 0 = no, 1 = yes). For the latter, direct, and indirect effects are therefore expressed in log-odds metrics. We calculated the model once without covariate and once controlled for the effects of depressive symptoms by adding the HDRS Total Depression Score at week 30 as covariate. When we controlled for the covariate only 95 subjects were included due to missing data in the HDRS. Confidence intervals and inferential statistic were calculated by employing bootstrapping method with 5000 samples and heteroscedasticity consistent standard errors [63]. Additionally, we tested both hypotheses for each trauma subtype measured by the CTQ.

To test whether attachment tendencies mediated the effect of CT on current suicidal ideation we calculated a second mediation analysis by using the SPSS Macro PROCESS Version 3.5. by Hayes [56], Model 4. As a history of suicide attempt increases the risk of lethal attempts, suicide crisis, and suicidal ideation [13], and is reportedly interlinked with depressive symptoms, and as its assessment is part of most depression questionnaires [54,58,64], we controlled for the presence of I) prior suicide attempts and II) depressive symptoms by including both as covariates in the analysis. Due to missing data on the HDRS and QIDS 93 subjects were included in this model. PROCESS uses ordinary least square regressions and confidence intervals, and inferential statistics are calculated by employing bootstrapping method with 5000 samples and heteroscedasticity consistent standard errors [63].

As a post-hoc estimation of the statistical power of the mediation analyses, we compared our samples size with the sample size of Fritz & MacKinnon [65].

Graphics were created by Excel and R Studio. Statistical analyses were performed by IBM SPSS statistic, version 22, and R Studio.

## 3. Results

### 3.1. Univariate analyses

Univariate analyses revealed that suicide attempters reported higher scores for CT infantile emotional, physical and sexual abuse, and emotional neglect, for the attachment subscales anxiety and avoidance adult depression and suicidal ideation (see Table 1). However, groups did not differ in gender, level of education, age, marital status, and endured physical neglect during childhood (see Table 1). There was a trend that suicide attempters differed significantly from non-attempters regarding psychiatric diagnoses ( $\chi^2(2) = 6.959$ ,  $p = 0.031$ ), but this result could not be confirmed in *post-hoc* tests, when the alpha-levels were corrected according to the Bonferroni-method (corrected  $\alpha$ -level = 0.0083 as  $p < (0.05/6)$ , as the cross-table presented 6 fields).

### 3.2. Bivariate analyses

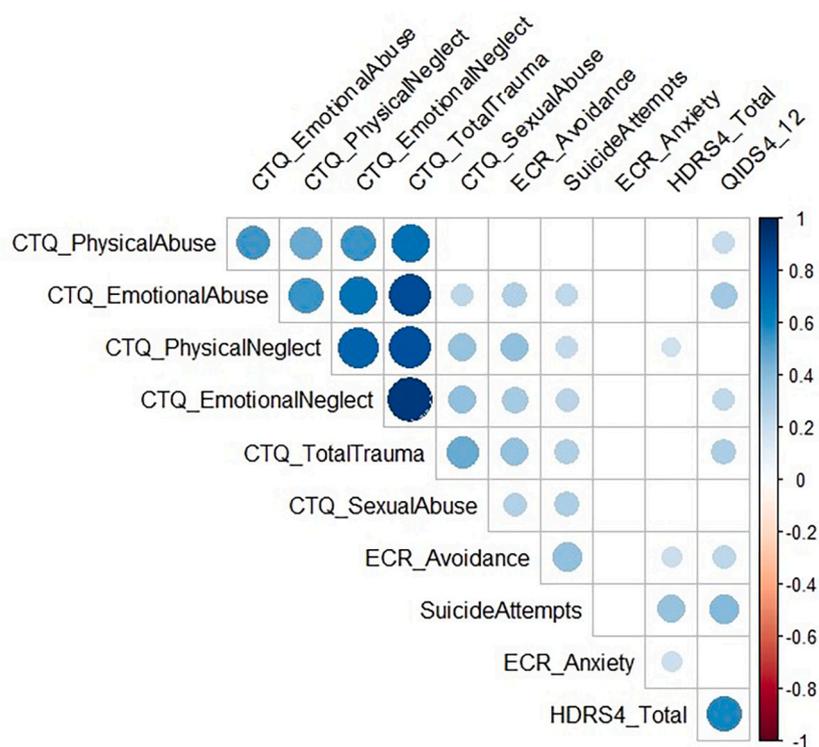
Bivariate analyses, Spearman's Rho correlation can be found in Fig. 1.

**Table 1**

Mean (standard deviation) if not otherwise specified of socio-demographic and clinical characteristics of total sample of patients (n = 96), suicide-attempters (n = 45) and non-attempters (n = 51) and the appropriate statistical analyses.

	Total sample N = 96		Non-attempters N = 51		Attempters N = 45		Statistical test	p - value	N
Female, n %	62	64.6	30	58.8	32	71.1	Mann-Whitney-U	0.209	96
Age	43.65	(14.33)	44.98	(15.50)	42.20	(12.96)	Mann-Whitney-U	0.289	96
Married, n %	42	43.75	20	39.22	22	48.89	Chi-square	0.340	96
Diagnosis, n %							Chi-square	0.031	96
Unipolar disorder	54	56.3	35	68.6	19	42.2			
Bipolar disorder	33	34.4	12	23.5	21	46.7			
Bipolar spectrum disorder	9	9.4	4	7.8	5	11.1			
Education, n %							Chi-square	0.120	94
5 years	5	5.2	2	3.9	3	6.7			
9 years	24	25.0	15	29.4	9	20.0			
12 years	20	20.8	6	11.8	14	31.1			
>12 years	45	46.9	26	51.0	19	42.2			
Self-rating questionnaires									
CTQ - Emotional Abuse	10.91	(6.26)	9.49	(5.72)	12.47	(6.52)	Mann-Whitney-U	0.020	96
CTQ - Physical Abuse	7.38	(4.17)	6.41	(2.73)	8.44	(5.13)	Mann-Whitney-U	0.008	96
CTQ - Emotional Neglect	13.34	(5.70)	12.06	(5.08)	14.73	(6.05)	Mann-Whitney-U	0.034	96
CTQ - Physical Neglect	8.19	(3.27)	7.63	(2.79)	8.80	(3.66)	Mann-Whitney-U	0.096	96
CTQ - Sexual Abuse	7.05	(4.35)	6.35	(3.80)	7.82	(4.81)	Mann-Whitney-U	0.025	96
CTQ - Total Trauma Score	46.83	(18.44)	42.02	(15.42)	52.27	(20.16)	Mann-Whitney-U	0.010	96
ECR - Anxiety	76.51	(20.72)	72.00	(19.90)	81.42	(20.69)	Student's t-test	0.024	96
ECR - Avoidance	57.17	(20.32)	50.37	(20.13)	64.58	(17.97)	Student's t-test	0.001	96
QIDS - Item 12 V30	0.50	(0.858)	0.16	(0.47)	0.88	(1.03)	Mann-Whitney-U	<0.001	94
External assessment tool									
HDRS4 - Total Score V30	10.38	(7.99)	8.02	(7.03)	13.07	(8.24)	Mann-Whitney-U	0.001	95

For continuous variables, Student independent t-test or non-parametric Mann-Whitney-U test were used depending on whether normal distribution was reached or not. Categorical variables were compared with Chi-square. Abbreviations CTQ = Childhood Trauma Questionnaire, total trauma score shows the total score of all 28 CTQ items; ECR = Experience in Close Relationship- Revised; HDRS = Hamilton Depression Rating Scale-17 items; QIDS = Quick Inventory of Depressive Symptomatology-Self Report – 16 items.

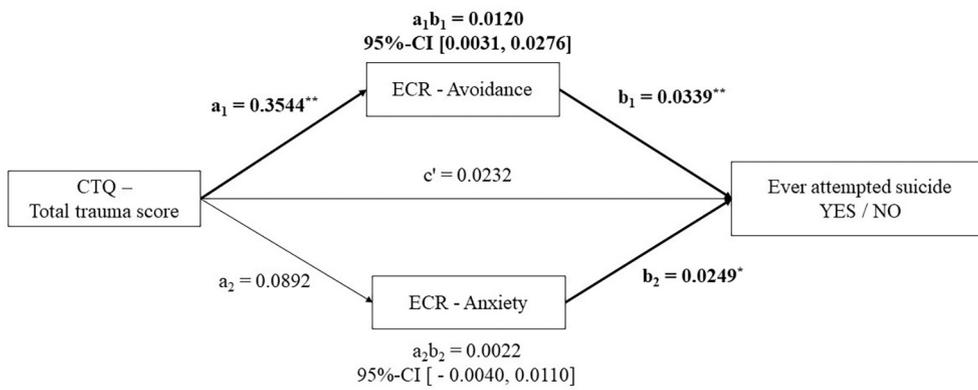


**Fig. 1.** Bivariate Spearman's rho analyses. Only significant correlations are displayed. The strength of the correlation is symbolized by the size of the circle, the direction of relationship (negative or positive) by the color, as indicated in the legend. The size effect of the correlation coefficients was interpreted by using the Cohen's method [66]. A rho coefficient  $|\rho| \geq 0.10$  indicates a weak relationship,  $|\rho| \geq 0.30$  a medium relationship, and  $|\rho| \geq 0.50$  a strong relationship. QIDS4\_12 represents the value of the 12th item of QIDS-SR 16 measuring suicidal ideation assessed at V30; HDRS4\_Total depression indicates the HDRS-17 total score at V30 (the fourth visit).

**3.3. Mediation analyses**

In the first mediation analysis conducted using ordinary least squares path analysis and logistic regressions we found that the relationship

between CT on whether a patient attempted suicide or not was completely mediated by avoidant attachment  $a_1b_1 = 0.0120$ , 95%-CI [0.0031, 0.0276] (see Fig. 2; effect size controlled for the HDRS Total Depression Score:  $a_1b_1 = 0.0096$ , 95%-CI [0.0013, 0.0255]). We found



**Fig. 2.** Mediation models on the effect of the total trauma score on the categorical variable, whether a patient attempted suicide or not through its effect through two parallel mediators, the attachment subscales avoidance and anxiety. Regression coefficients are unstandardized and labeled with significant levels \* $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , additionally significant paths are presented in bold. 95%-CI were considered to display significance when they did not contain 0. The mediation analysis contains two ordinary least square path analyses and one logistic regression. The total trauma score was assessed by the CTQ, suicidal ideation by the 12th item of QIDS-SR 16, attachment by the ECR-R and depression by the HDRS-17 (covariate).

no evidence for a direct influence of the total trauma score on whether a person attempted suicide - independently from attachment subscale (see  $c'$  in Fig. 2) nor for an indirect effect of CT through its effect on anxious attachment tendencies (see Fig. 2). In a secondary analysis, the same relationship was found for all subtypes of CT except for physical abuse. Physical abuse did not show a mediated effect through any attachment subscale but directly increased the probability that a patient belonged to the attempter group ( $c' = 0.1655$ , effect size controlled for the HDRS Total Depression Score  $c' = 0.1578$ ,  $p < 0.05$ ; results not shown).

The second mediation analysis conducted using ordinary least squares path analysis showed that CT (total trauma score) had no effect on suicidal ideation. We found no evidence for a direct nor an indirect effect of CT (total trauma score) or any subtype of CT (secondary analysis, results not shown) on current suicidal ideation through their effect on attachment subscale (data not shown). The only exception was emotional abuse with evidence for a direct effect of emotional abuse on current suicidal ideation  $c' = 0.0273$ ,  $p < 0.01$ . But also, no evidence was found for a mediating effect on suicidal ideation through attachment (see Fig. 3).

#### 4. Discussion

##### 4.1. Main results

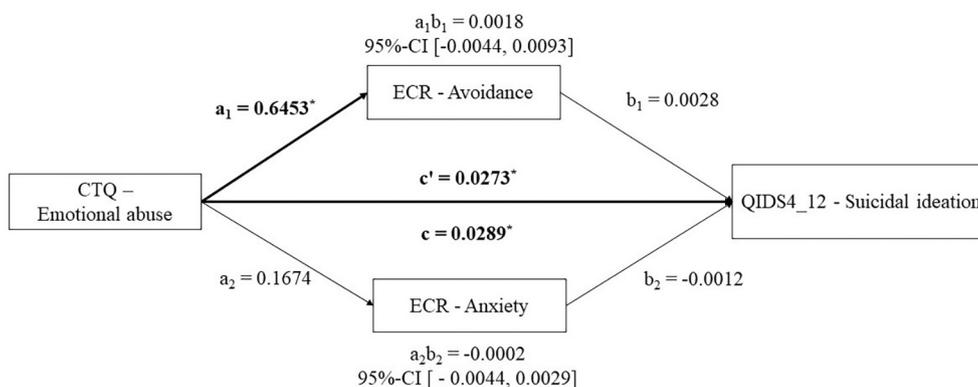
In the present study, we investigated the relationship between CT, attachment, and suicidal behavior in 96 patients diagnosed with mood disorder. The subtypes of CT (except sexual abuse) were highly inter-correlated, and medium correlated with avoidant attachment tendencies, depression scores and suicidal behavior. These results

confirmed our interest in the analysis for a mediated relationship.

In the first mediation analysis, we found that CT increased the probability that a patient belonged to the group of attempters through its effect on avoidant attachment. In the second mediation analysis, we found no effect of CT on suicidal ideation. Our secondary analysis of the subtypes (results not shown) revealed significant mediation effects of all CT subtypes except physical abuse on whether a patient belonged to the group of attempters through their effects on avoidant attachment, and a direct effect of emotional abuse on current suicidal ideation. That implies that patients who had endured more severe trauma (marked by higher frequency, higher total trauma score) and reported higher levels of avoidance in romantic relationships were more likely to have attempted suicide. The same relationship was found for all subtypes of trauma except for physical abuse. Instead, physical abuse directly increased the probability that a patient belonged to the attempter group. Our results replicate those of Stagaki et al. [44] and Touati et al. [45] but highlight for the first time the dominant mediating role of avoidant attachment on the effect of CT on suicide risk in adulthood.

##### 4.2. Neurodevelopmental profile behind suicide attempts

Thus, our results strengthen a neurodevelopmental trajectory of history of suicide attempts characterized by I) the experience of childhood trauma, and II) a high expression of avoidant relationship tendencies. According to attachment theory, avoidant attachment emerges from experience with non-responsive or neglectful caregivers [43]. Indeed, emotional neglect was the most prominent CT in our cohort and highly correlated with physical neglect, emotional and physical abuse, suggesting that those traumata often occur together. Attachment



**Fig. 3.** Mediation models on the effect of emotional abuse on suicidal ideation through its effect through two parallel mediators, avoidant and anxiety attachment). Effects were controlled for the severity of depression and the presence of a life-time suicide attempt, which were both included as covariates. Regression coefficients are unstandardized and labeled with significant levels \* $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . Additionally, significant paths are presented in bold. 95%-CI were considered to display significance when they did not contain 0. Path coefficients were calculated through three ordinary least square regressions. Emotional abuse was assessed by the CTQ, suicidal ideation by the 12th item of QIDS-SR 16, attachment by the ECR-R and depression by the HDRS-17 (covariate).

avoidance also differentiated suicide attempters from non-attempters. We therefore argue for a prominent role of avoidant attachment in the development of suicidal attempts in adulthood.

It can be assumed that avoidant attached persons have a profile of action strategies and thought patterns that are more likely to lead to action in the context of a suicide crisis [12] and lifetime vulnerability to attempt suicide: this assumption is supported by the observation that the deactivation strategies and interpersonal deficits that avoidant attached individuals display when dealing with social stress, correspond with well-studied predictors of suicidal behavior: namely mistrust of others [67], social withdrawal [68], low interpersonal skills and problem solving [69,70]. But broadly, individuals with an avoidant attachment style have internalized that their emotional needs will not be met in social relationships. Typically, those individuals feel uncomfortable with intimacy, interdependence, and self-disclosure [70,71] and are therefore in risk of leading rather superficial relationships [70]. They also present an alternated perception of social situations [72], in the sense that they tend to dismiss offers of social help as potentially harmful [73]. That might leave them with less reliable social connections when in need and feelings of being chronically alienated from others (“thwarted belongingness”) [74]. In the long-term, this alternated perception and poor social skills can lead to chronic social isolation that in turn is suggested to be linked to an increased long-term suicide risk [75]. In acute situations of intractable and overwhelming events, however alternate perception, isolation, and poor social skills may reinforce further social withdrawal through feelings of loneliness [76,77] and entrapment - the urgent feeling of needing to escape and the simultaneous perception that escape is impossible [78,79].

Additionally, the interpersonal theory of suicide (IPST [74]) states that CT leads to a fateful habituation to pain, and thus decreased fear of death [80]. Indeed, suicide attempters present a higher threshold to physical pain [81,82] and higher scores of dissociations [83] - a phenomenon that is typically reported by survivors of severe CT [84]. Neurodevelopmental changes due to childhood trauma and attachment insecurities are therefore likely to take place as circuitries that show divergent activity in correlation to infantile dissociation [84,85] are later also impacted in lowered pain sensitivity in suicide attempters [86,87]. In the context, of social withdrawal and alternated social perception oxytocin and the anti-reward system had been suggested as possible biomarkers [75]. Future studies should more deeply explore the role insecure attachment plays in this context. Finally, we can surmise that low fear of death and pain, in addition to high thwarted belongingness, an alternated perception of social help options and a lack of supportive environment, might lead especially insecure attached individuals to see death as the only escape and to attempt suicide.

#### 4.3. Difference between vulnerability to attempt suicide and current suicidal ideation

Our findings also extend on to the idea that a lifetime vulnerability to suicide attempts and current suicidal ideation are not necessarily subject to the same mechanisms [79,88]. The DSM-5 introduced Suicide Behavior Disorder [89]: A diagnosis that allows to understand suicide risk based on previous attempts independent from suicidal ideation. Our findings add to the idea of the DSM-5 diagnosis, as we suggest a neurodevelopmental profile that increases vulnerability to suicide attempts. Yet it takes more to predict a suicide crisis. A suicide crisis presumably derives from a complex emotional state [78,90] occurring less than then minutes before the attempt [91]. Suicidal ideations add to the crisis but are not sufficiently deterministic to proceed to action [92,93]. Instead, psychological pain is one of the drivers of suicide crises [79,93]. It arises from particularly strong emotionally hurtful experiences, such as emotional abuse [88]. Thus, the direct effect of emotional abuse on suicidal ideation found here is of interest.

#### 4.4. Practical implications

Our observation strengthens the assumption that therapeutic measures for early suicide prevention should address attachment insecurity. Insecure attachment places special demands on clinicians, since the interpersonal problems are also carried into the therapist-client alliance [94,95]. Therapeutic methods of the so-called third wave are specially designed to address these issues as they focus on the role of the therapists as a safe point of contact for the patient. Therapies like the Mindfulness-Based Cognitive Therapy (MBCT) [96], Schema Therapy [97], Cognitive Behavioral Analysis System of Psychotherapy (CBASP) [98]; Compassion Focused Therapy (CFT) [99] or Dialectical Behavioral Therapy [100] offer approaches such as limited self-disclosure and empathic boundary setting to address interpersonal problems at an early stage. Further, DBT, MBCT and CBASP provide approaches to deal with suicidal thoughts: While in MBCT suicide crises are conceptualized as downward spiral of negative thoughts that takes off as soon as sad feelings set in [101], DBT targets especially interpersonal problem solving in suicide prevention and CBASP addresses the perception of the patient as isolated in society. By applying technics as Disciplined Personal Involvement and Interpersonal Discrimination Exercise therapists schooled in CBASP can express authentic concern and are able to highlight differences between the therapist's response and the pejorative or neglectful responses of previous caregivers. This might be especially important in the context of avoidant attachment in order to reduce mistrust and encourage autonomous help seeking.

#### 4.5. Strengths & limitations

When interpreting the results of the mediation analyses, we must consider that our sample size was relatively small and presents a reduced probability of representing existing small to medium effects. The statistical effects that we found are therefore likely to exist in the population, but other effects may not have been detected. The small sample size also prevents the application of statistical approaches such as path models, or more detailed investigation of differences in trauma or attachment styles. Similarly, our results of the secondary analysis (mediation analysis of single CT subtypes) must be interpreted with caution, as we analyzed each CT subtype in a single model and did not correct for multiple testing. Our interest was to test exploratively whether certain effects might be present in the population of mood disorder patients. Our results should therefore not be interpreted as definite, but as likely existing. The here selected self-rating tools, CTQ and ECR-R, both demonstrate high psychometric properties. Since the CTQ measures the frequency of CT, it is particularly immune to memory effects, adding to the validity of the questionnaire. Nevertheless, future studies might want to integrate a more exhaustive assessment of suicidal behavior, attachment, and CT, e.g., the identity of the abuser (parent sibling, peer) or the developmental phase [102] in which the abuse happened. This could provide more insights into the developmental processes through which CT influences suicidal ideation and attempts in adulthood. It might further be indicated to elaborate intensity and intent of current suicidal ideation more exhaustively and to explore effects of CT and attachment in this context. Last, the data was collected in a cross-sectional design. All variables included in the mediation analysis were measured at the same time. However, the temporal sequential order of CT, attachment, suicidal behavior is theoretically justified. A prospective study design is nevertheless desirable. In general, it must be acknowledged that studying suicide risk always proves extremely difficult; suicide attempts are fortunately rare events and prospective studies with very long, preferably lifelong, follow-up periods are needed.

#### 5. Conclusion

This study suggests a neurodevelopmental profile of suicide attempts in mood disorder that is characterized by the presence of CT and

insecure attachment, especially avoidant attachment, driving the long-term (“chronic”) suicide risk. Mediating effects on suicide attempts were completely mediated through avoidant attachment, while only emotional abuse had a direct effect on suicidal ideation. Therapists should therefore screen for attachment, and establish a secure attachment through empathic personal involvement in the therapeutic relationship. Future research should also focus on a detailed assessment of attachment and suicidal behavior to further distinguish between effects of different developmental traumata, suicide attempts and suicidal ideation.

## Contribution

Funding acquisition: RB, WEH and PC, Data collection: RB, XZ, JLC, PC, EO, PP, WEH. Conceptualization: HI, RB, CD, Formal analysis: HI, JLC, RB and CD, Writing original draft: HI, Writing/ Reviews: all authors.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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