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ORIGINAL PAPER

Alexithymic Traits and Somatic Symptoms in Children and Adolescents: a Screening Approach to Explore the Mediation Role of Depression

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Abstract
The association among alexithymia, somatic symptoms and clinical correlates has been scantly investigated in children. The present study examined alexithymic features and somatic symptomatology in schoolchildren with high and low levels of depression, testing the role of depressive symptoms in mediating the associations between alexithymia and somatic symptoms. Seven-hundred schoolchildren were involved in this study and divided into two subgroups (8–10 years and 11–14 years) in order to test differences according to the age. Participants completed the Children's Somatization Inventory-24 for the assessment of somatic symptoms, the Alexithymia Questionnaire for Children to evaluate alexithymic features and the Children's Depression Inventory-2 to investigate depressive symptoms. Results showed that children with high levels of depression reported both higher alexithymia and somatic symptoms levels. Despite a direct effect of alexithymia on somatic symptoms, the mediation analyses also highlighted an indirect effect of alexythimia on somatic symptoms through depressive symptoms. Findings suggested that a depressive symptomatology may clarify why schoolchildren with high alexithymia scores tend to report higher levels of health problems. Results also support the possibility that depressive symptoms may contribute to the development of somatic symptomatology among schoolchildren in the presence of high levels of alexithymia.

Keywords Alexithymic traits · Somatic symptoms · Depression · Mediator · Schoolchildren

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Introduction

Alexithymia is defined as a difficulty in identifying and communicating one's emotions, as well as an externally-oriented cognitive style and constricted imaginative processes. A copious literature currently considers alexithymia a risk factor for both somatic and mental pathology, since difficulty in relating to oneself is thought to have different outcomes depending on interactions with other factors [1, 2]. From a theoretical point of view, Taylor and Bagby [2], define alexithymia as a trait deficit in the capacity to process or regulate emotions using cognitive strategies. This deficit predisposes a person to develop a host of disorders related to poor affect regulation, including mood disorders.

However, most of these studies have been carried out among adults, whereas it is important to gain more knowledge about how these patterns develop during childhood and adolescence. Several studies have demonstrated in general population samples of children and adolescents, a relationship between alexithymia and somatic complaints [3–6], and between alexithymia and internalizing/externalizing symptoms [6–9]. Furthermore, in clinical samples, high levels of alexithymia have been found in children and adolescents with several psychopathological disorders (e.g., eating disorders: [10]; chronic fatigue syndrome [11]; attention deficit and hyperactivity disorder [12]; and autistic spectrum disorders [13] and different somatic disorders (e.g., hematic disorders [14]; headache [15]; cancer [16].

While in adults there is evidence supporting the strong association between alexithymia, somatic symptoms and clinical correlates such as anxiety and depression [17], little has been done to better understand the nature of these relationships in children and adolescents. In general, there is still debate regarding whether alexithymia and depression are independent or overlapping constructs, and whether depression mediates the relationship between alexithymia and somatization. Regarding the first question, some studies support the opinion that alexithymia and depression are distinct constructs, and that alexithymia predisposes individuals to a negative emotional valence [18–20], while other studies have highlighted how alexithymia and depression overlap or co-exist [21–24].

Similarly, the role of depression in mediating the relation between alexithymia and somatization still remains controversial. In adult samples, while Bailey and Henry [25] showed that the relationship between specific facets of alexithymia and somatization were perfectly mediated by negative affectivity, other evidence suggested that depression did not fully account for this relationship [17]. Further, Lundh and Simonsson-Sarnecki [26] reported that there is no strong evidence supporting the association between alexithymia and somatic complaints once emotional distress is controlled for. With regard to a few studies utilizing samples of children, Rieffe and colleagues [20] suggested that the connection between alexithymia and health problems may be related to the degree of negative emotions experienced. Moreover, Rieffe et al. [6] found that mood states mediated the relationship between alexithymia and internalizing symptoms, but also that alexithymia contributed to internalizing symptoms above the effects of mood, suggesting an independent relationship between alexithymia and somatization. Finally, Allen et al. [27] indicated that depression partially mediated the relationship between alexithymia and somatization, at least for two facets of alexithymia (difficulty in identifying and in describing feelings).

In light of the above research, the present study aimed to analyse the link between alexithymia, depression and somatic symptoms in a general population of children from 8 to 14 years of age. Specifically, within a developmental framework, we first tested differences on alexithymia, depression and somatization levels between age subgroups (8–10 years old; 11–

14 years old) and gender, and then we explored the relationship among these three constructs. Moreover, differences in youth with high and low depression symptoms (with respect to the cut-off score of the questionnaire administered) on alexithymia and somatic symptoms were investigated. The role of depressive symptoms in mediating the associations between alexithymia and somatic symptoms was also tested.

Methods

Participants

Seven hundred Italian schoolchildren were recruited from four public middle schools in Italy and participated in the present study. Of these, six hundred and forty-nine completed all questionnaires (8% missing data). The total final sample ($N = 649$) comprised 52% of girls ($N = 341$) and 48% of boys ($N = 308$) aged 8 to 14 years (mean age = 10.8; SD = 1.635). All participants were Caucasian.

Exclusion criteria for participating in the study were: the presence of a diagnosed psychiatric illness, a history of significant neurological illness or brain injury and the use of medications that could affect the study outcomes.

Procedure

A written informed consent was obtained from all schoolchildren and their parents prior to their enrolment in the study. All participants included in the final sample completed the entire questionnaire battery in a designated classroom and a research assistant was available during data collection to provide assistance if necessary. The questionnaires were administrated in written form, during school hours. The collective administration took approximately 30–45 min. Anonymity of participants was ensured.

Measures

Alexithymia Features

The Italian version of the Alexithymia Questionnaire for Children (AQC [5, 28]) was used to assess alexithymic features. The AQC is a simplified version of the original questionnaire for alexithymia for adults, the 20-item Toronto Alexithymia Scale (TAS-20), developed by Bagby, Taylor and Parker [29]; it consisted of 20 items rated on a 3-point Likert scale (0 = not true; 1 = a bit true; 2 = true). Similar to the TAS–20, the AQC measures the following factors: Difficulty Identifying Feelings (DIF); Difficulty Describing Feelings (DDF) and Externally-Oriented Thinking (EOT). The AQC Italian version demonstrated good internal consistency for the Total score and the DIF factors (Cronbach's alpha of .66 for the Total score and of .70 for DIF factor), while the DDF and the EOT scales did not meet the criteria for internal consistency (Cronbach's alpha approximately .45). These data of the Italian version resulted consistent with those of the original version (EOT did not meet the criteria for internal consistency nor item homogeneity in the version by Rieffe and colleagues [5]). Despite these limits, and a general criticity related to the use of a self-report measure for the assessment of alexithymia in youth and adults, the AQC seemed to be

a valid instrument for the evaluation of the relationship between alexithymia and disease in childhood from 8 to 14 years old [5, 28].

Somatic Symptoms

The Children's Somatization Inventory (CSI-24) [30–32] was used to explore children's perception of somatic symptoms or complaints. It comprised 24 items rated on a 5-point Likert scale (0 = not at all, 1 = a little; 2 = somewhat; 3 = a lot and 4 = a whole lot), reflecting the extent to which symptoms were experienced in the past 2 weeks. Higher scores indicate higher levels of somatic symptoms. The CSI-24 was translated into Italian using the translation–back-translation method, with the approval of the Author. This self-report measure showed adequate reliability and validity. Specifically, in healthy paediatric samples, Walker and colleagues [32] reported an internal consistency (i.e., Cronbach's alpha) of.87. Similarly, in the Italian context, a Cronbach's coefficient of .84 has been reported among clinical paediatric samples [33].

Depressive Symptoms

The Children's Depression Inventory-2 (CDI-2) developed by Kovacs [34] is a self-rated scale questionnaire that typically quantifies a depressive syndrome and provides an index of the current range of symptoms and their severity. In this study, the Italian version of the CDI-2 was used [35] in order to rate the presence of depressive symptomatology. The CDI-2 derived from the original CDI [36] which represents the most widely used measure of children's depressive symptoms. It consisted of 28 items based on a 3-point response scale, from 0 (absence of symptoms) to 3 (severe symptoms). The scale ranged from 0 to 56. High scores may indicated the child had a sufficiently large number of symptoms of moderate or greater severity to be of clinical concern. A cut-off score of 14 discriminated the risk of a severe depressive symptomatology.

The questionnaire demonstrated high internal consistency, with a Cronbach's coefficient alpha ranging from .85 to .87 in Italian non-clinical samples [35] and .89 in Italian clinical samples [35].

Data Analytic Plan

The Statistical Package for Social Sciences (SPSS) version 22.0 for Windows was employed for analysing data. Descriptive statistical analysis (frequencies, percentages, means and standard deviations) were used to describe socio-demographic features as well as the alexithymic levels and somatic and depressive symptoms of participants. Descriptive statistics based on the CDI-2 cut-off score were also computed.

In order to better explore the link between alexithymia, depressive and somatic symptoms in children and adolescents, participants were divided into two age subgroups (8–10 years and 11–14 years), and a series of 2 sex (M versus F) × 2 age subgroups between subjects ANOVAs were performed on the total scores of all administered measures (AQC, CSI-24, CDI-2).

Pearson's correlation tests were also computed to calculate the linear relationships between the variables included in the study, and One-way ANOVAs were performed to test differences on both total and scales scores of the CSI-24 and the AQC of the whole sample in relation to the CDI-2 cut-off score.

Mediation analyses were conducted to examine the direct effect of alexithymia on somatic symptoms, and its indirect effect through depressive symptoms as measured by the CDI-2 on somatic symptoms. Mediation was tested using the SPSS macro, PROCESS. In particular, a series of linear regression models were fitted, and the size and significance of the indirect effects were estimated by a bootstrap procedure. A *p value* < .05 was considered significant.

Results

The total sample was divided into two age subgroups. The first group comprised 451 children aged 8 to 10 years while the second age group consisted of 198 adolescents ranging from 11 to 14 years old. Descriptive statistics (see Table 1) were computed on the overall sample as well as on the two chronological age groups as a function of sex.

We performed a 2 sex (M versus F) × 2 age groups (8–10 years. vs 11–14 years) between subjects ANOVA on the total scores of all of the administered measures (AQC, CSI-24, CDI-2).

With respect to the AQC scores, we found no significant effects for sex [$F(1, 636) = 0.10$, $p = .747$, $\eta^2_p = 0.000$] and age [$F(1, 636) = 0.15$, $p = .694$, $\eta^2_p = 0.000$]. As well, the interaction term [$F(1, 636) = 0.14$, $p = .704$, $\eta^2_p = 0.000$] was not significant.

Regarding the CSI-24 results, we observed no significant effect of sex [$F(1, 636) = 1.98$, $p = .160$, $\eta^2_p = 0.003$] or age[$F(1, 636) = 2.50$, $p = .114$, $\eta^2_p = 0.004$] but a significant interaction effect emerged [$F(1, 636) = 8.80$, $p = .003$, $\eta^2_p = 0.014$]. Post-hoc analysis of the interaction effect showed that no significant differences [$F(1, 636) = 1.04$, $p = .308$, $\eta^2_p = 0.002$] emerged between younger (M = 15.4, SD = 12.1) and older females (M = 16.9, SD = 12.4), while younger males scored significantly higher (M = 17.1, SD = 13.4) than older males (M = 12.2, SD = 10.3) [$F(1, 636) = 9.59$, $p = .002$, $\eta^2_p = 0.015$].

Finally, findings on the CDI-2 showed no significant effects of sex [$F(1, 636) = 2.47$, $p = .117$, $\eta^2_p = 0.002$] and age [$F(1, 636) = 1.24$, $p = .265$, $\eta^2_p = 0.002$]. However, the interaction effect resulted significant [$F(1, 636) = 23.44$, $p < .001$, $\eta^2_p = 0.036$], with older females scored significantly higher (M = 13.6, SD = 9.4) than younger females (M = 9.5, SD = 6.2) [$F(1, 636) = 22.30$, $p < .001$, $\eta^2_p = 0.034$], and younger males scored higher (M = 11.9, SD = 7.5) than older males (M = 9.8, SD = 8.2) [$F(1, 636) = 4.96$, $p = 0.026$, $\eta^2_p = 0.008$].

As expected, significant associations among study variables were found. Specifically, a positive significant correlation emerged between the AQC and the CDI-2 total scores (r = .320,

Table 1 Descriptive statistics of the sample

	8–10 years of age						11–14 years of age					
	Females		Males		Tot		Females		Males		Tot	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
CDI-2 [a]	9,48	6,18	11,89	7,49	10,64	6,94	13,63	9,36	9,77	8,17	11,89	9,03
CSI-24 [b]	15,39	12,08	17,06	13,44	16,19	12,77	16,87	12,36	12,20	10,26	14,76	11,67
AQC [c]	36,98	7,96	37,02	7,54	37,00	7,75	37,59	5,99	37,03	16,22	37,34	11,73

[a] Children's Depression Inventory-2

[b] Children's Somatization Inventory-24

[c] Alexithymia Questionnaire for Children

$p < .01$), as well as between the CDI-2 and the CSI-24 total scores ($r = .490$, $p < .01$). Additionally, data demonstrated a significant relationship between the AQC and the CSI-24 total score ($r = .392$, $p < .01$), confirming our hypothesis regarding a link between somatic symptoms and alexithymia facets in children and adolescents. Further results indicated significant associations between the three factors of the AQC, the CSI-24 and the CDI-2 total scores (see Table 2).

Total and factor scores of both the AQC and the CSI-24 of the whole sample were also analyzed as a function of the CDI-2 cut-off score. Children and adolescents scoring over the CDI-2 cut-off ($n = 172$) reported a higher score on both the CSI-24 and the AQC, than children and adolescents scoring below the CDI-2 cut-off score ($n = 477$). These differences were statistically significant [$F(1) = 128.01$, $p < .01$ for the CSI-24 scores and $F(1) = 41.13$ $p < .01$ for the AQC scores]. Significant differences between children and adolescents above and below the CDI-2 cut-off score also emerged for the DIF and DDF factor scores of the alexithymia questionnaire. Descriptive statistics and ANOVA results for participants above and below the CDI-2 cut-off score are presented in detail in Table 3.

Model 4 of the PROCESS macro [37] was used to investigate whether the indirect effect of depression on the link between alexithymia and somatic symptoms was significant. Age was considered a covariate for the prediction of both the CSI-24 and the CDI-2 total scores. Results showed a direct effect of the AQC total score on the CDI-2 total score ($b = .267$, $se = 0.031$, $p < .001$) while age was not significant ($b = .282$, $se = .175$, $p = .107$). The direct effect of the CDI-2 on the CSI-24 was also significant ($b = .676$, $se = 0.056$, $p < .001$) as well as the direct effect of the AQC total score on the CSI-24 ($b = .350$, $se = 0.047$, $p < .001$), with a significant value emerging for age ($b = -.853$, $se = .250$, $p < .001$). Finally, the indirect effect was significant ($b = .180$, bootstrap s.e. $= 0.045$, bootstrap 95% C.I.: .1189–.2868). Therefore, alexythimia demonstrated an indirect effect on somatic symptoms through depressive symptoms.

Discussion

The primary aim of the present study was to investigate the link between alexithymia, depression and somatic symptoms in a sample of schoolchildren aged 8 to 14 years old.

Table 2 Correlations among alexithymia factors, somatic and depressive symptoms

	1.	2.	3.	4.	5.
1. DIF [a]	1.00				
2. DDF [b]	.638**	1.00			
3. EOT [c]	.465**	.499**	1.00		
4. CSI-24 [d]	.446**	.330**	.184**	1.00	
5. CDI-2 [e]	.401**	.332**	.078*	.490**	1.00

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

[a] Difficulty Identifying Feelings scale of Alexithymia Questionnaire for Children

[b] Difficulty Describing Feelings scale of Alexithymia Questionnaire for Children

[c] Externally-Oriented Thinking scale of Alexithymia Questionnaire for Children

[d] Children's Somatization Inventory-24

[e] Children's Depression Inventory-2

Table 3 Means, standard deviations and ANOVAs as a function of the CDI-2 cut-off score

	CDI-2 (≥ 14) n= 172		CDI-2 (<14) n= 477			
	M	SD	M	SD	F(1, 648)	P
1. CSI-24[a]	24.22	14.8	12.71	9.8	128.01	0.000
2. AQC[b]	40.76	12.8	35.72	6.8	41.13	0.000
3. DIF[c]	12.41	4.5	9.92	2.8	69.33	0.000
4. DDF[d]	10.32	3.9	8.79	2.1	39.17	0.000
5. EOT[e]	16.60	5.2	16.10	3.3	1.98	0.159

Note. [a] Children Somatization Inventory-24; [b] Alexithymia Questionnaire for Children; [c] Difficulty Identifying Feelings scale of Alexithymia Questionnaire for Children; [d] Difficulty Describing Feelings scale of Alexithymia Questionnaire for Children; [e] Externally-Oriented Thinking scale of Alexithymia Questionnaire for Children·

Several studies have indicated that recurrent somatic symptomatology in childhood and adolescence represents a risk factor for the onset of psychopathological disorders (e.g, somatization, anxious and depressive symptoms) with repercussions on social and scholastic functioning [38–40].

With regard to the age and gender differences of alexithymia and its relationship to somatic and depressive symptoms, there are few studies on children and adolescents in comparison to the large number of studies on specific age and gender patterns in adult populations [41, 42]. In the current study we analysed the data by splitting the sample into younger (aged 8–10; n = 451) and older (aged 11–14; n = 198) youth and results showed no significant difference in the mean AQC score and in its subscales. Additionally, neither gender nor the interaction effect of age and gender were found. A significant difference between younger and older males on the CSI-24 scores was demonstrated, differently from results concerning females scores. This finding is not in line with previous studies in which no specific differences in the prevalence of somatic symptoms in childhood have emerged, while during adolescence, girls are more likely to report more somatic symptoms than boys [43–45]. Nevertheless, in other studies, no significant gender differences in the prevalence of somatic symptoms between girls and boys was found [46]. Conversely, some recent studies highlight a different gender pattern regarding the prevalence of specific somatic symptoms (e.g. muscle pain) in which younger males (8–10 years old) showed higher levels of physical symptomatology than did females [47].

Our findings on depressive symptoms suggested a significant gender difference among the two different age groups. Previous research has observed that depressive symptoms are more frequently reported by adolescent girls compared to boys, while no gender differences were found in children [48]. In Kovacs [36], both younger and older males reported higher scores than females, without any increase in mean symptom scores with age, nor a significant interaction between age and gender. Additionally, adolescent girls showed both a higher level of symptoms and a different developmental course of depressive symptomatology [49, 50]. In our study, we were interested to explore depressive symptoms in males and females across two different age groups (8–10 years vs. 11–14 years) in order to better understand if depressive symptomatology is significantly associated with increasing age when examining gender differences. The findings of this study are consistent with previous research [51, 52] and highlight that both male and female adolescents experience problems related to emotional distress (e.g., somatic and depressive symptomatology) with gender differences in emotional disorders during the adolescent transition. Specifically, females adolescents are particularly at risk of being depressed and of experiencing an increase in the development of depressive

symptoms throughout the two different age groups (8–10 years and 11–14 years). Interestingly, the present study provides evidence regarding a different prevalence pattern for males, showing that depressive symptoms decreased with advancing age. This finding differs from most of the literature showing that depressive symptomatology increases with age [53]. In our sample, we can hypothesize that the greater behavioural and social dysfunctional responses given by younger males (8–10 years) to the CDI-2, in addition to their health perceptions (somatic symptoms), represent a different pattern for expressing their psychological distress in comparison to older males (11–14 years).

Moreover, as predicted by our hypothesis, the total AQC score was related to psychological distress, demonstrating that higher levels of alexithymia were associated with greater somatic and depressive symptomatology. This is in line with the results of previous research on healthy children (i.e., Allen et al. [27]) that used the same measures of depression and somatization employed in the present study, confirming that children and adolescents with alexithymic traits are more likely to experience health problems. However, it is important to note that in Allen's [27] study, the full-length of the CSI (35 items) and the CDI original version were used. We think that a strength of this study consists in the use of a measure to assess alexythimia in children, such as the AQC, differently from those studies in which an instrument (TAS-20) developed for adolescents and adults, was employed with children [27].

With respect to the correlational analyses, we also observed significant associations between the three factors of alexythimia and the total scores of the CSI-24 and the CDI-2, respectively. In contrast with research that has shown significant associations between psychological distress and only two predominant factors of the AQC (i.e. difficulty in identifying and describing feelings) [27, 54–56], the results of this study highlight a link with the third factor of the AQC, externally-oriented thinking, that explores the tendency of individuals to focus their attention externally. This factor seems to characterize children and adolescents with somatic symptoms, supporting the role of specific psychological and behavioral characteristics (e.g. competition, perfectionism, ambition, rigidity and tendency to suppress emotions).

The present study was also designed to explore levels of alexithymia and somatic symptoms on the basis of clinically significant levels of depressive symptomatology. Specifically, using the cut-off value of the CDI-2 (CDI-2 $\geq$ 14; [34]) children and adolescents at risk for depression showed higher somatic symptoms as well as greater difficulty in identifying and describing feelings. This result confirms our hypothesis about the impact of depressive symptoms on psychosocial well-being.

Additionally, in order to further verify our hypothesis a mediational analysis, which allows greater exploration and understanding of the relationship between study variables, was carried out to examine the direct effect of alexithymia on somatic symptoms and its indirect effect through depressive symptoms. In line with previous studies [27, 57] our findings showed that depression, as measured by the CDI-2, mediated the relationship of alexithymia and somatic symptoms, suggesting that a depressive symptomatology may explain why individuals with reduced capacity to identify and describe feelings as well as externally-oriented thinking are more likely to report higher levels of health problems. Lumley's [18] findings support the notion that alexithymia predisposes individuals to a negative emotional valence. Whereas non-alexithymic people can regulate negative emotions stemming from stressful events, alexithymic people fail in doing so, and the negative affect remains unmodulated, yielding a chronic, undifferentiated dysphoria. Alexithymia is, therefore, hypothesized to interfere with

adaptive emotion regulation, resulting in negative affect such as depression [19]. Moreover, Rieffe and colleagues [20] reported that individuals with high levels of alexithymia fail to respond adaptively to emotional situations, thereby leading to chronic levels of negative emotions. Without emotion identification and subsequent appropriate action, individuals become stuck in a pattern of negative emotions and maladaptive responses to both external and internal stimuli, that have potentially long-term consequences on physical and mental health. The results of the present study support our hypothesis and raise the possibility that depressive symptoms in schoolchildren may contribute to developing somatic symptomatology in the presence of high levels of alexithymia.

However, there are several limitations that should be considered when interpreting these results. First, our sample comprised healthy children which may limit the generalizability of these findings to other populations. In particular, regarding alexithymia, some researchers question whether self-report measures of alexithymia provide a valid assessment of the construct, both in adults and in children [28, 58]. It is thought that some respondents may be unaware of their difficulties in identifying and describing their feelings, thereby limiting their capacity to report reliably and accurately such deficits on objective, self-report measures [26, 59]. Moreover, children could have difficulties in reading and understanding the items of the questionnaire, as well as a reduced ability in reflecting on themselves. In future, the use of multiple methods could eliminate the potential influence of measurement method-based response biases associated with monomethod assessment of alexithymia. Second, data were based on self-report measures that may have affected the results owing to the social desirability response bias. Third, this is a cross-sectional study and, consequently, the conclusions should be interpreted with caution. Further, although mediational analyses offer greater exploration of the associations between the variables investigated, they do not establish a direction of causality. Future longitudinal studies exploring the different effects of the potential mediators of associations need to be conducted.

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Compliance with Ethical Standards

Conflict of Interests The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval This study was approved by the Ethics Committee of the Department of Dynamic and Clinical Psychology, Sapienza University of Rome.

Informed Consent A written informed consent was obtained from all schoolchildren and their parents prior to their enrolment in the study.

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