

Received Date : 28-Sep-2016
Revised Date : 21-Nov-2016
Accepted Date : 21-Nov-2016
Article type : Original Article: Experimental Allergy and Immunology

Coping strategies, alexithymia and anxiety in young patients with food allergy.

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This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/all.13097

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ABSTRACT

Background Food allergy is major public health concern affecting nearly 15 million Americans and 80 million Europeans. Risk of anaphylaxis and implications for social activities affect patients' quality of life and psychological wellbeing. We previously found that young patients reported higher levels of alexithymia (difficulty in recognizing and expressing emotions) compared to healthy peers, and may influence affect, management style and clinical outcomes. This study aimed to explore links between coping strategies, alexithymia and anxiety among food-allergic adolescents and young adults.

Methods 92 patients with IgE-mediated food allergy (Mean age 18.6 years) completed Coping Orientation to Problems Experienced Inventory, Toronto Alexithymia Scale and Trait Anxiety subscale of State-Trait Anxiety Inventory. Multivariate Analyses of Variance assessed differences and associations between subgroups on the scales.

Results Significant differences found between alexithymia levels in coping style were explained by Avoidance strategies. "Avoidance" had the highest contribution in explaining alexithymia, followed by trait-anxiety, age, anaphylaxis, and social support. Respondents with higher alexithymia use avoidance as coping strategy over and above other coping strategies such as problem solving and positive thinking, are younger, will have experienced anaphylaxis, and will have lower social support.

Conclusions Recognizing the specific role of affect regulation in health behaviours may constitute an important step in supporting patients to explore more adaptive strategies.

Key Words

alexithymia; anaphylaxis; anxiety; avoidance; coping; emotions, food allergy.

Author Contributions

All the mentioned authors read and approved the manuscript and agree to the submission of the manuscript to the Journal.

Laura Polloni contributed to the conception and design of the study, acquisition and interpretation of the data and preparation and critical revision of the manuscript. She approved the final version of the manuscript.

Audrey DunnGalvin contributed to the analysis and interpretation of the data, preparation and critical revision of the manuscript. She approved the final version of the manuscript.

Emilia Ferruzza contributed to the conception of the study, interpretation of the data and critical revision of the manuscript. She approved the final version of the manuscript.

Roberta Bonaguro contributed to the design of the study, acquisition and interpretation of the data and revision of the manuscript. She approved the final version of the manuscript.

Francesca Lazzarotto contributed to the design of the study, acquisition and interpretation of the data and revision of the manuscript. She approved the final version of the manuscript.

Alice Toniolo contributed to the design of the study, acquisition and interpretation of the data and revision of the manuscript. She approved the final version of the manuscript.

Nicolò Celegato contributed to the design of the study, acquisition and interpretation of the data and revision of the manuscript. He approved the final version of the manuscript.

Antonella Muraro contributed to the conception of the study, interpretation of the data and critical revision of the manuscript. She approved the final version of the manuscript.

Introduction

Food allergy is major public health concern affecting nearly 15 million Americans and 80 million Europeans, including 8% of children, with high costs to public health services (1–4). Reactions can occur on initial exposure, from minimal quantities, and range from mild to life-threatening. Avoidance of the trigger food(s) is central to management but accidental ingestion is common. The likelihood of a fatal reaction is low with an annual incidence of 1.8 in adults and 3.25 in food-allergic children and adolescents per million person-years (3). Therefore, although preventing fatalities should always be a central concern, health-related quality of life (HRQL) and other patient related measures may be more meaningful measures of outcome in food

allergy research and practice. The real fear factor of life-threatening reactions, together with the need for constant vigilance and the implications for daily routines and social activities, affect patients' quality of life and psychological wellbeing. In recent years, an increasing number of HRQL studies provide insight into the everyday food allergy experience and which issues need to be addressed during consultations (5–14). However, little is known about psychological characteristics and how they might impact outcomes among these patients. This is an important area of study since research has shown that food-allergic adolescents have significantly higher internalizing problems such as anxiety, depression, relational difficulties, and higher impact of psychological problems on everyday life, than healthy peers (14,15). With regard to personality characteristics, we previously found that young people with food allergy reported higher levels of alexithymia compared to a matched healthy sample. Alexithymia was found to be associated to previous anaphylaxis among patients (13).

Alexithymia is a multifaceted personality construct described as “a lack of words to express emotions” (16). Alexithymia is described on a continuum and normally distributed in the general population, where prevalence is 10-13% (17–19). Interest in alexithymia has increased considerably particularly within interdisciplinary research with numerous investigations in clinical research, cognitive psychology, neurobiology, and psycho-neuro-endocrinology (17). From the first introduction of the term, the construct of alexithymia has been evaluated, criticized and subsequently modified. The construct describes a difficulty in identifying feelings and distinguishing between feelings and the bodily sensations of emotional arousal; constricted imagination, difficulty describing feelings to other people; and a stimulus-bound, externally oriented cognitive style (20). In effect, an individual will misread the physical expression of emotion as a physical expression of disease and vice-versa, e.g. by interpreting an anxious tightening in the stomach as food poisoning. ‘Constricted imagination’ gives rise to difficulties in regulating type and intensity of emotional expression, while an ‘external oriented cognitive style’ describes a propensity to be guided by strict rules, regulations, and social conformity, which provide a sense of comfort and security, rather than by emotions, which give rise to uncertainty and distress.

The validity of the alexithymia construct and its association with several common psychiatric and medical illnesses are well documented (21–23). Alexithymia plays a role in influencing clinical outcomes (17,18) and is associated with a lack of constructive coping strategies such as the ability to modulate emotional arousal, to properly express or suppress emotions, to gain and use social support, or to cope with painful emotions (21,23), resulting in avoidant coping and negative affect. Avoidant coping strategies are associated with psychological distress in food allergy and can mediate the link between illness perceptions and outcome. Focusing on and

venting of emotions significantly predicted greater stress, somatic symptoms, anxiety and insomnia and severe depression (24).

The present study aimed to explore links between coping strategies, alexithymia and anxiety among food-allergic adolescents and young adults, using validated and widely used instruments. Additionally, the influence of food allergy-related variables such as previous anaphylaxis and adrenaline prescription was investigated. An increased understanding of the interplay between the role of alexithymia in influencing clinical outcomes through a relationship with coping style and negative affect can help to provide practical suggestions for prevention and intervention in food allergy in research and in practice.

Methods

Procedure

The sample of food allergic patients was recruited sequentially during clinical visits at the Food Allergy Centre of Veneto Region, in Padua, considering the inclusion and exclusion criteria. Inclusion criteria consisted of being confirmed suffering from IgE-mediated food allergy by an allergist on the basis of a clinical history with positive skin prick test, in vitro specific IgE and a positive food challenge. Patients were excluded when they suffered from serious concomitant non-allergic disease, included psychological disorders (e.g. in our sample no participant showed symptoms of Autism Spectrum Disorder). Clinical information were collected through a cross check between parents/patients' report and hospital records.

Two patients refused to take part in the study. Individuals who agreed to complete the questionnaires, gave their oral consent or signed directly if 18 years old or older. Parents signed informed consent for the younger participants.

The study was approved by the Ethic Committee of Psychological Research of Padua University.

Instruments

COPE-NIV

The Coping Orientation to Problems Experienced-New Italian Version (COPE-NIV) Inventory was used to assess a broad range of coping responses. It consists of 60 items reflecting different adaptive and maladaptive coping strategies. We used the “dispositional” or trait-like version in which respondents’ report the extent to which they usually do the things listed, when they are stressed. The COPE-NIV is a valid tool for measuring coping styles in the Italian context. Factor Analysis showed five large essentially independent dimensions: *Social support* (SS), *Avoidance strategies* (AS), *Positive attitude* (PA), *Problem solving* (PS) and *Turning to religion* (TR). These five dimensions are substantially independent of each other, reliable and fairly stable in time; no essential difference was identified in relation to the level of education, gender and age. *Avoidance strategies* were found to be the conditions largely associated with emotional distress, whereas *Positive attitude* and *Problem solving* were related to less distress and greater psychological wellbeing.

TAS-20

The Toronto Alexithymia Scale, TAS-20 (25), Italian version (26), was used to assess alexithymia in participants. This validated and widely used self-rating questionnaire measures three different core factors in alexithymia: F1, *Difficulty in Identifying Feelings* (DIF); F2, *Difficulty in Describing Feelings* (DDF); and F3, *Externally Oriented Thinking* (EOT); it also for categorization of respondents into three groups: non-alexithymic (score <51); borderline (score between 51 and 60); and alexithymic (score = >61).

The original English Scale, as well as its Italian version, showed adequate validity and reliability among adults and teenagers (25,27,28).

STAI

We used the Trait Anxiety subscale of the State-Trait Anxiety Inventory (STAI) Y form - Italian version (29,30) to assess trait anxiety as a disposition, indicating anxiety proneness. Trait anxiety items include: “I worry too much over something that really doesn’t matter”. The subscale comprises 20 items rated on a 4-point scale. Higher scores indicate greater anxiety.

Statistical analysis

Preliminary checks were carried out to ensure data met the requirements for the statistical tests selected in terms of linearity and normality (31,32). Following a descriptive profile, a series of Multivariate Analyses of Variance were conducted to assess for differences and associations between subgroups (level of alexithymia, type of coping strategy, trait anxiety, anaphylaxis, age group, gender) and to control for the effects of all independent variables on dependent variables simultaneously. Dependent variables included COPE subscales and STAI total score (Trait). Independent categorical variables included age and gender, alexithymia categories and subscales, adrenaline prescription, and previous anaphylaxis experience.

An effect size index in ANOVA is denoted by eta squared (η^2). Effect size is a simple way of quantifying the difference between sub-groups that provides an advantage over the use of tests of statistical significance alone (31,32). Effect sizes for η^2 are: 0.01 (a small effect); 0.06 (a moderate effect); 0.14+ (a large effect).

Results

Participants

A total of 92 participants aged 14-32 (Mean age=18.6, SD=5.2; 50% female) were involved. Main characteristics of the sample are shown in Table 1. Half of participants reported experiencing anaphylaxis and the majority (N=82) had been prescribed self-injectable adrenaline on the basis of current guidelines (4). Patients came from Veneto Region (North-eastern Italy) and developed food allergy in early childhood. Forty-nine were below the cut-off point on the summative scale for alexithymia (<51.0); twenty-nine individuals were borderline (51.0-60.0), with the remainder (N=14) above the cut off for alexithymia (>61.0). Mean scores for each scale (response range 1-5) were Mean=2.5, SD=0.9 for DDF; Mean=2.3, SD=0.8 for DIF; Mean=2.6, SD=0.5 for EOT (Table 2). Post-hoc power analysis revealed a power of 0.9 to detect differences at a 95% confidence interval for a multivariate analysis of the relationship between all dependent and independent variables.

Table 2 shows alexithymia total score and subscales scores according to participant category. The total score increases from 41.0 for those below the borderline to 67.4 for those above. The highest mean scores were reported for DIF subscale (Mean=25.0, SD=4.8), followed by EOT (Mean=23.3, SD=4.0), and DDF (M=19.2, SD=3.0). Table 2 also shows the Mean score for Trait

anxiety (Mean=49.1, SD=10.6) for those above the borderline, compared to Mean=38.0, SD=9.5, for those below the borderline. There is a decrease in the mean score in Social Support, Positive Attitude and Problem Solving and an increase in scores for Avoidance Strategies and Turning to Religion for those below versus those above the borderline for alexithymia trait.

To investigate the relationship between alexithymia categories, Trait Anxiety and coping strategies, we carried out a Multivariate Analyses of Variance (Table 2). Significant differences were found for COPE and for Trait Anxiety [$F=3.95$, $p=0.0001$, $\eta^2=0.25$]. Post hoc analysis showed that the significant differences found between alexithymia levels 1 & 2 and 1& 3 for COPE lay in the use of 'Avoidance strategies' vs. Positive attitude, Social support, Religiosity, and Problem solving.

Post-hoc power analysis revealed a power of 0.9 to detect differences at a 95% confidence interval.

We next turned to analysis of the independent variables to investigate the effects of adrenaline prescription, anaphylaxis, age and gender on COPE, Trait anxiety, and Total score for alexithymia (Table 3).

There were significant effects for age group ($F=2.2$, $p=0.04$, $\eta^2=0.17$), for gender ($F=2.8$, $p=0.01$, $\eta^2=0.21$) and adrenaline prescription ($F=2.2$, $p=0.04$, $\eta^2=0.18$). Although we found no main effects for anaphylaxis, we did find a significant interaction between anaphylaxis and alexithymia [$F=6.000$, $p=0.048$, $\eta^2=0.07$]. This finding shows a relationship between reporting anaphylaxis and higher scores on alexithymia.

Post-hoc analysis showed that participants aged 19 years and younger had higher total scores on alexithymia (Mean=51.0, SD=1.7 vs. 47.0, SD=2.6). Trait anxiety was lower in the younger group (Mean=40.0, SD=1.5 vs. Mean= 44.0, SD=2.2). There were no significant differences in alexithymia scores between males and females (Mean =49.00, SD=2.3 vs. Mean=48.5, SD=2.3) but significant differences were found in trait anxiety with females obtaining higher scores (Mean=45.0, SD=1.8 vs. Mean 40.0, SD=2.0). Furthermore, females were more likely to report higher scores on social support (Mean=33.0, SD=1.3 vs. Mean=26.0, SD=1.2). There was a significant difference in social support and avoidance strategies between those who were prescribed adrenaline, and those without (Mean =34.0, SD=2.2 vs. Mean=27.5, SD=0.7). With regard to avoidance strategies, those who did not have adrenaline prescription had higher mean scores (Mean=27.0, SD=1.5 vs. Mean=22.5, SD=1.5).

We investigated differences according to alexithymia subscales and anaphylaxis, adrenaline prescription, age group, and gender. Multivariate analysis showed significant differences ($F=31.02$, $p<0.0001$, partial eta squared=0.5) for alexithymia levels for each alexithymia subscale. We found two significant differences on independent variables; those 19 years and under has significantly higher scores on EOT (Mean=21.5, SD=0.6 vs. Mean=18.9, SD=0.6) and those who reported anaphylaxis obtained higher mean scores on DIF than those who had not (Mean 17.7, SD=0.8 vs. Mean=15.3, SD=1.1).

Multiple linear regression analyses determined the variables with the most weight in predicting higher scores on alexithymia. Only significant predictors were included in the final model. Table 4 shows that 'Avoidance' explained over 40% of the variance in alexithymia controlling for the other significant factors. Trait anxiety explained over 30% of the variance followed by age, anaphylaxis, and level of social support. Therefore, those who use 'avoidance' as a coping strategy, are younger, have experienced anaphylaxis and have a lower level of social support will report higher scores on alexithymia.

Discussion

Alexithymia has been associated with an expanding range of somatic pathologies such as inflammatory bowel disease, myocardial infarction, chronic respiratory diseases, dermatologic conditions, chronic pain, neuromuscular disorders, diabetes, and food allergy (13,17–19,33–38). It has been found to increase unhealthy behaviours and susceptibility to organic diseases notably immune-mediated disorders via physiological, behavioural, cognitive or social pathways from childhood leading to adverse outcomes in adulthood (21,22,39).

Chronic diseases that are characterised by dysregulation of inflammation, such as food allergy, are particularly susceptible to modulation by stress and emotion. Our findings support a possible role for alexithymia in influencing clinical outcomes through a relationship with avoidant coping and negative affect. We found that 15% of the participants fell in alexithymia category. If we consider also borderline alexithymia we reach the 47% of the sample. Results are in line with our previous study (13), which showed a significant difference in the frequency of not-alexithymic individuals comparing food-allergic patients with matched controls. Healthy participants reported a prevalence of 10% for alexithymia and 28% for borderline alexithymia. Alexithymia in food-allergic patients vs. patients affected from other allergic diseases should be explored in the future.

Significant differences found between alexithymia levels 1 & 2 and 1& 3 in coping style were explained by the use of 'Avoidance strategies' over all other possible strategies including Positive attitude, Social support, Religiosity, and Problem solving. Furthermore, regression analyses showed that 'Avoidance' had the highest contribution in explaining alexithymia, followed by Trait anxiety, age, anaphylaxis, and social support. Respondents who achieved higher levels of alexithymia use 'avoidance' as a coping strategy, over and above other coping strategies such as problem solving and positive thinking, are younger, will have experienced anaphylaxis, and will have a lower social support.

Using 'avoidance' as a coping strategy is associated with psychological distress in food allergy and can mediate the link between illness perceptions and outcomes (24). The tendency to use 'avoidance' is compounded by problems in identifying, describing and regulating emotions and by an 'externally oriented cognitive style' which describes a propensity to be guided by strict rules, regulations, and social conformity, which provides a sense of comfort and security for the individual. Qualitative studies (12,40) on food allergy experience, found that when adverse reactions occur in spite of 'the rules' being followed (e.g. telling restaurant staff that you cannot eat a meal containing peanut and then receiving such a meal) a traumatic 'transition' in the developmental process can occur. This transition leads to difficulty for some in effectively regulating emotions and in differentiating between physical and emotional symptoms.

Although we found no main effects for anaphylaxis, we did find a significant interaction between anaphylaxis and alexithymia, demonstrating a relationship between reporting anaphylaxis and higher alexithymia scores. With regard to subscales, we found that those 19 years and under has significantly higher scores on EOT and those who reported anaphylaxis obtained higher mean scores on DIF than those who had not. In food allergy, parents (and health professionals) may be more focused on a child's physiological safety, rather than on their psychological wellbeing. Difficulty in identifying feelings may result in an altered interpretation of their physical condition and symptoms. Accurate perception of symptoms is a crucial factor for correct self-management in food allergy. In asthma, the use of emotion-focused coping strategies seems to be related to a worse perception of physical status, in particular denial could promote a poor clinical course in asthma (41). Denial has also been found to be prevalent among a subgroup of food-allergic children and teens, sometimes referred to as 'minimisation' (40), giving rise to risk-taking behaviours, such as not carrying an auto-injector, not informing food venues, and not telling friends about food allergy. The decline in the rate of alexithymia from early to late adolescence is consistent with the gradually improving cognitive skills relating to the processing of emotions.

We did not find any differences between genders on the alexithymia subscales, suggesting that both males and females had similar difficulties in identifying and describing feelings and in a propensity to externally oriented thinking. However, although younger respondents obtained higher total scores on alexithymia, and lower on Trait anxiety, this relationship was modified by gender. Females showed higher scores on social support, a strategy that typically shows gender differences, with lower rates found in males. It is possible that the use of social support may be inappropriate in some cases. Qualitative research has shown that avoidance is linked to support from a very few friends who 'understand' with new friendships shunned (40). In previous research, alexithymia has been associated patterns of affect intensity (males) and frequency (females), highlighting an overall deficit in the processing of emotions that is gender specific (5).

Research has recognized alexithymia as one of several possible risk factors that may alter the general susceptibility to stress via physiological, behavioural, cognitive or social pathways (21–23,39). For most children who become allergic, the polarization of their immune system into an atopic phenotype probably occurs during early childhood. The establishment of the Th1/Th2 balance during early childhood and the final tuning at the important middle childhood years (42) implies that children may be especially vulnerable to environmental and lifestyle stressors affecting this balance. Increasing evidence links alexithymia to impaired immune function (43), with some research reporting a diminished immune-mediated cellular response in alexithymic individuals with over-secretion of glucocorticoids (35). Alexithymia may skew the Th-1/Th-2 balance toward Th-2 dominant immunity and lower cell-mediated (Th-1) immune response and may increase an individual's risk for stress related disorders. The up-regulation of Th-2 response with impaired Th-1 response could contribute to the pathophysiology observed in allergic disease (43,44).

An increased understanding of the interplay between alexithymia's role in influencing clinical outcomes through a relationship with avoidant coping and negative affect can contribute to prevention and intervention in food allergy. In research, the links between alexithymia, immune function and psychophysiological activity, stress the importance of considering the patient as a whole. In other words, the awareness of the bidirectional ("top-down and bottom-up") interactions between mind/brain and body may be particularly effective in chronic diseases, such as food allergy. In clinical practice, the belief that a patient is defensive can lead to frustration on the part of the clinician because the patient is regarded as withholding information that would allow the caregiver to help him or her (17). In contrast, the construct of alexithymia created an alternative way for the clinician to considering these patients; that he or she has an emotional difficulty or a limitation, or that they may be confused, rather than actively avoidant or uncooperative.

Alexithymic patients tend not to adopt nuances in describing and discriminating feelings. They are more likely to express themselves in terms of bodily symptoms, providing excessive details of their health condition, behaviours, and daily events (17,39,41), which can be interpreted as valid attempts to describe personal experience via symptoms or practical details. Understanding that a patient “cannot” rather than “will not”, identify, distinguish and verbally express emotions, can improve patient-clinician communication and allow for the clinician to select interventions that are appropriate and targeted specifically to that patient (17,39,41).

HRQL and other patient outcome measures might be used as tools to focus communication on coping with food allergy or in difficulties in managing risk. Feedback to the patient about the specific role of affect regulation in causing certain behaviours may constitute an important step in helping patients to explore more adaptive strategies. Although little research has been conducted on interventions for alexithymia, cognitive behavioural strategies to help a patient’s awareness of their emotions have been described (21). Interventions that are externally focused, such as contingency management, or that are relatively structured may be better suited to alexithymic individuals. Coping skills training, techniques relaxation, activity rest cycling and communications skills might be particularly useful (21). Previous research on different chronic diseases highlighted the need to develop and test alexithymia interventions and examine their effects on important disease-related variables (e.g. HRQL, symptoms) (17,21,33–37). A controlled study found a significant decrease in TAS scores among cardiac patients in psychological treatment but not in controls. Furthermore alexithymia reduction predicted better cardiovascular disease outcomes 2 years later (45). Further evidence-based research aimed at exploring the effects of interventions for alexithymia on outcomes in food allergy are needed..

Given that this study was cross-sectional, the long-term stability of these findings requires further inquiry. Future research should also explore the possible impact of age, culture and gender-related variables.

Our findings suggest that an increased awareness of the construct of alexithymia will add value to clinicians interactions with patients in everyday practice. In research, the use of a global approach in food allergy, directed toward addressing functional links between mind/brain, may contribute to a greater understanding of the psychological and physical outcomes associated with the condition. Further longitudinal and prospective studies are required to elucidate the nature of these relationships and interactions between different levels (e.g. biological, psychological, environmental).

Competing Interests

No financial support was awarded in relation to this paper. Conflict of interest: nothing to declare for each named authors.

References

1. Prescott S, Allen KJ. Food allergy: Riding the second wave of the allergy epidemic. Vol. 22, *Pediatric Allergy and Immunology*. 2011. p. 155–60.
2. Burks AW, Tang M, Sicherer S, Muraro A, Eigenmann PA, Ebisawa M, et al. ICON: Food allergy. Vol. 129, *Journal of Allergy and Clinical Immunology*. 2012. p. 906–20.
3. Gupta RS, Springston EE, Warrier MR, Smith B, Kumar R, Pongracic J, et al. The prevalence, severity, and distribution of childhood food allergy in the United States. *Pediatrics*. 2011;128(1):e9–17.
4. Muraro A, Werfel T, Hoffmann-Sommergruber K, Roberts G, Beyer K, Bindslev-Jensen C, et al. EAACI Food Allergy and Anaphylaxis Guidelines: diagnosis and management of food allergy. *Allergy*. 2014 Aug 1;69(8):1008–25.
5. Dunn Galvin A, Hourihane JO. Health-related quality of life in food allergy : Impact, correlates, and predictors. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz*. 2016 Jul;59(7):841–8.
6. Cummings AJ, Knibb RC, King RM, Lucas JS. The psychosocial impact of food allergy and food hypersensitivity in children, adolescents and their families: a review. *Allergy*. 2010 Aug;65(8):933–45.
7. DunnGalvin A, Dubois AEJ, Flokstra-de Blok BMJ, Hourihane JO. The effects of food allergy on quality of life. *Chem Immunol Allergy*. 2015 Jan;101:235–52.
8. Flokstra-de Blok BMJ, Dubois AEJ, Vlieg-Boerstra BJ, Oude Elberink JNG, Raat H, DunnGalvin A, et al. Health-related quality of life of food allergic patients: comparison with the general population and other diseases. *Allergy*. 2010;65:238–44.
9. Polloni L, Baldi I, Lazzarotto F, Bonaguro R, Toniolo A, Gregori D, et al. Multidimensional analysis of food-allergic children and adolescents' self-concept: A comparison with a healthy matched sample. *J Health Psychol*. 2015 Jun;20(6):850–7.
10. Polloni L, Lazzarotto F, Bonaguro R, Toniolo A, Celegato N, Muraro A. Psychological care of food-allergic children and their families: an exploratory analysis. *Pediatr Allergy Immunol*. 2014 Dec;
11. Soller L, Hourihane J, DunnGalvin A. The impact of oral food challenge tests on food allergy health-related quality of life. *Allergy*. 2014 Sep;69(9):1255–7.
12. Muraro A, Dubois AEJ, DunnGalvin A, Hourihane JO, de Jong NW, Meyer R, et al. EAACI Food Allergy and Anaphylaxis Guidelines. Food allergy health-related quality of life

measures. *Allergy*. 2014 Jul 1;69(7):845–53.

13. Polloni L, Gregori D, Ferruzza E, Oricoli C, Lazzarotto F, Bonaguro R, et al. Alexithymia in food-allergic versus healthy children and young adults. *J Health Psychol*. 2015 Sep 8;
14. Polloni L, Ferruzza E, Ronconi L, Lazzarotto F, Bonaguro R, Toniolo A, et al. Mental health and behavior of food-allergic adolescents compared to a healthy matched sample. *Ann Allergy Asthma Immunol*. 2015 Aug;115(2):158–60.
15. Ferro MA, Van Lieshout RJ, Ohayon J, Scott JG. Emotional and Behavioral Problems in Adolescents and Young Adults with Food Allergy. *Allergy*. 2015;
16. Sifneos PE. The prevalence of “alexithymic” characteristics in psychosomatic patients. *Psychother Psychosom*. 1973;22:255–62.
17. Baiardini I, Abbà S, Ballauri M, Vuillermoz G, Braidò F. Alexithymia and chronic diseases: the state of the art. *G Ital Med Lav Ergon*. 2011;33(1 Suppl A):A47-52.
18. Baiardini I, Braidò F, Ferraioli G, Menoni S, Bruzzzone M, Conte ME, et al. Pitfalls in respiratory allergy management: alexithymia and its impact on patient-reported outcomes. *J Asthma*. 2011;48:25–32.
19. Mattila AK, Kronholm E, Jula A, Salminen JK, Koivisto A-M, Mielonen R-L, et al. Alexithymia and somatization in general population. *Psychosom Med*. 2008;70:716–22.
20. Nemiah JC. Alexithymia. *Psychother Psychosom*. Karger Publishers; 1977;28(1–4):199–206.
21. Lumley MA, Neely LC, Burger AJ. The assessment of alexithymia in medical settings: implications for understanding and treating health problems. *J Pers Assess*. 2007;89:230–46.
22. Lumley MA, Stettner L, Wehmer F. How are alexithymia and physical illness linked? A review and critique of pathways. Vol. 41, *Journal of Psychosomatic Research*. 1996. p. 505–18.
23. Kano M, Fukudo S. The alexithymic brain: the neural pathways linking alexithymia to physical disorders. *Biopsychosoc Med*. 2013;7:1.
24. Knibb RC, Horton SL. Can illness perceptions and coping predict psychological distress amongst allergy sufferers? *Br J Health Psychol*. 2008 Feb;13(Pt 1):103–19.
25. Bagby RM, Taylor GJ, Parker JD. The Twenty-item Toronto Alexithymia Scale--II. Convergent, discriminant, and concurrent validity. *J Psychosom Res*. 1994;38:33–40.
26. Bressi C, Taylor G, Parker J, Bressi S, Brambilla V, Aguglia E, et al. Cross validation of the factor structure of the 20-item Toronto Alexithymia Scale: An Italian multicenter study. *J Psychosom Res*. 1996;41:551–9.
27. Parker JDA, Taylor GJ, Bagby RM. The 20-Item Toronto Alexithymia Scale: III. Reliability and factorial validity in a community population. *J Psychosom Res*. 2003;55:269–75.

28. Taylor GJ, Bagby RM, Parker JDA. The 20-Item Toronto Alexithymia Scale: IV. Reliability and factorial validity in different languages and cultures. Vol. 55, *Journal of Psychosomatic Research*. 2003. p. 277–83.
29. Spielberger CD. *Manual for the State-Trait Anxiety Inventory (STAI Form Y)*. Consulting Psychologists Palo Alto. 1983. 4-6 p.
30. Pedrabissi L, Rolland JP, Santinello M. Stress and burnout among teachers in Italy and France. Vol. 127, *The Journal of psychology*. 1993. p. 529–35.
31. Field A. *Discovering statistics using IBM SPSS statistics*. Statistics (Ber). 2013;58:1–7.
32. Tabachnick BG, Fidell LS. *Using multivariate statistics*. Using Multivar Stat 5th ed. 2007;980.
33. Hosoi M, Molton IR, Jensen MP, Ehde DM, Amtmann S, O'Brien S, et al. Relationships among alexithymia and pain intensity, pain interference, and vitality in persons with neuromuscular disease: Considering the effect of negative affectivity. *Pain*. 2010;149(2):273–7.
34. Willemsen R, Roseeuw D, Vanderlinden J. Alexithymia and dermatology: The state of the art. *Int J Dermatol*. 2008;47(9):903–10.
35. Bruni R, Serino FM, Galluzzo S, Coppolino G, Cacciapaglia F, Vadacca M, et al. Alexithymia and neuroendocrine-immune response in patients with autoimmune diseases: Preliminary results on relationship between alexithymic construct and TNF- α levels. In: *Annals of the New York Academy of Sciences*. 2006. p. 208–11.
36. Silva H, Freitas J, Moreira S, Santos A, Almeida V. Alexithymia and psychopathology in patients with acute myocardial infarction. *Acta Cardiol*. 2016 Apr;71(2):213–20.
37. Jordan C, Sin J, Fear NT, Chalder T. A systematic review of the psychological correlates of adjustment outcomes in adults with inflammatory bowel disease. *Clin Psychol Rev*. 2016 Jul;47:28–40.
38. Chatzi L, Bitsios P, Solidaki E, Christou I, Kyrilaki E, Sfakianaki M, et al. Type 1 diabetes is associated with alexithymia in nondepressed, non-mentally ill diabetic patients: A case-control study. *J Psychosom Res*. 2009;67(4):307–13.
39. Honkalampi K, Koivumaa-Honkanen H, Antikainen R, Haatainen K, Hintikka J, Viinamäki H. Relationships among Alexithymia, Adverse Childhood Experiences, Sociodemographic Variables, and Actual Mood Disorder: A 2-Year Clinical Follow-Up Study of Patients with Major Depressive Disorder. *Psychosomatics*. 2004;45(3):197–204.
40. DunnGalvin A, Gaffney A, Hourihane JO. Developmental pathways in food allergy: a new theoretical framework. *Allergy*. 2009;64:560–8.
41. González-Freire B, Vázquez-Rodríguez I, Marcos-Velázquez P, De La Cuesta CG. Repression and coping styles in asthmatic patients. *J Clin Psychol Med Settings*. 2010;17(3):220–9.

42. Sicherer SH, Sampson H a. Food allergy. *J Allergy Clin Immunol*. 2014;125:291–307; quiz 308.
43. Guilbaud O, Curt F, Perrin C, Chaouat G, Berthoz S, Dugré-Le Bigre C, et al. Decreased immune response in alexithymic women: A cross-sectional study. *Biomed Pharmacother*. 2009;63:297–304.
44. Guilbaud O, Corcos M, Hjalmarsson L, Loas G, Jeammet P. Is there a psychoneuroimmunological pathway between alexithymia and immunity? Immune and physiological correlates of alexithymia. Vol. 57, *Biomedicine and Pharmacotherapy*. 2003. p. 292–5.
45. Beresnevaite M. Exploring the benefits of group psychotherapy in reducing alexithymia in coronary heart disease patients: a preliminary study. *Psychother Psychosom*. 2000;69(3):117–22.

Table 1: Profile of the sample

		%	N
No alexithymia	Score < 51	53	49
Borderline alexithymia	Score 51-60	32	29
Alexithymia	Score >61	15	14
Age categories	14-18 years	61	56
	19-32 years	39	36
Gender	Male	50	46
	Female	50	46
Anaphylaxis	Yes	50	46
	No	50	46
Adrenaline prescription	Yes	89	82
	No	11	10

Table 2: Alexithymia total score and subscale scores (DIF, DFF, and EOT) , COPE score on 5 strategy type subscales, and score on Trait Anxiety, according to participant category (1= no alexithymia/2= borderline/3= alexithymia).

<51=not alexithymic 51-60 borderline =>61 alexithymic		Social Support	Avoidance Strategies	Positive Attitude	Problem Solving	Turning to Religion	Trait Anxiety	DIF	DDF	EOT	Alexithymia Total
1	N	49	49	49	49	49	49	49	49	49	49
	Mean	28.55	21.43	30.16	30.08	19.41	38.04	12.49	9.98	18.59	41.06
	Std. Dev	7.861	3.500	5.190	7.002	4.663	9.471	3.548	3.086	3.674	5.695
2	N	29	29	29	29	29	29	29	29	29	29
	Mean	28.93	24.90	28.52	28.59	19.52	44.62	18.21	14.38	22.90	55.48
	Std. Dev	7.176	4.411	5.565	5.760	5.145	7.297	3.288	3.913	3.958	2.681
3	N	14	14	14	14	14	14	14	14	14	14
	Mean	27.29	26.71	29.57	28.07	20.64	49.07	24.93	19.21	23.29	67.43
	Std. Dev	6.157	5.622	4.941	4.446	4.144	10.623	4.859	3.043	3.970	6.676

Table 3: Multivariate Analyses of Variance showing F values, Significance and Effect size (partial eta squared) for dependent variables (COPE, trait anxiety, total score for alexithemia) in the independent variables : anaphylaxis; adrenaline prescription; age group; and gender.

	F	Hypothesis df	Error df	Significance*	Partial eta Squared
Age group	2.22	7.00	74.00	.04	.17
Gender	2.84	7.00	74.00	.01	.21
Anaphylaxis	1.84	7.00	74.00	.09	.15
Adrenaline prescription	2.24	7.00	74.00	.04	.18

*All p values in bold are less than 0.05 and therefore significant.

Table 4: Multiple linear regression analyses of alexithymia with predictors: avoidance, trait anxiety; age; anaphylaxis; and level of social support.

	Unstandardized Coefficients		Standardized Coefficients		95.0% Confidence Interval for B		
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	34.399	7.396		4.651	.000	19.697	49.101
Social Support	-.248	.130	-.163	-1.913	.052	-.205	.010
Avoidance Strategies	.971	.211	.403	4.593	.000	.551	1.39
Anaphylaxis	-3.589	1.843	-.161	-1.947	.053	-7.25	.075
Age	-.532	.182	-.248	-2.921	.004	-.895	-.170
Trait Anxiety	.357	.097	.316	3.677	.000	.164	.550