



# Mindfulness Skills and Psychological Inflexibility: Two Useful Tools for a Clinical Assessment for Adolescents with Internalizing Behaviors

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## Abstract

**Objectives** Two processes that have been largely studied in relation to psychological wellbeing during adolescence are mindfulness and psychological flexibility. Child and Adolescent Mindfulness Measure (CAMM) and Avoidance and Fusion Questionnaire for Youth (AFQ-Y) are specifically developed for children and adolescents and their items are built to assess specific processes. This study aims to identify cut-offs detecting adolescents with internalizing disorders, and describing specific behavioral repertoires within participants with high *Psychological Inflexibility* and poor *Mindfulness Skills*.

**Method** Participants ( $N = 1336$ ), aged between 11 and 18, were recruited. Participants completed the Italian versions of CAMM, AFQ-Y, and Youth Self-Report (YSR). To determine the cut-offs for CAMM and AFQ-Y discriminating participants with internalizing disorders two receiver operating characteristic (ROC) analyses were performed. Furthermore, to identify homogeneous groups with specific behavioral repertoires two Classification Tree Analyses (CTA) were performed.

**Results** The cut-offs identified are 24 for the CAMM, and 11 for the AFQ-Y. The CTA showed that low *Mindfulness Skills* and *Psychological Inflexibility* share a specific feature: namely, depressive symptoms. However, social withdrawal seems to be associated only with low *Mindfulness Skills*, while somatic symptoms seems to be associated only with *Psychological Inflexibility*.

**Conclusions** The potential uses of the CAMM and AFQ-Y in research and clinical practice are drawn. CAMM and AFQ-Y are short and simple measures that make them accessible in a school-based primary prevention setting.

**Keywords** Mindfulness · Transdiagnostic assessment · Adolescence · Internalizing disorders · Acceptance and commitment therapy (ACT)

Adolescence is a high risk period for the development of psychopathology (Calkins 2010; Neil and Christensen 2009; Zisook et al. 2007). Poor mental health during

adolescence predicts ongoing difficulties in adulthood (Fombonne et al. 2001). An epidemiological survey conducted in the United States on adolescent population, revealed 12-month prevalence rates of depression at 10%, and rates of anxiety disorders at 24.9% (Kessler et al. 2012). Literature has strongly suggested that those conditions tend to become chronic (Pine et al. 1998), and they are strongly related with high risk behaviors like substance abuse (O'Neil et al. 2011), and suicidal behavior (Nock et al. 2013). Furthermore, Zisook et al. (2007) have shown that the onset of major depression during childhood or adolescence was associated with poor functional impairment, poor quality of life and greater illness burden. Recent literature also suggests that, to estimate the burden of psychological disease in adolescence, the impact of sub threshold disorders should also be considered (Roberts et al. 2015):

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internalizing symptoms, such as sadness, fear, worry, somatization, withdrawal, even if they don't reach criteria for a diagnosis are associated with many health and behavioral problems during adolescence, including suicide (Balazs et al. 2013; Fergusson et al. 2005; Trudeau et al. 2012).

Together with the classifications provided by the Diagnostic and Statistical Manual for Mental Disorder (DSM-5; APA 2013), one of the most common forms to assess psychopathology during childhood and adolescence was developed by Achenbach that gathered psychological behaviors into two broad classes: internalizing and externalizing problems (Achenbach 1991). Behaviors that create conflicts within the environment or with others are classified as externalizing disorders, while inner-directed behaviors that cause emotional distress in the self are classified as internalizing disorders. Important internalizing conditions include depressive disorders, anxiety disorders, somatic complaints and teenage suicide (Liu et al. 2011).

Researchers and clinicians who support the DSM classification have underlined that a psychiatric classification system is a necessity for different causes: it provides a common way of speaking among mental health practitioners to describe individuals with psychological problems; it advances clinical science by grouping together people with similar problems; and it may be used to improve treatments or to develop new ones (Hayes and Hoffman 2018). However today we observe some critical issues that deserve to be analyzed and understood; first, the high rate of comorbidity between diagnoses leads us to reflect on the fact that many arbitrarily defined diagnoses as separate can actually share some aspects. High comorbidity and the recognition that causes and risk factors are often shared across and between psychological disorders provide strong evidence for common, "higher-order" pathological mechanisms (Ehrenreich-May and Chu 2013); diagnostic groups have been increasingly considered as dimensional aspects of a fundamental, underlying continuum of pathology, rather than discrete entities (Brown and Barlow 2005).

Furthermore, looking at the treatment protocols, an important overlap between protocols can be observed. Psychological interventions that take a transdiagnostic approach have the potential to address more efficiently a wide range of clinical and subclinical problems and to have more robust, generalizable outcomes targeting core processes (Ehrenreich-May and Chu 2013). Thus, although there is a need for tools that are able to detect mental disorders during adolescence, it is extremely important to question the pragmatic utility of the instruments used.

Within Cognitive Behavioral Therapy (CBT), that has gathered several specific disorder-oriented treatments, we are witnessing a change of perspective regarding the detection of common processes that can be at the basis of

different forms of psychopathology. Hayes and Hoffman (2018) claim that the identification of core processes in psychotherapy will guide psychotherapists into the future. Clinically Relevant Processes (CRP) will allow us to avoid the constraints of treatment protocols based on a rigid and arbitrary diagnostic system and will directly link treatment to theory.

Literature about internalizing disorders has already began to deal with CRPs in terms of common psychopathological processes which may provide a target for transdiagnostic research and interventions in adolescence. Evidence is accumulating about the role of the following factors in the onset and maintenances of anxiety and depression during both adulthood and adolescence: maladaptive perfectionism, with its key element of harsh self-criticism (Egan et al. 2011; O'Connor et al. 2010); rumination or repetitive negative thinking (Ehring and Watkins 2008; McLaughlin and Nolen-Hoeksema 2011); dysfunctional emotion regulation processes such as emotional avoidance and suppression of emotion (Aldao et al. 2010; McLaughlin et al. 2011a).

Functional Contextualism (Hayes and Brownstein 1986), Relational Frame Theory (RFT, Hayes et al. 2001) and Acceptance and Commitment Therapy (ACT, Hayes et al. 1999) have provided a strong and consistent epistemological and theoretical framework to the scientific study of the two core CBRs which are the object of this exploratory study: namely psychological flexibility and mindfulness. Within the ACT model, psychological flexibility is defined as the ability to fully contact the present moment and the thoughts and feelings it contains, and, depending on what the situation provides, to persist or to change the behavior to pursue goals and values (Hayes et al. 2006). In contrast, psychological inflexibility entails the rigid dominance of psychological reactions, over chosen values and contingencies, in guiding actions (Bond et al. 2011). This higher order process is composed of a set of six sub processes including experiential avoidance, in which individuals seek to avoid, escape, or otherwise control the occurrence of difficult thoughts and feelings, despite of the harmful consequences of doing so (Hayes et al. 1996).

Psychological inflexibility and experiential avoidance are theorized to contribute to the development, maintenance and exacerbation of a broad range of psychological problems (Chawla and Ostafin 2007; Kashdan et al. 2006). Data collected on young people show that psychological inflexibility can be considered a transdiagnostic factor related to various disorders and dysfunctional behaviors during adolescence such as self-harm (Howe-Martin et al. 2012), anxiety (Venta et al. 2012), depression (Mellick et al. 2017), and other internalizing problems (Greco et al. 2008). As pointed out by Kashdan (2011), psychological flexibility covers a wide range of human abilities such as: recognizing

and adapting to various contextual demands; changing mindsets or behavioral repertoires when these strategies compromise functioning; maintaining balance among valued life domains; to be aware, open, and committed to behaviors that are congruent with chosen values. Those processes have been widely studied in literature and results show that they are linked to psychological and physical health (Kashdan 2011); nevertheless research on that topic has been obstructed by the isolation of various experimental studies and disconnection from theory.

Within ACT model, mindfulness is a behavioral repertoire. Hayes et al. (2006) have described that the six key processes that compose the psychological flexibility (acceptance, defusion, contact with the present moment, self as context, values and committed actions) can be grouped into two high order processes. Consistently with an ACT/RFT perspective mindfulness encompasses four key ACT processes (i.e., acceptance, defusion, contact with the present moment, and self as context), and pervades the entire model (Fletcher and Hayes 2005). Furthermore, mindfulness can be defined "... as the defused, accepting, open contact with the present moment and the private events it contains as a conscious human being experientially distinct from the content being noticed" (Fletcher and Hayes 2005, p. 322). Although mindfulness originates in eastern culture and in particular in Buddhist tradition, western researchers and clinicians have introduced mindfulness practice into mental health treatment programs: popularity of clinical and preventive interventions based on training in mindfulness skills appears to be growing rapidly (Baer 2015; Keng et al. 2011). One striking characteristic of mindfulness is that it is helpful on a wide range of problems across different population including internalizing problems in children and adolescents (Tan and Martin 2012). Clinical effects of mindfulness practice have been shown in many specific psychopathological disorders (Baer 2015); positive outcomes are also an improvement in physical health, behavioral regulation and interpersonal functioning (Brown et al. 2007; Burke 2010).

Interventions that nurture mindfulness in young people may be a feasible and effective method, not only to treat disorders in the clinical population but also to prevent psychological problems in the general populations (Greenberg and Harris 2012). Recent studies suggested that mindfulness can reduce anxiety and depression problems in school population (Beauchemin et al. 2008; Raes et al. 2014) but further research, including investigation of mediators and moderators in experimental designs, is required to identify active ingredients in mindfulness-based programs in school settings (Johnson et al. 2016).

To better understand the relation between mindfulness, psychological flexibility and internalizing disorders in adolescent's adequate assessment tools are needed. These

measures should be valid, reliable, age-consistent and suitable to clinical and general population. To date there are two tools that satisfy these requirements: the Avoidance and Fusion Questionnaire for Youth (AFQ-Y, Greco et al. 2008) e the Child and Adolescent Mindfulness Measure (CAMM, Greco et al. 2011). The Italian version of both these questionnaires have been recently validated (Ristallo et al. 2016; Schweiger et al. 2017) and their features are briefly presented in the further section. As the previous definitions indicate, mindfulness is considered to be a key part of psychological flexibility. However, it is important to note that psychological flexibility and mindfulness come from different traditions: it is likely that experiential acceptance and the ability to contact the present moment measures will overlap, but not be redundant. For example, psychological flexibility includes mindfulness dimensions related to non-reactivity to inner experience (item such as "my thoughts and feelings mess up my life") and non-judging of experience (item such as "if my heart beats fast, there must be something wrong with me"). However, it also refers to items linked to goal-related activity, which are typically not present in mindfulness measures such as "I stop doing things that are important to me whenever I feel bad" (Ciarrochi et al. 2011).

The present study is part of a larger research project by *ACT for Kids and Teens* (Special Interest Group of ACT Italia Association), a group of researchers and clinicians who aims to develop and assess intervention protocols and evaluation measures for children and adolescents, based on ACT, in the Italian context. The first aim of our study was to assess if the Child and Adolescent Mindfulness Measure & Avoidance and Fusion Questionnaire for Youth identifies adolescents with internalizing disorder assessed with the Youth Self—Report (YSR). Furthermore, this study aims to determine which combination of narrow-band syndromic scales namely: withdrawn, somatic complaints, anxious/depressed, and demographic characteristics best discriminate adolescents with poor mindfulness skills and high psychological flexibility.

## Methods

### Participants

One thousand three hundred and thirty-six ( $N = 1336$ ) students (grade 6–13) were recruited from 12 schools in 10 cities in different areas of Italy including north, center and south. Participants were 11 to 18 years old, equally distributed between male and female. Demographic characteristics of participants are provided in Table 1. Mean age was 14.46 ( $SD = 2.16$ ), and the percentage of male and female participants was similar. About two-thirds ( $n = 821$ )

**Table 1** Study population

	Sample ( $n = 1336$ )	
	Mean $N$	SD %
Age	14.46	2.16
Gender		
Male	562	42.1
Female	756	56.6
Missing	18	1.3
Geographic area		
North	588	44
Center	44	3.3
South and Islands	693	51.9
Missing	11	0.8
School		
Middle School (6°–8°)	678	50.7
High School (9°–13°)	648	48.5
Missing	10	0.7
Administration		
Pencil & Paper	821	61.4
Online	506	37.9
Missing	9	0.7

of the participants completed the assessment procedure using paper and pencil, and five hundred and six (37.9%) participants completed online the assessment.

Although Italian law guidelines for this type of study mandated no institutional review board approval, the study was conducted according to the Declaration of Helsinki. The school board, school managers, and teachers approved all procedures involving the students. If parents did not provide informed consent, their children did not participate in the study.

## Procedure

Students filled out a battery of questionnaires, either online or on paper depending on equipment available at school. All questionnaires were anonymous: to identify cases, students were provided with a code number. Testing was performed in a classroom setting. In each class a psychologist of the research staff gave instruction to complete the task and answer any question. All students were requested to observe test conditions (i.e., work individually and silently). Time available to complete the task was 1 h and a half. To guarantee standard conditions in each class the same administration protocol was applied by all researchers. At the end of the research, to promote a social impact of the research a clinical psychologist wrote a report for each class, describing areas of psychological risk (emerged from

scores at YSR) and possible interventions. The report was produced by the research group and provided to the teachers and parents upon request.

## Measures

Child and Adolescent Mindfulness Measure (CAMM). The Italian version of Child and Adolescent Mindfulness Measure was recently validated by Ristallo et al. (2016). I-CAMM is a self-report questionnaire that assesses mindfulness skills such as present-moment awareness and non-judgmental, non-avoidant responses to thoughts and feelings in young people (11–18 years). The questionnaire comprises 10 items rated on a five-point scale (0 = never to 4 = always). Scores can be generated by reverse scoring negatively worded items (i.e., “I keep myself busy so I don’t notice my thoughts or feelings”). The I-CAMM shows a two factors solution (“Awareness” and “Will-ingness”), with a higher-order factor named “Mindfulness Skills”. The scale shows good internal consistency (Cronbach’s  $\alpha = 0.79$  for the factor “Mindfulness Skills”) and a good convergent validity with the scale of the internalizing problems of the YSR ( $r = -0.515$ ) and with *Psychological Inflexibility* measured by I-AFQ-Y ( $r = -0.703$ ) (Ristallo et al. 2016).

Avoidance and Fusion Questionnaire for Youth (AFQ-Y). The Italian version of the Avoidance and Fusion Questionnaire for Youth (I-AFQ-Y; Schweiger et al. 2017) is an 8 item self-report measure assessing *Psychological Inflexibility* in young people (11–18 years). The first version of the AFQ-Y included 17 items. Both Livheim et al. (2015), and the Italian validation of the instrument (Schweiger et al. 2017) reveal that the 8-item version of the AFQ-Y shows better psychometric properties than the 17-item version of the instrument. It includes items like “My life won’t be good until I feel happy”, “The bad things I think about myself must be true”, “and I can’t be a good friend when I feel upset”. Responses are scored on a five-point Likert scale (from 0 = not at all true to 4 = very true), and higher scores indicate higher *Psychological Inflexibility*. I-AFQ-Y shows a one-factor solution. The scale has moderate internal consistency (Cronbach’s  $\alpha = 0.69$ ) and a moderate test-retest reliability ( $r = 0.64$ ). Furthermore, convergent validity was found with internalizing problem scale ( $r = 0.53$ ) and total problem scale ( $r = 0.52$ ) of the YSR; the correlation with externalizing problem scale is lower ( $r = 0.32$ ).

Youth Self—Report (YSR). The Youth Self Report (YSR—Achenbach and Rescorla 2001) is a self-report questionnaire modeled after the CBCL, and included in the Aseba System, for use with adolescents ages 11–18. The questionnaire is divided into two parts: (1) Competencies, that contains 7 items about practical, social and academic

skills (each item is made by different closed-ended questions); (2) Problems, that contains 112 item describing behavioral and emotional problems. Respondents are asked to rate—on a three-point scale (0 not true, 1 = somewhat or sometimes true, 2 = very or often true)—how often in the last six months they experienced the problem stated. Scores are given for eight narrow-band syndromic scales: withdrawn, somatic complaints, anxious/depressed, social problems, thought problems, attention problems, rule-breaking behavior, and aggressive behavior. Three broad scale scores are provided: internalizing problems (withdrawn plus somatic complaints plus anxious/depressed), externalizing problems (rule-breaking behavior plus aggressive behavior) and total problems (all scales). YSR is based on a solid empirical research and provides a reliable and valid measure to assess maladaptive functioning in young people (Achenbach 1995; Achenbach et al. 2004). YSR has been translated into many languages, including Italian, and transcultural research has confirmed its characteristics (Achenbach et al. 2008). Research has confirmed that YSR Internalizing t score discriminates cases with anxiety and depression (Van Meter et al. 2014; Ivarsson et al. 2002). In this study, children were classified as having a clinical internalizing problem if their score was equal or greater than 70 as suggested in the YSR's manual (Achenbach 1991).

## Data Analyses

Data are presented as mean and percentage. To determine if *Mindfulness Skills* and *Psychological Inflexibility* scores were different in male and female participants, *t*-tests for independent groups were performed, and effect sizes (ESs) were calculated.

To determine the cut-offs of the *Mindfulness Skills* and *Psychological Inflexibility*, Receiver Operating Characteristic (ROC) analyses were carried out. In a ROC analysis, the sensitivity and specificity are plotted over the range of cutoff points (Fletcher et al. 1996). The Area Under the Curve (AUC) represents the accuracy of the instrument in predicting those who will have or will not have poor *Mindfulness Skills* and high *Psychological Inflexibility*, respectively. The interpretation of the AUC values is traditionally the following: an  $AUC < 0.7$  suggests “low” diagnostic accuracy, from 0.7 to 0.9 “moderate” diagnostic accuracy, and  $AUC \geq 0.9$  “high” diagnostic accuracy (Swets and Pickett 1982).

Classification Tree Analysis (CTA) based on the CHAID ( $\chi^2$  automatic interaction detection) procedure was used to determine the ability of narrow-band syndromic scales, and demographic characteristics to discriminate subgroups of adolescents with high and low *Psychological Inflexibility* and with high and low *Mindfulness Skills*. CTA has previously been applied in different areas of medicine,

including psychiatry and health services research (Cassano et al. 2012; Rucci et al. 2012), and was used to support clinical decision-making. The CTA begins with selecting from the set of predictors the one that is most associated with the dependent variable (*Psychological Inflexibility* and *Mindfulness Skills*) and uses it to partition the population into subgroups defined by existing categories (if the variable is dichotomous or nominal) or by categories obtained through the identification of optimal cut-points continuous variables. The procedure then continues by selecting the second-best predictor and so on, until no further significant improvement in the segmentation of study participants is possible or a stopping rule is met. At the end of the procedure, a grouping of cases is obtained, such that the cases are as homogeneous as possible with respect to the value of the dependent variable. The CTA-based procedure is represented graphically as an inverted tree. Beginning with a root node that includes all cases, the tree branches and grows iteratively until the procedure is completed. The final nodes (or the ‘leaves’ of the tree) comprise subgroups with distinct characteristics. Gender, age, Y-SR somatic complaints scale, Y-SR withdrawn/Depressed scale, and Y-SR Anxious/Depressed scale were selected as potential “predictors” of *Psychological Inflexibility* and *Mindfulness Skills*. All analyses were conducted using IBM SPSS Statistics, version 21.0. SPSS

## Results

### Mindfulness Skills and Experiential Avoidance in Adolescents

Age-stratified scores distributions for the I-CAMM total score *Mindfulness Skills*, and for the two factors, *Awareness* and *Willingness*, are reported in Table 2. Overall, *Mindfulness Skills* ( $t = 6.26$ ;  $p < 0.001$ ;  $ES = 0.35$ ) and *Awareness* ( $t = 4.99$ ;  $p < 0.001$ ;  $ES = 0.50$ ) are higher in male than female participants, while male and female participants reported similar scores on *Willingness* factor ( $t = 1.50$ ;  $p = 0.134$ ). Furthermore, *Mindfulness Skills* are homogeneous through age groups.

Age-stratified Score distributions for the I-AFQ-Y total score are reported in Table 3. Female participants reported higher scores on *Psychological inflexibility* than male participants ( $t = 5.83$ ;  $p < 0.001$ ;  $ES = -0.34$ ), and the ES suggest a small, but significant effect size. Data showed no significantly differences among age groups.

### ROC Analyses

In order to determine cutoffs discriminating participants with internalizing problems for the total scores of the I-

**Table 2** I-CAMM: age-stratified normative data ( $n = 1336$ )

	F1 Awareness		F2 Willingness		I-CAMM Total score Mindfulness skills	
	M	F	M	F	M	F
$n = 1336$	20.45 (SD = 5.70)		4.35 (SD = 1.96)		24.81 (SD = 6.60)	
Total sample (M = 558; F = 752)	21.76 (SD = 5.24)	19.48 (SD = 5.85)	4.37 (SD = 2.05)	4.37 (SD = 1.89)	26.13 (SD = 6.28)	23.85 (SD = 6.69)
Age-stratified groups						
11 (M = 72; F = 72)	21.47 (SD = 4.98)	23.30 (SD = 5.67)	3.94 (SD = 2.13)	4.33 (SD = 2.04)	25.42 (SD = 6.18)	27.64 (SD = 6.92)
12 (M = 62; F = 60)	21.43 (SD = 6.01)	20.66 (SD = 5.65)	4.37 (SD = 2.14)	4.03 (SD = 1.90)	25.81 (SD = 7.18)	24.70 (SD = 5.86)
13 (M = 52; F = 53)	22.11 (SD = 5.27)	18.33 (SD = 5.89)	4.25 (SD = 2.19)	4.49 (SD = 1.98)	26.37 (SD = 6.25)	22.83 (SD = 6.74)
14 (M = 87; F = 199)	21.83 (SD = 5.64)	18.95 (SD = 5.70)	4.59 (SD = 2.09)	4.39 (SD = 1.92)	26.41 (SD = 6.82)	23.34 (SD = 6.62)
15 (M = 80; F = 161)	21.85 (SD = 5.14)	18.48 (SD = 5.49)	4.91 (SD = 1.96)	4.34 (SD = 1.76)	26.76 (SD = 6.03)	22.83 (SD = 6.39)
16 (M = 67; F = 70)	21.71 (SD = 4.68)	20.46 (SD = 5.59)	4.37 (SD = 1.89)	4.31 (SD = 2.00)	26.09 (SD = 5.29)	24.77 (SD = 6.62)
17 (M = 63; F = 75)	21.38 (SD = 5.35)	19.13 (SD = 5.32)	4.22 (SD = 2.01)	4.83 (SD = 1.70)	25.60 (SD = 6.59)	23.96 (SD = 5.91)
18 (M = 55; F = 44)	22.05 (SD = 4.51)	18.86 (SD = 6.58)	4.38 (SD = 1.90)	4.25 (SD = 1.89)	26.44 (SD = 5.36)	23.11 (SD = 7.50)

CAMM and for the I-AFQ, ROC two analyses were performed. The first analysis revealed a strong ROC curve (Fig. 1) for *Mindfulness Skills* ( $AUC = 0.210$ ,  $95\% CI = 0.18-0.24$ ;  $p < 0.001$ ) that was significantly better than chance in classifying participants with internalizing problems versus participants who do not report internalizing problems. In other words, I-CAMM total score allowed to predict accurately about 80% (i.e.,  $1-AUC$ ) of participants with internalizing behavior with a sensitivity of 0.72 and a specificity of 0.73 for a score equal or greater than 24. The positive predictive value ( $PPV$ ) was 0.52, and the negative predictive value ( $NPV$ ) was 0.88.

Similarly, the second analysis revealed a strong ROC curve (Fig. 2) for *Psychological Inflexibility* total score ( $AUC = 0.780$ ,  $95\% CI = 0.75-0.81$ ;  $p < 0.001$ ). The AUC indicates that the I-AFQ-8 allowed to predict accurately the 78% of cases with internalizing problems, with a sensitivity of 0.73 and a specificity of 0.70 at a cutoff score of 10.5. The  $PPV$  was 0.45, and the  $NPV$  was 0.89.

### Classification Tree Analyses (CTA)

The first CTA was carried out using features that describe people with internalizing behavior namely anxiety and depressive symptoms, social withdrawal and worry about somatic symptoms. Furthermore, sex and age were considered as potential predictors of high scores on *Mindfulness skills*. Among these 5 variables, anxiety and depressive symptoms assessed with YSR was identified by the most discriminative predictor of *Mindfulness Skills* and generated the main branching of the classification tree (Fig. 3). Among participants who reported a depression/anxiety score greater than 13, a subsequent split was generated according to the social withdrawal reported by participants. Thus, among participants who reported high depressive and anxiety symptoms and high social withdrawal the likelihood of having poor mindfulness skills was 91.1% (see node 10 in Fig. 3).

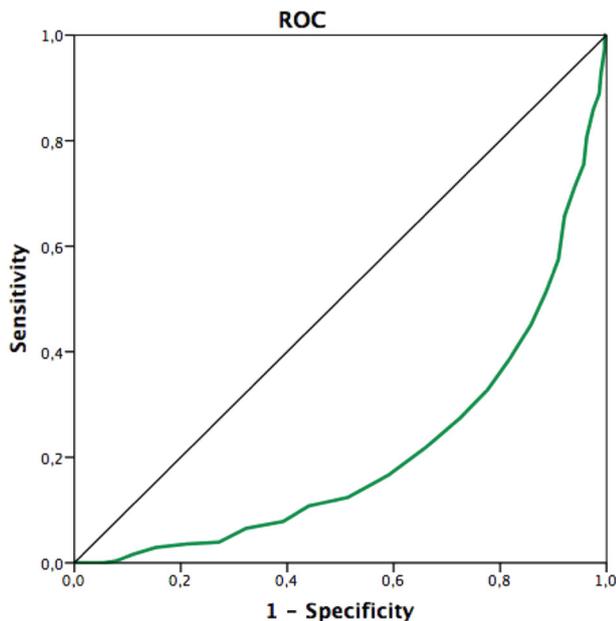
Vice versa, among participants with low depression/anxiety score (lower than 4) and without any kind of social withdrawal symptoms (Withdrawn/Depressed scale = 0), the likelihood of referring poor mindfulness skills was less than 10% (see node 6 in Fig. 3).

In conclusion, the CTA procedure generated eight mutually exclusive groups that are distributed on a “depressive” continuum (though the most important nodes are node 10 and node 6). Participants differ from each other on the basis of two variables: i.e., depressive and anxiety symptoms and social withdrawal: after these variables and their interaction were entered in the model, the ‘excluded’ variables did not contribute to generate further subgroups.

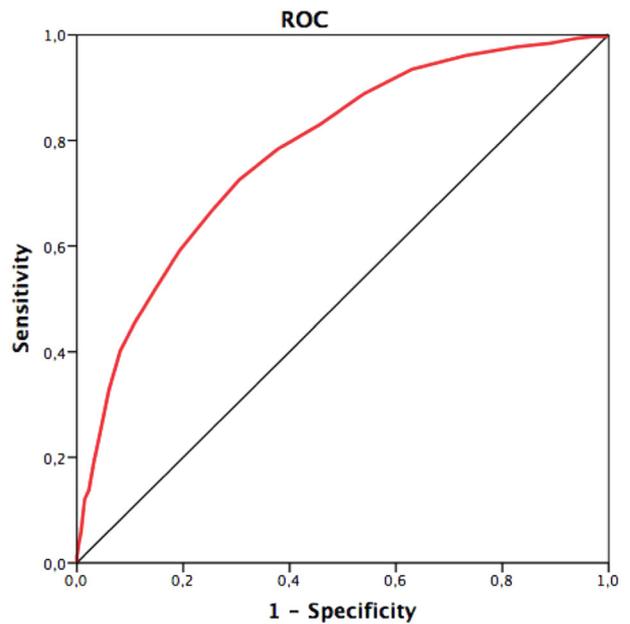
The second CTA was carried out using the same variables that were entered in the previous CTA model as

**Table 3** I-AFQ-Y: age-stratified normative data ( $N = 1248$ )

$N = 1248$	I-AFQ-Y Psychological Inflexibility	
	M	F
Total sample (M = 510; F = 721)	9.01 (SD = 4.98)	10.78 (SD = 5.42)
Age-stratified groups		
11 (M = 69; F = 72)	8.32 (SD = 4.95)	7.75 (SD = 5.35)
12 (M = 63; F = 60)	10.02 (SD = 6.31)	9.57 (SD = 5.36)
13 (M = 50; F = 52)	9.04 (SD = 5.13)	12.04 (SD = 5.84)
14 (M = 86; F = 197)	7.97 (SD = 4.14)	11.31 (SD = 5.12)
15 (M = 79; F = 160)	9.06 (SD = 4.44)	11.71 (SD = 5.14)
16 (M = 66; F = 67)	9.58 (SD = 4.90)	9.97 (SD = 5.54)
17 (M = 59; F = 74)	9.80 (SD = 4.90)	10.58 (SD = 5.27)
18 (M = 31; F = 33)	8.06 (SD = 4.15)	11.97 (SD = 5.43)

**Fig. 1** Receiver operating characteristic curve: I-CAMM vs. internalizing disorders

potential predictors of high scores on *Psychological Inflexibility*. As for the previous model, anxiety and depressive symptoms assessed with YSR generated the main branching of the classification tree (Fig. 4) performed to identify homogeneous subgroups of participants with high and low *Psychological Inflexibility*. Among participants who reported a depression/anxiety score greater than 13, the percentage of adolescents with high *Psychological Inflexibility* was around 90% (see node 4, Fig. 4). However, among participants with low depression/anxiety score (lower than 5) a subsequent split was done according to somatic complaints reported by participants. Therefore, among participants who reported low depressive and

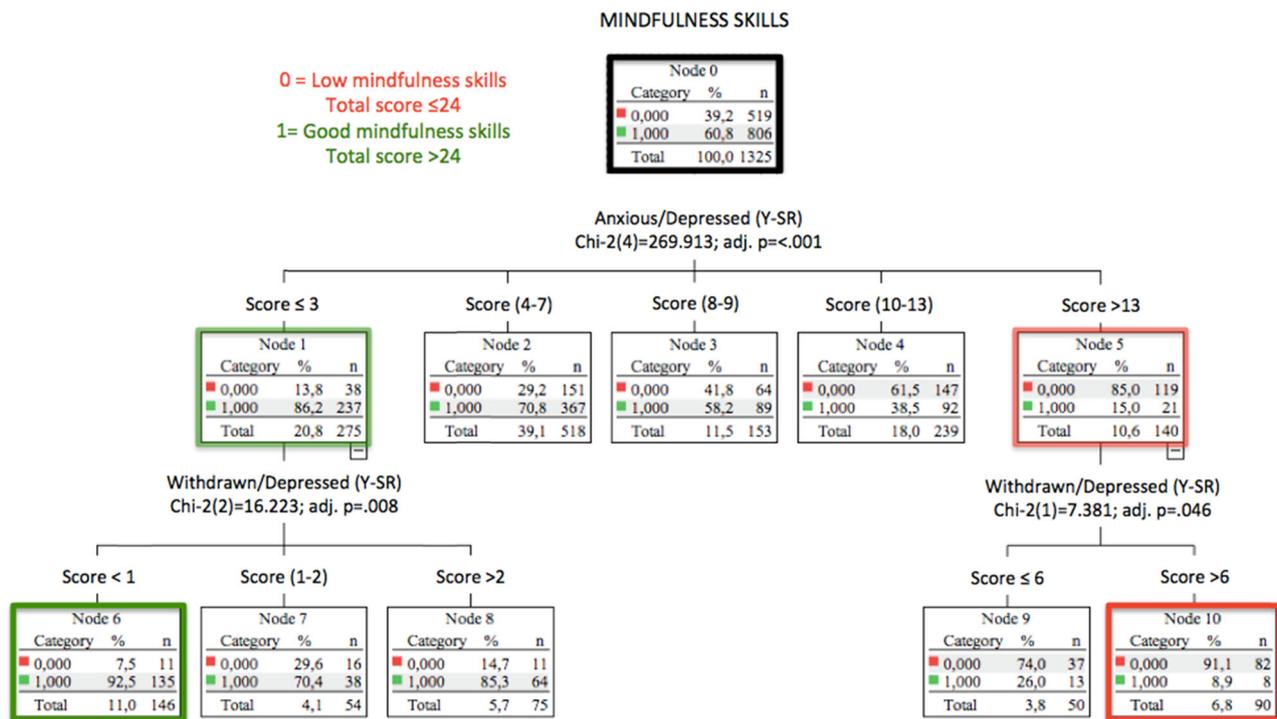
**Fig. 2** Receiver operating characteristic curve: I-AFQ-Y vs. internalizing disorders

anxiety symptoms and low somatic complaints, 244 (84.7%) out of 288 participants reported good psychological flexibility (see node 5, Fig. 4).

A further subgroup of participants was defined on the base of mild level of depressive and anxiety symptoms that reported at least one somatic complaint with at least 13 years old (see node 10, Fig. 4); in this subgroup, about a half of participants reported good psychological flexibility. In conclusion, participants differ from each other on the basis of three variables: namely depressive and anxiety symptoms, age and somatic complaints that seem to be correlated with the variable age: after these variables and their interaction were entered in the model, the 'excluded' variables did not contribute to generate further subgroups.

## Discussion

Internalizing behaviors in children and adolescents are widespread and have negative effects on physical and psychological well-being and social functioning. Furthermore, these conditions tend to grow chronic (Neil and Christensen 2009) becoming a high social burden. Thus, easy-to-administer instruments that identify a probable risk of having internalizing behaviors are useful primary prevention tools. In this exploratory study, I-AFQ-Y and I-CAMM total scores reliably distinguished children and adolescents with internalizing behaviors from participants who did not report these kind of behaviors. Specifically, I-CAMM allowed to predict accurately about 80% of participants with internalizing behaviors, and the I-AFQ-Y



**Fig. 3** Classification tree analysis showing subgroups with low and good mindfulness skills

allowed to predict the 78% of participants with these features. These process based measures may provide a method of detecting internalizing behaviors that offer more accurate responding; in other words, detecting a specific deficit on mindfulness skills or psychological flexibility may allow clinicians to tailor an eventual treatment based on the impaired behavioral function rather than on a rigid and arbitrary diagnostic system.

To our knowledge, although some studies used CAMM and AFQ-Y in clinical settings (i.e., Howe-Martin et al. 2012; Mellick et al. 2017; Greco et al. 2008), literature reports only one study (Venta et al. 2012) that provides a cut-off for the AFQ-Y. However, Venta et al. (2012) administered the 17-items version of the questionnaire to adolescents' inpatients, thus our results are not directly comparable with those reported by that study. The identification of a cut-off, using a procedure that optimizes both sensitivity and specificity, can simplify screenings or assessments based on the needs of the primary prevention, clinical purpose, or research. It is important to underline that a procedure that provides a cut-off does not reduce a dimensional measure into a categorical one, but it is a simple way that facilitates decision-making tasks in different settings. Consistent with a functional contextual approach, we agree with the fact that categorical and dimensional approaches are equivalent, but that one or other perspective is more appropriate depending on the issues being addressed (Kraemer et al. 2004).

Thus, the first result from the current study supports the use of the I-AFQ-Y, and I-CAMM for initial screening and identification of adolescents with internalizing behaviors. The second relevant result is that *Mindfulness Skills*, and *Psychological Inflexibility* scores detect homogeneous subgroups of adolescents with specific internalizing features. Consistently with a transdiagnostic perspective (Craske 2012; Ehrenreich-May and Chu 2013), the goal is not to identify a formal category, but rather to identify which are the processes that contribute to the maintenance of problematic behaviors. In this study, the two CTA that have been performed on I-AFQ, and I-CAM identify the YSR anxious/depressed scale that describes cognitive, emotional, and behavioral features of anxiety and depression, as the first watershed in both models. This outcome is in line with previous theoretical and research literature that reported the role of mindfulness skills and acceptance in reducing anxiety disorders in adolescents (Ciarrochi et al. 2011; Greco et al. 2005; Hofmann et al. 2010; Venta et al. 2012).

Despite I-AFQ-Y and I-CAMM share the first branch; these measures behave differently for the subsequent variables that identify similar subgroups of adolescents. Specifically, poor mindfulness skills appear to be associated with a repertoire characterized by shyness, social withdrawal, sadness, and isolation. This data appears consistent with the theoretical speculation that describes mindfulness as a propensity to open up and get in touch with experiences rather than closing in on their own thoughts (Thompson and

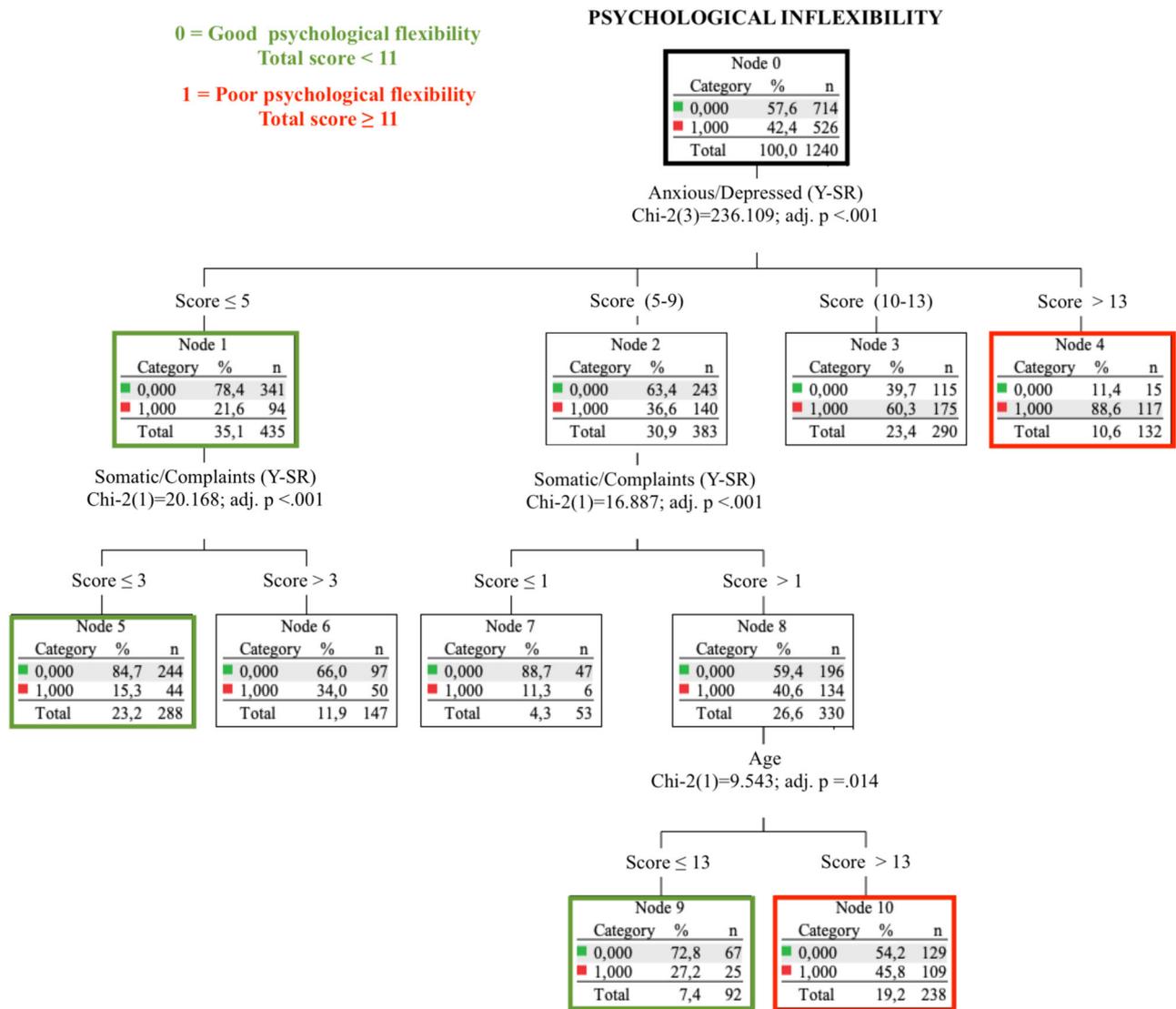


Fig. 4 Classification tree analysis showing subgroups with good and poor psychological flexibility

Gauntlett-Gilbert 2008), and consistent with some studies that found an association among mindfulness, mood fluctuations, and social skills in adolescents and young adults (Beauchemin et al. 2008; Brown et al. 2011; Hayes et al. 2010; Scagnelli et al. 2017).

A further result is related to psychological flexibility. Results show that the absence of somatic symptoms is the second component that discriminates adolescents with high psychological flexibility from those with poor psychological flexibility. The role of acceptance and psychological flexibility in perception and reaction to pain and somatic symptoms is also documented both in adults, and in children and adolescents (Feinstein et al. 2011; Kanstrup et al. 2016; Wicksell et al. 2011). Finally, within the group with some symptoms of anxiety and depression, and at least one somatic symptom, participants with 13 years old or less

show better psychological flexibility than participants with more than 14 years old. This result can be read, from an ACT perspective, on the basis of language development. Adolescents learn to use language to categorize and judge their own experiences, including physical sensations, rather than to observe it for what it really is (Hayes and Gifford 1997); thus, the coherent use of language can lead, consistent with Relational Frame Theory, to psychological inflexibility that causes discomfort.

**Limitations and Future Research**

A number of methodological shortcomings should be taken into account in this exploratory study that provides only correlational results. The main limitation is the sole use of self-report measures. Parent and teachers reports can

overcome this issue, and further studies should apply multiple source measures and replicate our results. A further limitation is that we have not yet administered I-CAMM and I-AFQ-Y to a clinical population. In the light of what is stated above, it is recommended that future studies aim to include a clinical population assessed with standardized diagnostic tools and test the cut-offs that we have found in our study population. Finally, the study design does not allow us to make statements on predictive validity of the instruments: longitudinal studies are needed to determine the predictive value both of the I-CAMM, and I-AFQ-Y in the development of internalizing behaviors and psychological disorders.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all participants included in the study.

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