# Factor Structure and Psychometric Properties of a New Scale to Assess Alexithymia-Like Features in Japanese Youth

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**Background:** Studies of alexithymia have primarily targeted adult populations. Although some recent studies of alexithymia have focused on children and young adolescents, the literature is not sufficient for development of an assessment tool. The aim of this study was to develop, and evaluate the psychometric properties of, a new scale to measure alexithymia-like features in young adolescents.

**Methods:** A total of 1,444 Japanese junior high school students (701 males, 743 females; age range 12-15; mean [SD] age, 13.37 [0.98] years) participated in 2 surveys conducted at their own schools.

**Results:** First, exploratory factor analysis of the first survey data (n=981) demonstrated that this new scale had a unifactor structure, as determined by minimum average partial analysis and parallel analysis. Second, confirmatory factor analysis of the second survey data (n=463) confirmed the unifactor structure of this new scale and acceptable goodness of model fit. The new scale had modest internal consistency.

**Conclusions:** The correlations of this new alexithymia scale with related variables were weak but significant, in accordance with our hypothesis. The scale had acceptable reliability and convergent validity and thus might be useful for measuring alexithymic tendency in young adolescents.

(J Nippon Med Sch 2020; 87: 285-293)

Key words: alexithymia, children/adolescents, scale development, reliability, validity

## Introduction

Alexithymia is a complex of features that refers to severe deficits in the cognitive and affective components of emotional experience<sup>1</sup>. Alexithymia has been defined<sup>1,2</sup> as reduced capacities for emotionalizing, fantasizing, identifying emotions, verbalizing emotions, and pensé opératoire<sup>3</sup>, or analyzing emotions. Alexithymia-like features are assumed to be common in psychosomatic patients, and existing evidence indicates a relationship of alexithymia with physical and mental health problems. Previous studies have focused on psychosomatic disorders<sup>4</sup> and somatoform disorders<sup>5</sup>, depressive symptoms<sup>6</sup>, the link between alexithymia and childhood trauma<sup>7,8</sup>, conduct disorders<sup>9</sup>, substance use disorders<sup>10</sup>, and self-harming behaviors<sup>11</sup>. Alexithymia can be viewed as a per-

sonality trait<sup>1,6</sup> or state<sup>13,14</sup> but is sometimes regarded as a state and trait phenomenon<sup>10</sup>. Most studies of alexithymia have focused on adults and thus it is difficult to apply exisitng findings to children and adolescents.

A number of recent studies of alexithymia have investigated youth populations. The prevalence of alexithymia in children and adolescents was reported to range from 7.3% to 29.9%<sup>15-18</sup>, as compared with a rate of 10% in adult populations<sup>19,20</sup>. Some previous studies found that age is inversely correlated with alexithymia score<sup>16,21</sup>, while other studies found that scores remained stable throughout life<sup>22</sup> or increase with grade level in junior high school<sup>23</sup>. Säkkinen et al.<sup>16</sup> claimed that alexithymia prevalence decreased from early adolescence to middle adolescence, as the ability for emotional recognition in-

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https://doi.org/10.1272/jnms.JNMS.2020\_87-507

Journal Website (https://www.nms.ac.jp/sh/jnms/)

creased with age in children and adolescents. Findings on alexithymia in youth populations are limited but, in children as in adults, alexithymia was found to be associated with physical and mental health problems, such as migraines, depression, anxiety, and eating disorders<sup>24-28</sup>.

Various methods have been used to measure alexithymia, including an interview-based approach, observer-based evaluation, and self-rating; self-reported measures are the most widely used assessment<sup>29</sup>. The Toronto Alexithymia Scale (TAS-20)<sup>30,31</sup> is widely used and consists of 3 factors: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. The Bermond-Vorst Alexithymia Questionnaire (BVAQ)<sup>32</sup> was developed because the TAS-20 can only measure the cognitive facet of alexithymia. The BVAQ consists of 2 high-order factors and 5 subfactors, namely, cognitive components (verbalizing: the degree to which one is able to or inclined to describe or communicate one's emotional reactions; identifying: the degree to which one can identify one's own emotions or arousal sates; and analyzing: the degree to which one seeks cognitive explanations of one's own emotional reactions) and affective components (fantasizing: the degree to which one is inclined to fantasize, imagine, and daydream; and emotionalizing: the degree to which one can be mentally and emotionally aroused by emotion-inducing events). The BVAQ can measure both fantasizing (lack of fantasy) and experiencing (lack of emotional experiences), which are important aspects of alexithymia<sup>33-35</sup>, while the TAS-20 does not measure affective components. Both measures are commonly used in adult populations.

For measurement of alexithymia in youth populations, the TAS-20 can be used for adolescent population samples<sup>16,22</sup>, while the Alexithymia Questionnaire for Children (AQC)<sup>36</sup> and the Alexithymia Scale for Adolescents (ASA)<sup>23</sup> have been developed by adapting the TAS-20 for those populations. Like the TAS-20, both the AQC and ASA comprise 3 factors.

However, the TAS-20 and AQC have only 3 features related to alexithymia-cognitive components, while the AQC has also been described in terms of unstable factor structures, such as 2-factor<sup>37,38</sup> and 3-factor structures<sup>36</sup>. Moreover, previous studies of the TAS-20 for adolescents and AQC have indicated that a third factor, "externally oriented thinking," had low factor loadings and low reliability<sup>37,38</sup>. In contrast, the BVAQ consists of 5 features, including not only alexithymia-cognitive but also affective components, which the TAS-20 and AQC do not measure, although the BVAQ was developed for adults. Thus,

a new scale for evaluating alexithymia in children and adolescents should be developed with reference to the BVAQ.

Using the BVAQ as reference, we aimed to develop a new scale for measuring alexithymia-like features in youth populations and to evaluate the factor structure, gender differences, and psychometric properties, such as reliability and validity, of the scale. We hypothesized that this new scale would correlate with depressive tendencies and difficulty in recognizing the emotions of others. In this study, we describe alexithymia in children and adolescents as "alexithymia-like features," as alexithymia might vary because of this population's immature emotional and cognitive development. There is a possibility for future development in this respect. No conclusion has been reached as to whether alexithymia is a trait or state. That being the case, those with alexithymic tendencies, as evaluated by any scale, would comprise only those who have alexithymia-like features at the time of measurement, without regard to what might happen in the future. Therefore, we refer to the new scale developed in this study as the Alexithymia-like Features Scale for Youth (AFS-Y).

### Methods

#### **Participants and Procedures**

Two surveys were administered to 1,444 students (701 males, 743 females; age range, 12-15 years; mean [SD] age, 13.37 [0.98] years) of Japanese junior high schools. We invited 6 junior high schools in the Kanto and Chubu regions of Japan to participate in this study, and 3 agreed. The set of questionnaires (see Measures below) was distributed to students by classroom teachers at the schools. After the students completed the questionnaires, the teachers collected the data.

To investigate descriptive statistics and gender differences and explore the factor structure of the AFS-Y, we administered the first survey to 981 students (467 males and 509 females; age range 12-15 years; mean [SD] age, 13.15 [0.92] years). Then, to evaluate the reproducibility of the AFS-Y factor structure with confirmatory factor analysis, the internal consistency and convergent validity of the AFS-Y, we administered the second survey to 463 students (231 males, 232 females; age range, 12-15 years; mean [SD] age, 13.86 [0.90] years).

Potential participants in both surveys were excluded from subsequent statistical analysis if any administered measures were not completed. To ensure participant anonymity, we did not obtain their written consent. The authors provided an information page concerning informed consent as the cover of the set of questionnaires, and participants were then informed that they could refuse to answer the questionnaire if they did not agree to participate in the study. Additionally, we asked the classroom teachers who distributed the questionnaires to help participants by providing verbal instructions about the information page. Thus, answering the questionnaires was regarded as informed consent to participate.

## **Ethical Approval**

The Ethics Committee of the University of Tsukuba (25-146) approved this study. The study procedures were conducted in accordance with the ethical standards of the Declaration of Helsinki<sup>39</sup>.

# Measures

The Alexithymia-like Features Scale for Youth (AFS-Y)

To develop the new scale, we referred to the BVAQ<sup>32</sup>, a 40-item, self-rated measure for evaluating alexithymia by using a 5-point Likert scale. The BVAQ consists of 2 high-order factors and 5 subscales with 8 items per scale, namely, cognitive components (verbalizing, identifying, and analyzing) and affective components (fantasizing and experiencing). The questionnaire was reported to have good psychometric properties<sup>32,40</sup>, and the Japanese version has already been developed<sup>41</sup>. When selecting items for the AFS-Y, we discussed which items were appropriate for Japanese junior high school students (age 12-15 years), which items fit the study purpose, and what was the participant burden for answering the items. We consulted several practicing junior high school teachers on the simplicity, language, and understandability of the items, until consensus had been reached. Finally, while taking account of factor loadings in the Japanese version of the BVAQ, we adopted 15 items (6 normal items and 9 reversed items) comprising 5 subscales, with 3 items per subscale.

Like the BVAQ, the 5 subscales of the AFS-Y are verbalization, fantasizing, identifying, experiencing, and analyzing. Each subscale has 3 self-rated items that measure alexithymia-like features, which are evaluated on a 4point scale ranging from 0 (it never applies to me) to 3 (it very often applies to me). General instruction was provided ("Please read each of the following 15 items carefully. For each item, circle the answer that most applies to you: 3 = applies very much; 2 = mostly applies; 1 = somewhat applies; 0 = does not apply"). The sum of the items is the total score, and higher scores indicate a greater tendency for alexithymia-like features. Additionally, an English version of the items and instructions prepared for this publication was accurately translated by a Japanese translation agency, with careful consideration of age-appropriate readability and simplicity.

The Depression Self-Rating Scale for Children (DSRS-C)

The DSRS-C comprises 18 self-rated items that measure the depressive tendencies of elementary and junior high school students for 1 week; items are scored on a 3-point scale ranging from 0 to 2<sup>42</sup>. The Japanese version of the DSRS-C was developed by Murata et al.43, and the Cronbach alpha coefficient was .77. In this study, 2 items about bullying and suicide were excluded from the surveys because the teachers who helped us were concerned about the possible negative effects that students might experience if the items were included. Therefore, we used 16 items of the DSRS-C, excluding the abovementioned 2 items. The 16-item version of the DSRS-C has been reported<sup>44</sup> and includes 2 subfactors: 1) diminished activity and enjoyment, and 2) depressive mood. We calculated the sum score of the 2 subfactor items separately. Higher sum scores for each subfactor item indicate greater diminishment of activity and enjoyment and worse depressive mood.

Emotional Skills & Competence Questionnaire (ESCQ) for Japanese Junior School Students

The ESCQ45 is a 45-item, self-rated questionnaire for assessing emotional intelligence. It includes 3 subscales, namely, perceive and understand emotions (e.g., "When I see how someone feels, I usually know what has happened to him"), express and label emotions (e.g., "I am able to express my emotions well"), and manage and regulate emotions (e.g., "When I am in a good mood, every problem seems soluble"). The Japanese version of the ESCQ (J-ESCQ)<sup>46</sup>, as well as the 28-item version of the J-ESCQ for junior high school students<sup>47</sup>, have already been developed. We only used the subscale "perceiving and understanding others' emotions (PUOE)" of the J-ESCQ for junior high school students. This subscale evaluates the tendency to perceive and understand others, such as friends; the Cronbach alpha coefficient was .84<sup>47</sup>. The subscale has 8 items scored on a 4-point scale ranging from 1 to 4. The sum of all items is the total score, and higher scores indicate greater perception and understanding of others' emotions.

### Statistical Analysis

# Descriptive Statistics

We calculated mean scores, standard deviations, and skewness/kurtosis statistics for each item of this new scale with the first survey data.

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	No.	Item	Mean	SD	Skewness	Kurtosis
Verbalizing	1	I like to talk to everyone about my feelings.	1.32	1.03	0.19	-1.11
-	6	I am good at expressing my feeling in words.	1.11	1.01	0.52	-0.85
	11	I have been told by people around me that I should talk about my feelings more.	0.67	0.94	1.23	0.41
Fantasizing	2	I like to imagine various things.	1.76	1.08	-0.31	-1.19
-	7	Before going to sleep at night, I often reflect on the day's accomplishments.	1.03	1.06	0.60	-0.95
	12	I would rather do something else than imagining some- thing.	0.89	0.96	0.79	-0.45
Identifying	3	During unpleasant times, I understand whether I am angry, sad, or scared.	1.87	1.07	-0.47	-1.06
	8	Sometimes I do not know how I am feeling.	1.01	1.01	0.62	-0.77
	13	When I am irritated, I usually know why.	1.80	1.04	-0.41	-1.02
Experiencing	4	When I see someone crying, I become sad.	1.61	1.06	-0.18	-1.20
	9	No matter how difficult something is, I remain calm.	1.09	0.95	0.49	-0.71
	14	Even if everyone around me is happy, I remain calm.	0.90	0.93	0.78	-0.30
Analyzing	5	I often think about my feelings.	1.52	1.05	-0.03	-1.19
	10	If something unpleasant happens, I try not to think about it as much as possible.	1.32	1.06	0.18	-1.20
	15	If I am worried about something, I try to find the reason why.	1.42	1.09	0.04	-1.29

 Table 1
 Descriptive statistics for items on the Alexithymia-like Features Scale for Youth

Factor Structure, Item Response Theory, and Gender/ Grade Differences

To evaluate the factor structure of the AFS-Y, we performed an exploratory factor analysis (EFA) of the factor structure in the first survey data. We also calculated item-parameter and test information functions by using item response theory (IRT), followed by confirmatory factor analysis (CFA) to verify and reproduce the factor structure of the AFS-Y with the second survey data; principal axis factoring was used as the extraction method. Each correlation matrix for the AFS-Y was subjected to EFA and CFA. We decided the number of factors by using minimum average partial (MAP) analysis and parallel analysis when performing the EFA. With respect to the benchmarks of factor loading, our intention was to be inclusive by over .35. Additionally, 2-way ANOVA was performed to investigate gender/grade differences of the scale with the second survey data.

# Reliability

To evaluate reliability as the internal consistency of AFS-Y, Cronbach alpha coefficients were computed with the second survey data. An alpha of greater than .70 is widely accepted as indicating adequate reliability.

### Validity

Pearson coefficients were calculated for the correlations of total AFS-Y score with the other targeted variables (the DSRS-C and PUOE). We hypothesized that higher AFS-Y scores indicated greater depressive tendencies and lower perception and understanding of others' emotions.

The EFA and IRT were conducted with HAD15.0<sup>48</sup>, CFA was calculated by Mplus 8.1<sup>49</sup>, and the other statistical analyses were performed by using IBM SPSS Statistics, version 26.

# Results

#### **Descriptive Statistics and Factor Structure**

Descriptive statistics for all AFS-Y items are shown in **Table 1**, including mean scores, standard deviations, and skewness/kurtosis values. All items were within the recommended range (±2) for skewness and kurtosis<sup>50</sup>.

From the first survey data, the item properties of the AFS-Y were investigated, and some floor effect was observed (items #11, 12, 14). Then, using the remaining items, we conducted MAP analysis to determine the factor structure of the AFS-Y. The item correlation matrix was found to be 0.028, 0.047, 0.073, and 1.097..., suggesting a unifactor solution. Parallel analysis also indicated that the AFS-Y would have a unifactor structure. On the basis of these findings, EFA was conducted, and some items (items #8, 9, 10) showed low communality. With the exception of these items, the AFS-Y factor structure was determined (Table 2). Moreover, we conducted IRT, and Table 3 shows the results of the discrimination parameters (a) and threshold (difficulty) parameters (b1, b2, b3). All items in the AFS-Y were adequately discriminative and neither too easy nor too difficult.

	Item	Factor	communality
5	I often think about my feelings.	.774	.599
1	I like to talk to everyone about my feelings.	.723	.522
6	I am good at expressing my feeling in words.	.691	.478
3	During unpleasant times, I understand whether I am		
	angry, sad, or scared.	.691	.478
2	I like to imagine various things.	.657	.432
7	Before going to sleep at night, I often reflect on the		
	day's accomplishments.	.651	.423
4	When I see someone crying, I become sad.	.650	.422
15	If I am worried about something, I try to find the		
	reason why.	.647	.418
13	When I am irritated, I usually know why.	.567	.322
	Contribution	4.095	

Table 2 Factor structure of the Alexithymia-like Featur	s Scale	for Y	outh
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Table 3 Item parameters of the Alexithymia-like Features Scale for Youth

	Item	Discrimination	b1	b2	b3
1	I like to talk to everyone about my feelings.	1.32	-0.81	0.23	1.25
2	I like to imagine various things.	1.04	-1.35	-0.36	0.64
3	During unpleasant times, I understand whether I am angry, sad, or scared.	1.17	-1.37	-0.52	0.45
4	When I see someone crying, I become sad.	0.99	-1.19	-0.24	0.98
5	I often think about my feelings.	1.44	-1.00	-0.05	0.91
6	I am good at expressing my feeling in words.	1.24	-0.55	0.60	1.45
7	Before going to sleep at night, I often reflect on the day's accomplishments.	1.06	-0.30	0.65	1.51
13	When I am irritated, I usually know why.	0.83	-1.58	-0.59	0.77
15	If I am worried about something, I try to find the reason why.	1.01	-0.87	0.03	1.17

*Note*: b1-b3 = threshold

We also performed CFA to confirm the unifactor structure of the AFS-Y and calculated the fit indices by using the second survey data. Covariance lines were drawn between the error terms for items 1 and 6, and items 3 and 13. The results yielded the following fit indices for the unifactor model: a comparative fit index (CFI) of .89, a standardized root mean square residual (SRMR) of .05, and a root mean square error of approximation (RMSEA) of .08 (90% CI, .07-.10). The results of CFA are shown in **Figure 1**.

Additionally, when we conducted 2-way ANOVA to investigate gender and grade differences for the total of 9 items of the AFS-Y (**Table 4**), the significant main effect of gender was that alexithymia was greater for boys (M = 12.37, SD = 4.89, 95% CI = 11.74-13.01) than for girls (M = 10.66, SD = 4.80, 95% CI = 10.04-11.28) in the AFS-Y (F(1, 456) = 14.09, p<.001,  $\eta p^2 = .03$ ).

# Reliability

We calculated alpha coefficients to evaluate the internal consistency of the AFS-Y including 9 items. The alpha was .88.

#### Validity

To evaluate the convergent validity of the AFS-Y, we calculated correlations of the AFS-Y with the targeted variables (**Table 5**). As we hypothesized, the AFS-Y was small but significantly positively correlated with diminished activity and enjoyment. Furthermore, there was a significant moderate negative correlation between the AFS-Y and PUOE but no correlation with depressive mood.

# Discussion

The present results indicate that the AFS-Y is a feasible tool for measuring alexithymia-like features in Japanese youth and has good or acceptable psychometric properties. There was no distortion of any item of the AFS-Y; however, this new scale has a single-factor structure, and 6 items were excluded as a result of the EFA. The BVAQ consists of 2 high-order factors and 5 subfactors, but not all studies have replicated the factor structure<sup>51,52</sup>. Several previous studies have reported the factor structure of the AQC, but the structure is not consistent among these

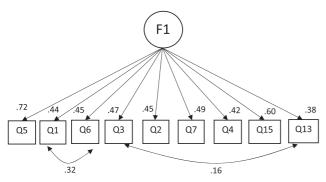


Fig. 1 CFA model for the ASF-Y and its standardized parameters. Note: CFA = Confirmatory Factor Analysis; AFS-Y

= the Alexithymia-like Features Scale for Youth.

studies<sup>38</sup>. All 6 excluded items were normal items (alexithymic), while 9 of the adopted items of the AFS-Y were reversed items (non-alexithymic). Recent studies noted that a self-reported scale with reversed-scored items is problematic because it tends to increase the cognitive burden on the examinee, produces a method factor within the scale's factor structure, and decreases internal consistency<sup>53</sup>. Thus, reversed items should not be used in the scale, and, as a result, the AFS-Y does not include such items. Additionally, although 6 items were excluded throughout the abovementioned process, we confirmed that the IRT yielded adequate psychometric properties for the AFS-Y. However, the 9 items adopted, which were non-alexithymic, were originally intended to be reversescored items and thus the user must now reverse the item score, which might be slightly burdensome.

Analysis of gender differences for the AFS-Y showed that alexithymia was greater for boys than for girls, which is consistent with the finding for an adult population<sup>19</sup>. However, another study of junior high school students<sup>23</sup> found that girls had greater difficulty than boys in identifying feelings (i.e., identifying on the BVAQ) and describing feelings (i.e., verbalizing on the BVAQ), while boys had higher externally oriented thinking (i.e., analyzing on the BVAQ). Another study reported mixed results in an analysis of differences in alexithymia in a young population<sup>8</sup>.

The AFS-Y has modest internal consistency; however, we did not investigate test-retest reliability. Evidence regarding whether alexithymia is a trait or state is unclear, and we are unable to state whether the alexithymic features measured by the AFS-Y are a trait or state scale. Some previous studies noted that alexithymia reflects a stable trait in both adults and late adolescents<sup>54</sup>. How-

Table 4 Gender and grade-level differences in means (SD) of the Alexithymia-like Features Scale for Youth

	Grade	Mean	SD	N
Male	1st grade	12.11	4.591	71
	2nd grade	12.69	4.919	80
	3rd grade	12.29	5.144	79
	Total	12.37	4.885	230
Female	1st grade	10.79	4.911	78
	2nd grade	10.6	4.802	67
	3rd grade	10.59	4.761	87
	Total	10.66	4.804	232
Total	1st grade	11.42	4.79	149
	2nd grade	11.73	4.961	147
	3rd grade	11.4	5.005	166
	Total	11.51	4.914	462

ever, another study reported that alexithymia scores were higher for a teenage population than for other age groups<sup>21</sup>. Säkkinen et al.<sup>16</sup> concluded that adolescence is a significant developmental period emotionally, psychologically, and socially and that alexithymia tendency could decrease between early and late adolescence because of increasing recognition of emotions. Thus, we avoided labelling young adolescents in this study as alexithymic and instead referred to them as having "alexithymia-like features", as they are in the midst of emotional development. Although no difference was found in relation to grade level in this study, future studies should evaluate test-retest reliability and whether alexithymia-like features measured by this new scale indicate a trait or state.

Considering the validity of the AFS-Y, the present AFS-Y scores showed a correlation with the targeted variables, depressive tendencies, and perceiving and understanding the emotions of others, as we hypothesized. Therefore, we conclude that the convergent validity of the AFS-Y is partially supported by these findings. An interesting point is that AFS-Y scores positively correlated with diminished activity and enjoyment of the DSRS-C but not with depressive mood. Jellesma et al.55 noted the potential problem that self-reports yield information on an individual's subjective perception but fail to provide information on actual abilities. Alexithymic individuals are believed to have difficulties in describing and identifying their own emotions. Therefore, young adolescents, who could be alexithymic, could misread items related to depressive mood (eg, "I feel so sad I can hardly stand it" or "I feel very bored") or fail to recognize whether they match the content of each item. Additionally, Saarni<sup>56</sup> ex-

	AFS-Y total	Diminished	Mood	DSRS Total	PUOE
DSRS-C					
Diminished	0.354**	-			
Mood	-0.084	0.294**	-		
Total	0.197**	0.851**	0.753**	-	
PUOE	-0.527**	-0.174**	0.148**	-0.037	-

 Table 5
 Correlations of subscales of the Alexithymia-like Features Scale for Youth with other variables

Abbreviations: DSRS-C, Depression Self-Rating Scale for Children; Diminished, subscale for diminished activity and enjoyment of DSRS-C; Mood, subscale for Depressive Mood of DSRS-C; Total, total score of DSRS-C; PUOE, Perceiving and Understanding Others' Emotions.

Note: \*\*p<.01, \*p<.05

plained that the 7 emotion management skills and awareness of own emotions, which is the ability to identify and label internal emotional experiences, are a fundamental first skill for processing and handling emotions. To initiate effective strategies to regulate emotions, people must first recognize the presence of a distinct aversive emotional state that needs to be regulated<sup>57</sup>. Saarni<sup>56</sup> also reported that people can obtain the second skill of understanding the emotions of others after first, or simultaneously, obtaining awareness of one's own emotions. Thus, people who do not recognize their own emotions are unlikely to discern and understand the emotions of others, as we hypothesized. Although our study results therefore partially support the convergent validity of the AFS-Y, we only evaluated correlations of the AFS-Y with 2 variables. Further studies concerning the correlations with external criteria are required in order to further evaluate the validity of the scale.

The results above suggest that the AFS-Y reflects alexithymia-like features in young adolescents. Moreover, these findings for youths are consistent with the results of previous studies, although almost all previous studies of alexithymia targeted adults. To be sure, a self-reported scale is limited by the gap between the subjective perception and actual abilities of a person (e.g., Jellesma et al.<sup>55</sup>), and higher AFS-Y scores indicate a greater decline in activity and lower perception and understanding of the emotions of others. Thus, young adolescents with alexithymia-like features might develop mental health problems and interpersonal conflicts because of difficulties in understanding the emotions of others. This short, easy-to-use scale for evaluating alexithymia-like features will likely be useful for screening young adolescents with potential health risks.

#### Limitations

First, this study targeted healthy junior high school students, not children in clinical care, and the survey was conducted in a fairly small area of Japan. We therefore cannot exclude the possibility of selection bias, and the suitability of the scale for use with clinical samples is unknown. Additionally, we did not evaluate test-retest reliability and thus cannot evaluate the time stability of the scale. Finally, we did not investigate the relationship between the AFS-Y and other alexithymia scales for young adolescents.

#### Conclusion

This study used a Japanese sample to develop a new scale for assessing alexithymia-like features in junior high school students and to evaluate factor structure, reliability, and validity. The results indicate that this new scale has a 9-item, validated, single-factor structure and moderate validity and reliability. Nevertheless, the scale requires further study of other psychometric properties, such as in a clinical sample.

Acknowledgements: We wish to express our gratitude to all the participants and the staff of each junior high school who contributed to this study. We also thank Dr. Chisa Okubo for her assistance and Editage (www.editage.jp) and Ulatus (www.ulatus.jp) for English language editing.

**Funding:** This work was supported by the Japan Society for the Promotion of Science KAKENHI (grant number 23730646).

**Data availability statement:** Not applicable because no datasets were generated or analyzed in this study.

Conflict of Interest: The authors report no conflicts of inter-

est.

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(Received, November 29, 2019)

(Accepted, January 21, 2020)

(J-STAGE Advance Publication, February 20, 2020)

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