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Development and Validation of a New Measure of Everyday Adolescent Functioning: The Multidimensional Adolescent Functioning Scale

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ABSTRACT

Purpose: Everyday functioning is an important outcome for studies of the developmental psychopathology of adolescence. An unbiased, well-validated, and easy-to-use instrument to specifically assess normal adolescent functioning is not yet available. The current study aimed to introduce and validate the Multidimensional Adolescent Functioning Scale (MAFS).

Methods: The MAFS was developed by clinical consensus, resulting in a 23-item self-report questionnaire with three distinct subscales: general functioning, family-related functioning, and peer-related functioning. MAFS data were collected in a general population sample (N = 842; mean age = 15.0 years [standard deviation = .4]) at baseline and again at 1- and 3-year follow-up. Psychometric analyses included confirmatory factor analysis, calculations of internal consistency, scale correlations, and correlations with the abridged General Health Questionnaire.

Results: Confirmatory factor analysis showed that the hypothesized 3-factor structure fits well to the MAFS data. All scales showed adequate internal consistency (greatest lower bound: .75–.91) and sufficient discriminative ability (scale intercorrelations: $\rho = .15$ –.52). Of the scales, general functioning was most strongly correlated with the General Health Questionnaire, whereas family- and peer-related functioning showed weaker correlations with this general measure. The results were stable across repeated measurements and gender groups.

Conclusions: The MAFS is an easy-to-use instrument with good psychometric characteristics, which could be suitable for a broad range of future research applications, especially when a multidimensional and unbiased indication of normal adolescent functioning is required.

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IMPLICATIONS AND CONTRIBUTION

The Multidimensional Adolescent Functioning Scale (MAFS) is introduced as a 23-item self-report questionnaire to assess normal adolescent functioning, distinguishing general, family-related, and peer-related functioning. The MAFS was shown to be an easy-to-use instrument with good psychometric characteristics, which could be suitable for a broad range of future research applications.

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Level of daily functioning is an important outcome domain in psychopathological research and adds important information on individual's situation regardless of his or her formal diagnosis. Even within clinical populations, daily functioning and psychiatric diagnosis are not necessarily dependent on each other [1]. Instead, other factors such as perceived social support [2] and the ability to cope with problems in a constructive way [3] also affect the level of functioning.

Instruments that assess functioning are usually designed from a clinical perspective, taking pathology or nonnormality as a starting point. They assess impaired functioning, along with psychopathology and mental health problems, or are part of screening instruments for clinical psychiatric diagnoses. In line with this, these scales are usually designed to detect major changes associated with psychopathology and treatment response. For instance, the widely used General Health Questionnaire (GHQ) [4] was intended to screen for psychiatric illness in general practice, and the Global Assessment of Functioning [5] includes assessments of psychopathological symptoms and functioning into one scale. Because of this, the indication of functional deterioration that these instruments provide is likely to be linked to the severity of psychopathology. This is useful clinically, but it makes these instruments unsuitable for use in populations that are relatively “healthy”, where functional changes may be much more subtle and specific to distinct aspects of life, such as peers or family. Although small functional changes might seem insignificant, they could be predictive of an increased risk of future psychopathology and may be a source of distress for the individual. Confounding of functional ratings by psychopathology is avoided if a measure only assesses functioning and not symptoms (e.g., the Social and Occupational Functioning Assessment Scale) [6].

All aforementioned instruments were designed for adults, which makes them less than optimal for use in adolescents. Adolescence is a dynamic developmental period characterized by numerous biological, psychological, and sociological changes [7]. Consequently, functioning in this period is different from functioning in adulthood. During adolescence, young people begin the process of individuation and separation from their parents [8]. Although family ties are still important to adolescents [7,9], peers are becoming increasingly significant, and levels of family and peer functioning may become quite different. In addition, the behaviors, thoughts, and priorities deemed appropriate in adolescence differ from adulthood. For these reasons, measurements of adolescents functioning should take these differences into account.

Currently, there are several instruments to assess the functioning of children and adolescents, in the form of either rating scales or self-report questionnaires [10]. The Child Global Assessment Scale (CGAS) [11] is a one-dimensional rating scale, designed to measure functional changes resulting from emotional disturbance. The CGAS is simple, quick, and cheap to administer, but this also makes the CGAS quite ambiguous and insensitive to subtle changes. Multidimensional ratings include the “Global Functioning Scales: Social” and “Global Functioning: Role” rating scales [12], which allow for some degree of differentiation between functional domains. Other multidimensional ratings for children and adolescents, such as the Child and Adolescent Functional Assessment Scale [13–15], have also been developed [10,16]. Unfortunately, despite their ease of use, rating scales have inherent problems. First, raters are often not in the position to adequately judge the level of functioning, especially when it comes to adolescent-specific issues (e.g., peer relations) or sensitive information. Second, raters need experience and time-consuming training. Third, rating scales are susceptible to rater bias [17,18]. Alternatively, one could use self-report questionnaires, such as the Youth Self Report [19] or the Child Behavior Check List [20], which provide subscales to assess psychopathology-related functioning. As argued earlier in the text, this makes them less than optimal to assess normal functioning. The Child Behavior

Check List also incorporates parallel ratings by parents or teachers for use with children. However, by adolescence, individuals can report on their own functioning, and the participation of parents in research is not always appropriate, given the confidentiality involved, adolescents’ growing personal independence, and the extra costs this incurs.

Taken together, there is a need for an instrument capable of assessing adolescent functioning, which takes normality, rather than pathology, as a starting point. This instrument should use a multidimensional approach to assessing different domains of adolescent functioning, focus on the subjective experience of the adolescents, and be logistically simple, financially viable, and useful for small studies, as well as large cohort studies. This article introduces a questionnaire that meets these requirements: the Multidimensional Adolescent Functioning Scale (MAFS). The MAFS is a 23-item self-report questionnaire covering three domains of adolescent functioning: general functioning (MAFS-GF), peer functioning (MAFS-PF), and family functioning (MAFS-FF). This questionnaire was designed for general populations and populations at-risk for psychopathology. Therefore, the MAFS takes normality as a reference point and does not assess psychopathological symptoms, enabling the measurement of functioning to be made independent of psychopathology. The current study reports on the development and the psychometric evaluation of the MAFS in a large adolescent general population sample ($N = 842$).

Methods

Participants

Participants were recruited into this longitudinal study through secondary schools in the western metropolitan region of Melbourne, Australia. Thirty-four schools participated (20 government, 5 Catholic, and 9 independent schools). Three data collection waves were completed. All participants were in grade 10 at baseline (T1). In Australia, young people are required to remain in schooling until the end of grade 10.

At baseline (T1), 842 participants completed the MAFS without any missing responses. After 12 months, 593 participants completed the MAFS (70.4% of T1 participants). Those who did not participate were of the same age ($p = .13$) and had similar gender distribution ($p = .25$) and similar scores on the MAFS ($p = .20-.52$) as those who returned at T2. At T3 (3 years after baseline), 483 participants completed the MAFS. Included participants at T3 had similar mean age ($p = .30$) and MAFS test scores ($p = .22-.43$), but were less likely to be male (43.5%) than those who were not included at T3 ($p = .001$). Because no repeated measures analyses were done, participants were not required to have scores at all time points: the groups did not completely overlap between T1, T2, and T3. Forty-two participants were only assessed at T1 and T3, 14 were only assessed at T2 and T3, and two were only assessed at T3.

Procedure

At T1, students from each school were assessed using a questionnaire during one study period. Trained research assistants were present in the classroom to answer queries. All participants provided written informed consent and assent from their parent/guardian. The second wave of data collection (T2) was conducted 12 months later. Participants were contacted and invited to take

Table 1
The MAFS items arranged according to subscale

MAFS subscales		
General functioning (MAFS-GF) I feel like I am working toward a goal (related to work or study). I am pleased with how my life is going. I look after my health.	Family-related functioning (MAFS-FF) My parents' rules are reasonable. I get on well with my parents. My parents disapprove of my friends, lifestyle, or appearance. My living arrangements are stable. Members of my family are disappointed in me. My family are supportive of me when I need it.	Peer-related functioning (MAFS-PF) My friends are encouraging. I feel close to my friends. I spend quite a lot of time with my friends. My friends are often disappointed in me. My friends are supportive of me when I need it. My friends disapprove of me in some way (e.g., lifestyle or appearance).
I have plenty to do most of the time. I often feel bored. I am pleased with what I have achieved in my life so far.	My parents are encouraging.	—
I am in good physical health. I attend school/university/work regularly. I get along well with my teachers or supervisor/boss. I think that going to school/TAFE/university or work is important for my future.	— — —	— — —

MAFS = multidimensional adolescent functioning scale; TAFE = technical and further education.

part in this phase of the study, regardless of whether they were still attending school. This assessment comprised a semi-structured interview and questionnaires. Written consent was once again obtained from participants and from their parent/guardian if they were still under 18 years of age. This process was repeated 3 years after baseline assessment (T3). The study was approved by the Research and Ethics Committees at the University of Melbourne, of the Victorian Department of Education and of the Catholic Education Office.

Measures

The multidimensional adolescent functioning scale. The MAFS is a self-report questionnaire, designed to measure different aspects of adolescent functioning. It consists of three subscales that are aimed at assessing “MAFS-GF,” “MAFS-FF,” and “MAFS-PF.” The MAFS-GF scale covers a broad range of functional domains, including school, physical health, life satisfaction, and perceived achievements. The MAFS-FF scale covers functioning in the context of the family including closeness to parents and perceived parental support. The MAFS-PF scale covers functioning in the context of peers and/or friends including approval and support by friends.

The items of the MAFS were designed and assembled by adolescent psychologists and an adolescent psychiatrist (A.R.Y., E.K., and E.C.). The investigators conducted workshops with mental health clinicians (clinical psychologists and psychiatrists) experienced in working with adolescents. These clinicians suggested relevant areas of functioning and wording for items. The inclusion of three domains (GF, FF, and PF) was considered to yield the best and most useful representation of daily adolescent functioning. Additionally, a small focus group of three adolescents was held during which the young people selected items that they preferred. Based on these experiences, a number of candidate items were designed for each of the three subscales, leading to the assembly of an initial pool of 42 candidate items. The time taken to complete the MAFS was also assessed. Eventually, the development resulted in a questionnaire of 23 items. The included items per subscale are presented in Table 1, and the complete questionnaire can be found in Supplement 1.

For each MAFS item, the respondent is asked to rate how well the statement describes his/her situation on a 4-point Likert scale that ranges from 1 (not at all or rarely) to 4 (always or

almost always). If a statement is not applicable, the respondent can answer with 0. Each subscale score is calculated by simply adding up the item scores within each scale. The MAFS-GF subscale consists of 10 items and has a scoring range of 0–40, the MAFS-FF subscale includes seven items and has a scoring range of 0–28, and the MAFS-PF consists of six items and has a scoring range of 0–24. On all scales, a higher score indicates better functioning.

The MAFS includes the following five reverse-keyed items that have to be rescored before subscale computation: item 8 (I often feel bored), item 9 (my parents disapprove of my friends), item 13 (members of my family are disappointed in me), item 15 (my friends are often disappointed in me), and item 18 (friends disapprove of me in some way).

Other measures. The participants completed the abridged GHQ-12 [21], a widely used 12-item screening instrument of mental well-being. The GHQ-12 items are scored on a 4-point Likert scale (from 0 to 3; range: 0–36), with higher scores indicating worse functioning. The GHQ-12 has been shown to have good psychometric properties in Australian adolescents [22].

Statistical analyses

Confirmatory factor analyses. To evaluate whether the hypothesized latent 3-factor structure (GF, FF, and PF) was represented by the collected MAFS data, Confirmatory Factor Analyses (CFA) were conducted with EQS 6.2 (Multivariate Software, Inc., Encino, CA) [23].

The items were ordinal Likert type and nonnormally distributed. Therefore, the EQS procedure for ordinal data was followed [23,24]. In this procedure, the polychoric correlation matrix of the items is computed first, following the method by Lee, Poon, and Bentler [25]. These polychoric correlations are computed under the assumption that the items are categorical representations of underlying continuous variables that are normally distributed. Next, to estimate model fit, maximum likelihood (based on reweighted least squares) estimation is used to obtain the normal theory χ^2 and fit estimations. Finally, to acquire fit estimations that are appropriate for categorical nonnormal data, the χ^2 and test statistics are adjusted with a large optimal weight matrix [23]. The resulting robust Satorra–Bentler χ^2 and fit indices are used to judge model fit [23,26].

Table 2
Characteristics of the research sample at three consecutive time points

Characteristic	T1	T2	T3
N	842	593	483
Gender, n females (%)	450 (53.4)	323 (54.5)	273 (56.5)
Age (years) (mean, SD)	15.0 (.4)	16.0 (.4)	18.0 (.4)
MAFS (mean, SD)			
General functioning	30.7 (5.3)	32.5 (4.7)	32.1 (5.5)
Family-related functioning	20.8 (3.4)	22.1 (3.0)	22.2 (3.2)
Peer-related functioning	18.9 (3.6)	20.4 (3.1)	20.4 (3.1)
GHQ-12 (mean, SD)	11.1 (6.2)	10.0 (5.4)	11.1 (5.5)

GHQ-12 = abridged general health questionnaire; SD = standard deviation.

Model fit was investigated with fit indices instead of the traditional χ^2 test because the latter is oversensitive to minor deviations from perfect model fit when testing complex models and when the sample is large [24]. The indices used were the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). A CFI of at least .90 indicates adequate fit ($\geq .95$ indicates good fit), and an RMSEA smaller than .08 indicates acceptable fit ($\leq .06$ indicates good fit). Together, these indices should indicate adequate model fit to conclude that the model is a good representation of the data [24].

In the tested model, three factors were defined (GF, FF, and PF). Items were set to load freely on their corresponding factor, except for one item per factor, which had its loading set to 1 to set the scale of the model and to ensure an identified model. Factor variances and covariances were set to be freely estimated. The error variances were set to be freely estimated (with loadings of 1 on all items).

Additional analyses. Several statistical analyses were performed to evaluate the psychometric properties of the MAFS. All analyses were performed three times (T1, T2, and T3) to check the consistency of the findings over time. First, to evaluate the internal consistency, the greatest lower bound (GLB) reliability coefficient was calculated with EQS 6.2 for each MAFS subscale. The GLB incorporates the error variances of the items to calculate the lower bound of the possible range of the true reliability ρ ($GLB < \rho < 1$) [27]. The GLB enables a better evaluation of reliability than Cronbach α , which systematically underestimates reliability and does not incorporate measurement error [27]. Second, to investigate the amount of differentiation between the MAFS subscales, Spearman correlations (ρ) were calculated between each of them. Third, to evaluate the convergence with other functional measurements (convergent validity), correlations (ρ) between the MAFS subscales and the GHQ-12 were calculated. These analyses were conducted with SPSS 18.0 (SPSS, Inc., Chicago, IL). All analyses were repeated in male and female adolescents separately to investigate the generalizability of the MAFS psychometric properties across gender groups.

Results

Sample characteristics

The characteristics of the research sample at the three time points are shown in Table 2. At baseline, there were 842 participants, with a mean age of 15.0 years (standard deviation = .4). There were 450 (53.4%) female adolescents. The gender distribution remained stable across T2 (54.5% female adolescents) and T3 (56.5% female adolescents). The mean MAFS scores were slightly

higher at T2 and T3 compared with T1, but generally, the pattern of scores was comparable across time points. The mean GHQ-12 scores were slightly higher at T1 and T3 compared with T2.

Confirmatory factor analyses

The results of the CFA are presented in Table 3. The hypothesized 3-factor model fits the data well at T1 (CFI = .95; RMSEA = .055), T2 (CFI = .94; RMSEA = .057), and T3 (CFI = .95; RMSEA = .055). At all three time points, all factor loadings, factor variances, and factor covariances were significant at the .05 level. The average standardized residuals ranged from .056 to .068 across time and gender groups. These results indicated that a 3-factor structure adequately described the underlying structure of the data. Both in the male and female groups, adequate fit for the 3-factor structure was observed for both genders across all time points, with CFIs that ranged from .94 to .97 and RMSEAs that ranged from .041 to .059. Together, these findings supported the construct validity of the MAFS.

Internal consistency

The GLB coefficients are presented on the diagonals in Table 4 for both gender groups and for the three time points. At T1, the GLB ranged from .80 to .86 for male adolescents and from .75 to .83 for female adolescents. At T2, the GLB ranged from .80 to .85 for male adolescents and from .82 to .90 for female adolescents. At T3 the GLB ranged from .81 to .90 for male adolescents and from .87 to .90 for female adolescents. These results indicated that the internal consistency was in the adequate good range in all groups and consistently so for the three scales across gender and follow-ups.

Scale correlations

The correlations (ρ) between the subscales of the MAFS are presented separately for male and female adolescents in Table 4. At T1, correlations ranged from .37 to .49 in male adolescents and from .31 to .48 in female adolescents. At T2, correlations ranged from .37 to .52 in male adolescents and from .33 to .50 in female adolescents. At T3, correlations ranged from .15 to .40 in male adolescents and from .36 to .40 in female adolescents. These

Table 3
Confirmatory factor analysis to evaluate the fit of a 3-factor structural model to the MAFS data at three time points

Time-point	T1	T2	T3
Complete group			
S-B χ^2 (227)	813.7	667.6	519.6
CFI	.95	.94	.94
RMSEA (90% CI)	.055 (.051–.060)	.057 (.052–.062)	.055 (.049–.062)
Male group			
S-B χ^2 (227)	537.4	405.6	341.8
CFI	.94	.95	.96
RMSEA (90% CI)	.059 (.053–.065)	.054 (.045–.062)	.049 (.038–.059)
Female group			
S-B χ^2 (227)	523.3	482.5	329.9
CFI	.96	.94	.97
RMSEA (90% CI)	.054 (.048–.060)	.059 (.052–.066)	.041 (.031–.050)

All fit indices based on polychoric correlation matrices. CFI = comparative fit index; S-B χ^2 (227) = Satorra-Bentler χ^2 with 227 degrees of freedom; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA.

Table 4

Correlations and reliability coefficients of the MAFS-scales at three time points for male and female adolescents separately

Time-point	Gender	General functioning (GF)		Family-related functioning (FF)		Peer-related functioning (PF)	
		Male	Female	Male	Female	Male	Female
T1 (N = 842)	GF	.86	.81	—	—	—	—
	FF	.49	.48	.80	.83	—	—
	PF	.38	.31	.37	.37	.81	.75
	GHQ-12 ^a	-.45	-.57	-.24	-.37	-.28	-.29
T2 (N = 582)	GF	.84	.90	—	—	—	—
	FF	.52	.50	.85	.85	—	—
	PF	.40	.41	.37	.33	.80	.82
	GHQ-12 ^a	-.45	-.54	-.26	-.40	-.26	-.37
T3 (N = 426)	GF	.90	.91	—	—	—	—
	FF	.40	.36	.83	.87	—	—
	PF	.27	.40	.15	.37	.81	.88
	GHQ-12 ^a	-.46	-.48	-.23	-.37	-.16	-.36

Underlined coefficients are GLB reliability coefficients; correlations are Spearman's ρ coefficients (all significant at $p < .01$); and zero responses (not applicable) not included in the calculations.

^a Includes all participants with complete data on the MAFS and the GHQ-12.

results indicated moderate interrelatedness at all time points. At each time point, the correlation between MAFS-GF and MAFS-FF was highest, and the correlation between MAFS-FF and MAFS-PF was lowest. Interestingly, at T3, the correlations were considerably lower than at T1 and T2, especially for the male adolescents. This is likely to reflect the effect of increasing age on the differentiation between the assessed functional domains: family- and peer-related functioning become more independent with age.

Correlations with the GHQ-12

The correlations between the MAFS and the GHQ-12 are presented separately for male and female adolescents in Table 4. All coefficients were negative because MAFS-scores increase with better functioning and GHQ-12 scores increase with worse functioning. The strongest negative relationship was found between the MAFS-GF and the GHQ-12 across all time points (T1: $\rho = -.45$ and $-.57$; T2: $\rho = -.45$ and $-.54$; T3: $\rho = -.46$ and $-.48$ for male adolescents and female adolescents, respectively). This confirms the general nature of the MAFS-GF subscale. The GHQ-12 was only moderately correlated with the MAFS-FF ($\rho = -.23$ to $-.40$ across time points and gender) and the MAFS-PF ($\rho = -.16$ to $-.37$ across time points and gender), which is in line with the more specific nature of these MAFS subscales. Together, these results indicate that the MAFS can be used to assess both general and more specific aspects of adolescent functioning.

Discussion

We present a new questionnaire to assess everyday functioning in adolescents: the MAFS. Psychometric analyses of MAFS data collected in a large general population school sample supported the MAFS' internal consistency and construct validity. In addition, correlations between its scales indicated that three quite distinct domains of functioning can be assessed with the MAFS. Correlations between the MAFS-scales and the GHQ-12 indicated that the MAFS-GF scale was most strongly related to the GHQ-12's general functioning coverage. The MAFS-FF and PF scales were less strongly related to general functioning, support-

ing the idea that they assess more specific domains. The observation that peer- and family-related functioning was separate but correlated factors is in line with the theory that adolescents still depend on their parents/family but also get involved with peers in their own independent social circles [7]. In addition to its favorable psychometric properties, the MAFS is short in length, making it easy and cheap to administer.

An important characteristic of the MAFS is that it takes normality as its reference point. This makes the MAFS particularly valuable in clinical research because there is no overlap with symptoms. Other scales (e.g., the CGAS and Child and Adolescent Functional Assessment Scale) were designed to assess functioning in relation to emotional disturbance, which leads to them being correlated with psychopathology by default and can lead to an overestimation of the link between daily functioning and psychopathology. In addition, the focus on serious pathology-related deterioration in current functional assessments makes them prone to overestimate the level of functioning in healthy or at-risk populations and less sensitive to change.

Another important feature of the MAFS is its multidimensional approach, which allows for the detection of change in specific functional areas. The distinction between family- and peer-related functioning is useful, because functioning in these areas can be quite different in adolescents [7–9]. The CFA results confirmed the validity of this distinction. It is almost certain that more elaborate models would be needed to explain the full breadth of all functional domains [28]. However, to operationalize such models would require lengthy, time-consuming, and expensive instruments. In this respect, the MAFS represents a good trade-off between breadth of covered domains and scale length.

The MAFS' internal consistencies and other psychometric results remained quite stable with increasing age. Although these results were based on repeated measures within the same sample, which could have led to a slight overestimation of stability, they still indicate that the MAFS can (at least) be applied to adolescents aged 15–18 years. The applicability of the MAFS outside this range should be further investigated.

The current study has several strengths. First, the sample size was large, which allowed for the reliable estimation of psychometric properties. Second, the participants formed a good representation of average school-aged adolescents, increasing generalizability of the results and the potential field of use of the MAFS. Third, the longitudinal design allowed for the evaluation of age effects on the psychometric properties of the MAFS. Some study limitations should also be kept in mind. First, one should be careful with the generalization of these results to other populations, such as subjects with psychiatric/medical problems and/or other problems that prevent them from going to school. Second, the results apply to the age range of 15–18 years. Third, the effects of response bias and/or impression management were not controlled for and their potential effects on the data cannot be ruled out. Fourth, sample attrition over time might have led to some bias, although the consistency of the results across time suggested that this effect was limited. Finally, the items were designed by a team of experts on adolescent development and mental health, which could have slightly affected the selection of items and the design of the MAFS. However, we trust that the involved experts were capable of judging what level of functioning is normal for adolescents. In addition, a focus group of adolescents was involved to further ensure the appropriateness of the included items.

Future research should aim to expand the current results by testing the psychometric properties of the MAFS in other samples, such as younger and older adolescents and somatic and psychiatric patient groups. In addition, the role of methodological factors such as response bias should be investigated. In conclusion, the MAFS is a promising new self-report questionnaire to specifically normal functioning in adolescents. Future research might benefit from the fact that the MAFS is short, multidimensional, and specifically tailored toward adolescents. Eventually, the MAFS could be used to investigate the associations between health problems and variations in normal level of functioning in adolescents, but also to evaluate adolescents' functioning in other settings.

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Appendix. Supplementary data

Supplementary data (including a paper and pencil version of the MAFS) associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jadohealth.2012.06.021>.

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