ORIGINAL ARTICLE

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Comparative assessment of validity and reliability of the Oral Impacts on Daily Performance (OIDP)

frequency scale: a cross-sectional survey among adolescents in Davanagere city, Karnataka, India

Abstract: Aim: To evaluate reliability and validity of an abbreviated version of the Oral Impact on Daily Performance (OIDP) questionnaire and to analyse the interrelationship between OIDP scores, sociodemographic characteristics and oral health status among high school children in Davanagere city, Karnataka, India. Materials and methods: This cross-sectional survey was conducted with 900 school children aged between 12 and 15. The subjects were randomly selected from six high schools. Selected subjects completed a survey instrument predesigned to measure subjective oral health indicators including the eight-item OIDP frequency scores. The study participants were clinically examined for dental caries, and they completed a self-administered questionnaire about demographic information and oral behaviours. Results: 44% of the students reported at least one oral impact in the previous 6 months. The reliability of the instrument was measured in terms of Cronbach's alpha for the OIDP frequency. It was found to be 0.81. Eating was the most common performance affected (33%) followed by cleaning teeth (22%) and speaking (20%). The severity of impacts was low for relaxing and carrying out works. Conclusion: The OIDP frequency score has acceptable psychometric properties in the context of an oral health survey among high school children of Davanagere city, Karnataka, India.

Key words: dental caries; India; knowledge; oral health; quality of life

Introduction

Health is a fundamental human right. Being healthy, an individual can lead a happy life, increase the productivity and enjoy the quality of life. According to World Health Organization (1948), 'Health is a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity and the ability to lead a socially and economically productive life' (1). Oral health is important to maintain good general health, which in turn influences the quality of life, growth, looks, speech, mastication of food, socialization, as well as the sense of social well-being.

Oral diseases such as dental caries and periodontal disease are highly prevalent, and their consequences are not only physical but also



economical, social and psychological. They severely impair large number of individuals and can affect various aspects of life including oral functions, appearance and interpersonal relationships. Among all the oral diseases, dental caries is considered as a serious global health problem. One of the most common chronic diseases in childhood is dental caries. It affects 1 in 10 both preschool and school-going children (http://www.who.int; accessed 23 December 2010). It may result in pain, which in turn may lead to consequences on a child's daily life such as absence from school or difficulty in eating. Therefore, the notion of oral health-related quality of life (OHRQOL) is the product of many observations and research about the impact of oral diseases on different aspects of life (2).

Oral health-related quality of life is a relatively new but rapidly growing phenomenon that has emerged over the past two decades (2). Growing recognition of the importance of quality of life in the field of dentistry has since led to the development of a number of oral health-related quality of life instruments (3). Among all the OHRQOL instruments, Oral Impacts on Daily Performance (OIDP) is a scale that assesses impacts that affect individuals' daily life. Oral Impacts on Daily Performance (OIDP) instrument is advantageous for use in population surveys. It is not only user-friendly but also it measures behaviour state rather than feeling state. It is based on an explicit conceptual framework, the World Health Organization's International Classification of Impairments, Disabilities and Handicaps (ICIDH) (4), that has been amended for dentistry by Locker.

Most studies using OHRQOL to assess oral impacts of the mouth and teeth have been on adults and elderly populations (5-9). Few studies have been conducted with children possibly because no OHRQOL measures designed for use with children existed until recently. Evaluating the impact of oral health on the quality of life of children requires specific determination methods because they differ from adult patients by at least two main characteristics (10, 11). The first, and most important one, is the lack of decision-taking capability when it comes to maintaining one's own oral health, because it depends on parents or caregivers. The second main distinction between the adult patient and child patient is represented by the very significant differences in quality when it comes to perception and experience. Because of these two factors, the evaluation of a child's oral health-related quality of life should adapt to the various phases of development (12). Two instruments have been developed to measure OHRQOL in younger age groups: Child Perception Questionnaire and Child version of the Oral Impacts on Daily Performance (Child-OIDP). Both the questionnaires are used to assess the symptoms, functional limitations and well-being in 6- to 10-year-olds and in 11- to 14-year-olds (13-16). The Child-OIDP, which has been derived from the OIDP (17, 18), was developed and tested among Thai school children aged 11-12 years (13, 14). It has been found to be a reliable and valid instrument when applied to children in Thailand, France and UK (8, 13, 14, 19).

A single measure, dental pain, was used on children in Malaysia (20) and in South Africa (21). They found a high prevalence of pain that affected daily living. Similarly, a study in New Zealand found that most school children complained of at least one dental symptom (22). To date, in India, there were no systematic OHRQOL studies of a large population-based sample of children. In particular, the OHRQOL of high school children, who are frequently the main target group for dental health services, has not been assessed.

Hence, an attempt has been made to examine reliability and validity of an abbreviated version of the OIDP questionnaire and to analyse the interrelationship between OIDP scores, socio-demographic characteristics, dental caries experience and self-reported oral health status among 12- to 15-year-old school children in Davangere city, India.

Materials and methodology

This survey was a descriptive cross-sectional survey conducted to examine the reliability and validity of an abbreviated version of the OIDP questionnaire and to analyse the interrelationship between OIDP scores, socio-demographic characteristics and oral health status among 12- to 15-year-old children of Davanagere city, Karnataka, India. Davangere city is the district headquarters of Davangere district, which has an area of 68.68 km², has a population of around 4.5 lakhs and consisted a total of 155 higher primary schools (62 government schools and 93 private schools). Six schools (both private and government school) were randomly selected by lottery method. List of all the students belonging to 12- to 15-year age group from the selected schools was obtained from school records. The systematic sampling method was used for the selection of the participants, and every third subject based on the seating order of the class room was included for the study. Sample size was calculated based on caries prevalence of the children in Davanagere city obtained by a pilot study conducted with 100 subjects to know the caries prevalence. It yielded a sample size of 874, which was rounded off to 900.

The study had two aspects: administration of a questionnaire followed by the clinical examination. The Child-OIDP questionnaire (23) was the measure of oral health-related quality of life used in this study. It is derived from the OIDP with wording modifications addressing children's capability in relation to their intellectual, cognitive and language development. It is based on a modified version of WHO's International Classification of Impairments, Disabilities and Handicaps (24). The Child-OIDP assesses oral impacts on the following daily performances: eating, speaking, cleaning teeth, smiling, emotional stability, relaxing, doing schoolwork and social contact.

The methods used to translate the questions in the Child-OIDP index to Kannada and to adapt the index to the Indian culture followed the published guidelines (21). The process of translation involved several steps: after first meeting with the expert panel, questionnaire was translated from English to Kannada and pilot testing was carried out on a group of subjects. In second meeting, re-evaluation was made by back-

translation to English. The Child-OIDP was translated from English to Kannada by three Kannada-speaking professional translators. Two of the three translators were unaware of the concepts used and of the objectives of the study. The validity of the translation was verified by experts in the use of questionnaire in both languages. All documents were translated from English to Kannada, and the validity was checked by back-translation method. This was also checked after wording modifications to ensure the conceptual and functional equivalences of the questionnaire. A pilot study was carried out on 10% of the estimated total sample size selected from different areas of Davanagere city to validate all questionnaires before using them in the main survey. It confirmed the feasibility of the methodology with only minor modifications of the wording of the questionnaire. These subjects were not included in the main study.

The proforma consisted a total of 22 questions with three subgroups. Subsection one was related to socio-demographic characteristics. Subsection two and three were related to the OIDP inventory and oral health-related behaviours and self-assessed oral health status. The questionnaire was pilot-tested for validity and reliability. Reliability was tested by test–retest method. Validity was assessed by Cronbach's alpha. We found a weighted kappa statistics and Cronbach's alpha of 0.78 and 0.81, respectively. This reflected a good reliability and excellent validity.

The data collection was scheduled for 3 months from August to October 2010. Before scheduling the survey, ethical clearance was obtained from the ethical committee of Bapuji Dental College and Hospital, Davangere. Informed consent was obtained from the parents as well as from the teachers before the distribution of the questionnaire. Before the distribution of the questionnaire, the purpose, aim and objectives were explained and discussed in detail with the study participants. The participants were requested to fill the questionnaire with interest and concentration, so as to obtain valid results.

Oral Impact on Daily Performance was obtained by adding scores for eight frequency items. 'During the past 6 months, how often have problems with your mouth and teeth caused you any difficulties with (1) eating, (2) speaking and pronouncing clearly, (3) cleaning teeth, (4) sleeping and relaxing, (5) smiling without embarrassment, (6) maintaining emotional state, (7) enjoying contact with other people and (8) carrying out major schoolwork?'. The scale used was in the range: 0 = 'never affected', 1 = 'less than once a month', 2 = 'once or twice a month', 3 = 'once or twice a week', 4 = '3-4 times a week' and 5 = 'every or nearly every day'. For analysis, dummy variables were constructed yielding the categories 0 = 'never affected' (including the original category 0) and 1 = 'affected less than once a month or more often' (including the original categories 1-5). Simple count scores (SC range, 0-8) were created by adding the eight dummy variables. Additive scores (ADD range, 8-40) were created by adding the eight OIDP items as assessed originally. Finally, the OIDP SC frequency scores were dichotomized, yielding the categories 0 = 'no daily performance affected' and 1 = 'at least one daily performance affected'.

Received oral health care was assessed by one question: 'During the past 2 years, have you attended a dental clinic in order to receive treatment?' The response categories were 1 = yes, 0 = no. Satisfaction with dental appearance/oral condition was assessed by one item each, that is, 'Are you satisfied or dissatisfied with the appearance/condition of your teeth?' A three-point response scale was used ranging from 1 = 'very satisfied' to (2) 'not satisfied'. For analyses, two dummy variables were constructed yielding the categories 0 = 'satisfied with dental appearance/oral condition' and 1 = 'dissatisfied with dental appearance/oral condition'. Last dental appointment painful was assessed by one item, that is, 'If you have attended a dental clinic, was your last visit painful?', using the categories 0 = 'not painful' and 1 = 'painful'.

Clinical examination

Before the start of the study, the principal investigator (GV USHA) was calibrated for examination of dental caries at Department of Community Dentistry, Bapuji Dental College and Hospital, Davanagere, under the guidance of a professor to minimize the intra-examiner variability. Principal investigator herself conducted an oral examination under field condition with an assistant recording the findings. The participant was seated on a chair in the shade outside the school building. Natural light was used as the source of illumination. Dental caries was examined by applying WHO modification (1986) of DMF index. Each tooth was wiped with cotton and dried prior to examination.

Data analysis

Data were analysed using spss (version 16.0; SPSS Inc., Chicago, IL, USA). Internal reliability was tested by using the standardized Cronbach's alpha coefficient, as well as item-total and interitem correlations. Test-retest reliability was tested by using the weighted kappa for categories of the Child-OIDP scores, as well as the intraclass correlation coefficient (ICC) using the two-way random-effects model for the Child-OIDP score. Significance value was fixed at $P \leq 0.05$. To assess discriminate validity, multivariate analyses were performed by logistic regression and with the dichotomized OIDP SC scores as dependent variable, checking for all possible two-way interactions between independent variables. ANOVA was conducted to assess construct validity after using log-transformation (nonlinear transformation) of the OIDP ADD scores. Age, gender and parental educations were entered into multivariate analyses independent of statistical significance with the outcome variable to control for potential confounding effects.

Results

Table 1 shows distribution of study subjects according to age, gender, type of school and socio-economic status. The study

Table 1. Distribution of study subjects according to age, gender, type of school, socio-economic status and dental attendance pattern

	Number of subjects	Percentage
Age		
12	100	11.1
13	327	36.3
14	173	19.2
15	300	33.3
Gender		
Boys	429	47.7
Girls	471	52.3
Type of school		
Private	673	74.8
Government	227	25.2
Socio-economic status		
Class I	105	11.7
Class II	301	33.4
Class III	203	22.6
Class IV	285	31.7
Class V	6	7
Dental attendance		
Yes	205	22.7
No	695	77.2

sample consisted of 900 subjects. Among them, 429 (47.7%) were boys and 471 (52.3%) were girls. Majority of the subjects (673; 74.8%) were studying in private school, and only few subjects (227; 25.2%) were studying in government schools. Out of those subjects, only 205 (22.7%) had visited dental clinic for oral examination.

Table 2 shows percentage distribution (percentage of students affected less than once a month or more) and mean frequency scores (SD) for the eight OIDP items and the OIDP ADD and OIDP SC scores. The mean OIDP ADD and OIDP SC scores were, respectively, 9.1 (SD, 8.0; range, 8–40) and 3.6 (SD, 2.6; range, 0–8). A total of 33.7% and 22.3% of the subjects complained of difficulties with eating and cleaning teeth, respectively. The second most prevalent impact was difficulties with speaking (20.1%), followed by showing teeth and emotional status (17.6%). A total of 44% of the students experienced at least one impact during the 6 months preceding the survey.

Table 3 shows correlation matrix for OIDP frequency scores (1–8). The interitem correlation coefficients among the eight OIDP items ranged from 0.46 (between eating and emotional status) to 0.71 (between showing teeth and emotional status). There were no negative correlation coefficients, indicating the homogeneity among the items.

Table 4 shows discriminant validity: percentage distribution and odds ratio of single and overall OIDP SC frequency scores by clinical indicator (OR adjusted for age, gender and socio-economic status). Overall DMFT scores ranged from 0.0 to 10.0 with a mean of 2.1 (SD 2.3). Statistically significant differences were observed between participants with (DMFT > 0) dental caries experience (DMFT = 0) and without dental caries experience across the entire range of OIDP frequency items (P < 0.05). Participants with dental caries

Table 2. Percentage distribution [percentage of students
affected less than once a month or more) and mean frequency
scores (SD) for the eight Oral Impact on Daily Performance
(OIDP) items and the OIDP ADD and OIDP] SC scores

OIDP items	Number of subjects affected n (%)	Mean scores (1–5) SD
Eating Speaking Cleaning teeth Sleeping/relaxing Showing teeth Emotional status Carrying out work Enjoy social contact Total OIDP SC scores	303 (33.6) 181 (20.1) 201 (22.3) 132 (14.6) 159 (17.6) 159 (17.6) 132 (14.6) 149 (16.5) 396 (44)	1.7 (0.9) 2.6 (1.2) 2.5 (1.1) 2.6 (1.1) 2.5 (1.1) 2.5 (1.1) 2.5 (1.1) 2.4 (1.1) 3.6 (2.6) 0.1 (8.0)

experience were 4.4 times (95% CI, 2.9–6.7) more likely to report difficulty with sleeping and relaxing as compared to their counterparts without dental caries experience. Participants with dental caries experience were 3.3 times (95% CI, 2.5–4.4) more likely to report difficulties with eating when compared with their counterparts without dental caries experience.

Table 5 shows construct validity: mean values and 95% CI for OIDP SC and OIDP ADD scores by subjective oral health indicators (adjusted for age, gender and socio-economic status). Statistically significant relationships were observed between the OIDP and subjective oral health indicators. Participants who were dissatisfied with oral condition and dental appearance and who experienced last dental visit as painful scored higher OIDP than did their counterparts in the opposite groups (P < 0.001). Participants with higher OIDP scores reported dental dissatisfaction more frequently when compared with participants with lower OIDP scores (P < 0.05).

Discussion

The main aim of this study was to rigorously adapt the Child-OIDP index for Indian children aged between 12 and 15 and successfully assess its psychometric properties in a sample drawn from Davanagere city, Karnataka, India. This study showed that the Child-OIDP index has good reliability and validity, thus indicating its applicability for child population of similar age group in India.

Child-OIDP index is aimed to be a brief and cost-effective measure with high applicability in public health and reflects the socio-dental needs, and it assesses oral impacts in relation to eight independent daily performances. The OIDP frequency scores showed item-to-scale correlations without negative values that are similar to those obtained in the previous applications (25), and the internal consistency or reliability in terms of Cronbach's alpha of 0.8% indicates excellent psychometric properties compared with the recommended level of 0.7% as standard (23). Previous applications of the OIDP scale

Table 3. Correlation matrix for Oral Impact on Daily Performance (OIDP) frequency scores (1-8)

	Eating	Speaking	Cleaning teeth	Sleeping/ relaxing	Showing teeth	Emotional status	Carrying out work	Enjoying social contact
Eating Pearson's correlation <i>P</i> -value	1							
Speaking								
Pearson's correlation <i>P</i> -value	0.546** <0.001	1						
Cleaning teeth								
Pearson's correlation	0.565**	0.669**	1					
<i>P</i> -value	<0.001	<0.001						
Sleeping/relaxing	0 401**	0 571**	0 504**	4				
Pearson's correlation P-value	<0.001	< 0.001	<0.001	I				
Showing teeth								
Pearson's correlation <i>P</i> -value	0.541** <0.001	0.634** <0.001	0.656** <0.001	0.634** <0.001	1			
Emotional status								
Pearson's correlation	0.457**	0.594**	0.627**	0.552**	0.712**	1		
Carrying out work	<0.001	<0.001	<0.001	<0.001	<0.001			
Pearson's correlation <i>P</i> -value	0.466** <0.001	0.577** <0.001	0.591** <0.001	0.528** <0.001	0.667** <0.001	0.629** <0.001	1	
Enjoying social contact Pearson's correlation <i>P</i> -value	0.477** <0.001	0.563** <0.001	0.543** <0.001	0.552** <0.001	0.608** <0.001	0.622** <0.001	0.662** <0.001	1

**Correlation is significant at the 0.01 level.

to the various populations have yielded internal consistency values ranging from 0.67 to 0.85 (24, 26, 27).

Test-retest reliability, evaluated using the weighted kappa (0.78) and ICC (0.86), indicated very good reliability. This result is comparable with other validation studies of the Child-OIDP (27–29). As this index can be applied not only by a health care provider but also by any trained person, it can be used in public health programmes as a socio-dental indicator of oral health (30).

A total of 44% of the participants reported experiencing an oral impact that affected their daily life in the past 6 months. The eight impact prevalence rates ranged from 15% to 34% and were consistent with the results reported in previous OIDP surveys (9, 23, 24, 26, 27, 30). Although difficulties with eating and cleaning teeth were most frequently reported, it was lower than the scores reported in other studies of similar ages (13, 23, 27) and higher than the Tanzania- and the UK-based studies. This could partly be explained by the differences in the disease levels, age groups, culture and location of the sample.

The importance of oral health-related quality of life is particularly relevant to the children. Their perceptions are important as a number of their social and psychological coping skills are still developing. The results emphasize that perceptions of oral health and satisfaction with the mouth are strongly associated with oral health-related quality of life; the better the perception, the lower the prevalence of oral impacts. An understanding of oral health-related quality of life can only be achieved by asking the child about the impacts of dental conditions on their quality of life.

In this survey, both government and private school children were included, and random sampling approach was employed to minimize selection bias. Children have been regarded as unreliable respondents, and a number of studies have relied on using proxy measures. But this approach has certain limitations, especially in relation to its accuracy because children and parents may not share the same views about illness and health. Consequently, it has been advocated that children should be asked directly about the impact of illness and health on their daily lives. Hence, the data were directly collected from the participants. Another important consideration is the mode of administration of quality of life measures. Self-completed questionnaires are reported to be cost-effective and are more suitable for older children. This study includes more representative population because it includes school children from both government and private sectors. The sample size being scientifically determined by a pilot study can certainly validate the results. Back-translation method has taken care of language-induced bias. Validity and reliability checks have suggested validation of the instruments.

The structured questionnaires applied in this study might have certain limitations. Reporting bias because of giving socially desirable answers and lack of recall are frequently encountered by children. The study was limited to a single regional state. The predicted applicability of the Child-OIDP cannot be generalized to the whole nation because India is a vast country with cross-cultural differences.

Table 4. Discriminant validity: percentage distribution and odds				
ratio (OR) of single and overall Oral Impact on Daily				
Performance (OIDP) SC frequency scores by clinical indicators				
(OR adjusted for age, gender and socio-economic status)				

	DMFT			
OIDP items	>0 (<i>n</i> = 428)	0 (<i>n</i> = 472)	OR (95% CI)	Ρ
Eating				
Yes	202 (47.2)	101 (21.4)	3.3 (2.5–4.4)	< 0.05
No	226	371		
Speaking				
Yes	126 (29.4)	55 (11.7)	3.2 (2.2–4.5)	<0.05
No	302	417		
Cleaning teeth				
Yes	128 (29.9)	73 (15.5)	2.3 (1.7–3.2)	< 0.05
No	300	399		
Sleeping/relaxing				
Yes	101 (23.6)	31 (6.6)	4.4 (2.9–6.7)	< 0.05
No	327	441		
Showing teeth				
Yes	111 (25.9)	48 (10.2)	3.1 (2.1–4.5)	< 0.05
No	317	424		
Emotional status				
Yes	100 (25.5)	50 (10.6)	2.9 (2.0–4.2)	< 0.05
No	319	422		
Carrying out work				
Yes	91 (21.3)	41 (8.7)	2.8 (1.9–4.0)	< 0.05
No	337	437		
Enjoy social contact				
Yes	101 (23.6)	48 (10.2)	2.7 (1.9–4.0)	<0.05
No	327	424		
OIDP scores >0				
Yes	260 (60.7)	136 (28.8)	(2.9–5.1)	< 0.05
No	168	336		

Hypothesis regarding the construct validity was confirmed in that the OIDP frequency scores varied positively with global measures of self-rated oral health status, dental attendance and experience with dental pain. In the evaluation of the construct validity of the child-OIDP index, the score increased progressively, indicating worse oral health-related quality of life, as the children's self-rated oral health status, dental attendance and dental pain changed from healthy to unhealthy. This consistent pattern throughout the construct validity testing is an interesting and strong finding, because it highlights the close relationship between oral health-related quality of life and other subjective measures of oral and general health. These differences were statistically significant for all the variables measured.

Conclusion

This study has shown that a self-administered oral healthrelated quality of life instrument is applicable for use among adolescents attending secondary schools in Davanagere, Karnataka, India. Overall, the child-OIDP showed good reliability and excellent validity. Thus, the provision of dental care on children should address not just their clinical dental needs, but give attention to their socio-dental needs, taking also into consideration their perceptions in terms of the impact of the oral conditions on their daily life. Moreover, this study indicates that the social and behavioural context is important in changing adolescent responses to oral disorders. This is particularly important in children as their experiences in early life may influence their future attitudes and behaviours. Within these limits, this study suggests the incorporation of oral health-related quality of life measures into the oral health care services for the younger generation in Karnataka, India.

Table 5. Construct validity: mean values and 95% CI for Oral Impact on Daily Performance (OIDP) SC and OIDP ADD scores by subjective oral health indicators (adjusted for age, gender and socioeconomic status)

Subjective oral health indicators	Number of subjects	OIDP scores mean ± SE (95%CI)	OIDP ADD scores mean ± SE (95%CI)	<i>P</i> -value
Dental condition				
Good	430	1.3 ± 0.1 (1.1–1.5)	3.3 ± 0.32 (2.7-4.0)	<0.001
Average	82	$4.1 \pm 0.1 (3.4 - 4.7)$	2.6 ± 1.0 (2.6–3.8)	
Bad	388	$1.4 \pm 0.3 (1.1 - 1.6)$	$10.7 \pm 0.2 (8.7 - 12.7)$	
Dental satisfaction	1	· · · · ·	· · · ·	
Very satisfied	271	1.7 ± 0.2 (1.3–2.0)	4.2 ± 0.5 (3.3–5.1)	<0.05
Satisfied	505	$1.3 \pm 0.1 (1.1 - 1.5)$	$3.0 \pm 0.3 (2.4 - 3.5)$	
Not satisfied	124	$2.5 \pm 0.2 (2.0-2.9)$	$5.5 \pm 0.6 (4.4 - 6.6)$	
Treatment needed				
Yes	541	1.7 ± 0.1 (1.5–1.9)	3.7 ± 0.3 (3.2-4.3)	>0.07
No	199	$1.3 \pm 0.2 (1.0 - 1.7)$	$3.7 \pm 0.5 (2.7 - 4.7)$	
Don't know	160	$1.5 \pm 0.2 (1.1 - 1.8)$	$3.4 \pm 0.5 (2.4 - 4.5)$	
Dental appearance	е			
Good	383	1.5 ± 0.1 (1.3–1.8)	3.7 ± 0.4 (3.0–4.3)	<0.001
Average	451	$1.4 \pm 2.3 (1.2 - 1.6)$	$3.0 \pm 0.3 (2.5 - 3.5)$	
Bad	66	3.2 ± 0.4 (2.5–3.9)	8.1 ± 1.1 (6.0–10.3)	
Last appointment				
Painful	544	2.2 ± 0.2 (2.0-2.5)	5.2 ± 0.4 (4.4–5.9)	<0.001
Not painful	356	1.2 ± 0.12 (1.1–1.4)	2.7 ± 0.3 (2.2–3.2)	

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