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Oral health-related quality of life of children with oligodontia

DAVID LOCKER[1], ALEKSANDRA JOKOVIC[1], PREETI PRAKASH[1] & BRYAN TOMPSON[2]

[1]Community Dental Health Services Research Unit, and [2]Department of Orthodontics, Faculty of Dentistry, University of Toronto, Toronto, ON, Canada

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Objectives. To assess the functional and psychosocial impact of oligodontia in children aged 11–14 years.

Methods. Children aged 11–14 years with oligodontia were recruited from orthodontic clinics when they presented for orthodontic evaluation. All completed a copy of the Child Perceptions Questionnaire for 11- to 14-year olds, a measure of the functional and psychosocial impact of oral disorders. Information on the number and pattern of missing teeth for each child were obtained from charts and radiographs.

Results. Thirty-six children were included in the study. The number of missing teeth ranged from one to 14 (mean = 6.8). Just over three-quarters of the subjects reported experiencing one or more functional and psychosocial impacts 'Often' or 'Everyday/almost everyday'. Correlations between scale and sub-scale scores and the number of missing teeth were weak and nonsignificant.

Conclusions. Children with oligodontia experience substantial functional and psychosocial impacts from the condition. When compared with other clinical groups, children with oligodontia appear to have worse oral health-related quality of life than children with dental decay and malocclusion, but better oral health-related quality of life than children with oro-facial conditions.

Introduction

Oligodontia or hypodontia is the congenital absence of one or multiple teeth. It is the most common developmental anomaly of the permanent dentition. It has been found that, when third molars are excluded, this condition affects between 5.3% and 7.9% of children[1–4]. A prevalence of 4% for four or more congenitally missing teeth has been reported[5]. After the third molars, agenesis of the upper lateral incisors and the second premolars occurs most often[6]. The pattern of tooth absence varies and can be symmetrical or haphazard. Frequently, oligodontia is associated with other oral anomalies, such as reduced size and structural malformation of teeth, late eruption, transposition, and crowding[7–9]. The treatment of oligodontia requires a multidisciplinary approach and can involve orthodontic, prosthodontic, surgical, and/or restorative therapy[10–12]. In the province of Ontario, Canada, the Ontario Ministry of Health covers 75% of the cost of orthodontic treatment for children who are missing five or more teeth.

One issue that needs to be addressed with respect to oligodontia is its impact on well-being and quality of life. Increasing emphasis is being placed on patients' perceptions of the impact of oral disorders and this is particularly important with respect to conditions such as oligodontia and malocclusion whose effects are predominantly functional and psychosocial. Understanding the consequences of such conditions has the potential to contribute to their clinical management and evaluation of the benefits of different therapeutic approaches[13].

In order to facilitate studies of the impact of oral disorders on children we developed the Child Oral Health Quality of Life Questionnaires (COHQoL) which assess the effects of oral and oro-facial conditions on children aged 6–14 years and their families[14–17]. The questionnaires have demonstrated excellent cross-sectional validity and test–retest reliability in clinical and general populations. This research has also established their discriminative properties, i.e., their ability to distinguish between groups of children with different clinical conditions and the varying levels of

Correspondence to:
Dr David Locker, Community Dental Health Services Research Unit, Faculty of Dentistry, University of Toronto, 124 Edward Street, Toronto, M5G 1G6 ON, Canada.
E-mail: david.locker@dentistry.utoronto.ca

severity of these conditions. The child questionnaires were developed with input from children with various oral disorders and ask for their perspectives on the way in which these disorders affect their daily lives. Consequently, they give children a voice and facilitate child-centred research[18].

The Child Perceptions Questionnaire for 11- to 14-year olds (CPQ11-14)[15] was used by Wong *et al.*[13] in a study of 25 patients with severe hypodontia who were attending the Paediatric and orthodontic Unit at Prince Philip Dental Hospital, University of Hong Kong. The children were aged 11–15 years. The number of missing teeth ranged from 4 to 20 with a mean missing of 8.9. All of the children reported one of more of the impacts captured by the CPQ11-14; all reported oral symptoms as a result of the condition, 88% reported functional limitations, 88% experienced impacts on emotional well-being and all reported one or more social impacts. The mean CPQ11-14 score was 29.0, and there was a significant association between these scores and the number of missing teeth.

Consequently, when undertaking a study to evaluate a publicly funded treatment program for oligodontia the main outcome measure employed was the CPQ11-14. The aim was to extend the rather sparse literature on quality of life outcomes in relation to congenitally absent missing teeth and the extent to which impacts on quality of life are reduced by the provision of orthodontic and other treatments for the condition. This study reports the results of the baseline phase and seeks to determine if a sample of Canadian children with missing teeth experience substantial functional and psychosocial impacts as a result of their condition, as recently reported by Wong *et al.*[13] for a sample of hypodontia patients in Hong Kong.

Material and methods

Participants and recruitment

Participants in the study were children aged 11–14 years with oligodontia. They were recruited from the orthodontic clinics at the Hospital for Sick Children and the Bloorview MacMillan Children's Centre Traveling Clinics in the northern Ontario communities of Thunder Bay, Sudbury, Sault Ste. Marie, and Timmins when the children presented for orthodontic screening. A convenience sampling approach and the following inclusion criteria were used: absence of systemic and developmental disorders (e.g., craniofacial anomalies, hypohidriotic ectodermal dysplasia); no previous treatment for oligodontia, and fluency in English. This study was approved by the research ethics boards at the University of Toronto, Hospital for Sick Children and Bloorview MacMillan Children's Centre. Written parental consent and child's verbal assent were sought. A child's dissent superseded the parental consent.

Data collection

The data were collected using the Child Perceptions Questionnaire for children aged 11–14 years (CPQ11-14), one of the four questionnaires comprising the COHQoL measure. It contains 37 questions concerning the impact of oral disorders and encompasses four health domains: oral symptoms, functional limitations, emotional well-being, and social well-being. The last consists of the subdomains of schooling, peer interaction, and leisure activities. All questions asked about the frequency of events in relation to the condition of teeth and mouth in the last 3 months. Responses to these questions are scored on a frequency scale with the following response options and associated codes: 'Never' = 0; 'Once/twice' = 1; 'Sometimes' = 2; 'Often' = 3'; and 'Everyday/Almost every day' = 4. The questionnaire also contains two single-item global ratings. The first asks children to rate their oral health on a scale from 'Excellent' to 'Poor' and the second asks children how much their oral health issues affect their life overall, scored on a scale ranging from 'Not at all' to 'Very much'. All questionnaires were self-completed.

The number and pattern of missing teeth were determined for each child from the clinical charts and the radiographs that were taken as part of the orthodontic screening process.

Data analysis

Overall CPQ11-14 and domain additive scores for each child were calculated by summing the response codes for the questions comprising the scale and individual domains. Scores were also generated by counting the number of impacts reported 'Often' or 'Everyday/Almost every day' for the scale as a whole and the four domain sub-scales. These count scores mean that the impact of oligodontia can be expressed in terms of prevalence (the per cent reporting one or more impacts 'Often' or 'Everyday/Almost everyday') and extent (the mean number of impacts at this level of frequency) whereas the mean CPQ11-14 additive score indicates severity[19]. These indicators can be used to compare differences in the frequency, nature and levels of impact within and between groups with different clinical conditions.

Variations in the prevalence, extent and severity of quality of life impacts according to age and gender and the severity of oligodontia were examined using nonparametric and parametric statistical tests. The scores of children with oligodontia were also compared with those of children with dental, orthodontic, and oro-facial conditions that were obtained as part of the study used to develop and evaluate the psychometric properties of the CPQ11-14[15].

Results

Thirty-six children with oligodontia participated in the study. Their average age was 12.6 years (SD = 1.4) and 56% were female. Overall, the 36 subjects had 244 missing teeth. The number of missing teeth ranged from one to 14 (mean = 6.8). Sixty-nine per cent of the children had six or more missing teeth. Premolars were the most common missing teeth (58%), followed by anterior teeth (26%) and molars (16%). The number of missing anteriors ranged from one to seven (mean = 2.4).

The prevalence, extent, and severity of quality of life impacts as reported using the CPQ11-14 are shown in Table 1. Overall, just over three-quarters of the subjects reported experiencing one or more functional and psychosocial impacts 'Often' or 'Everyday/almost everyday': 28% had oral symptoms 'Often' or 'Everyday/Almost everyday', 61% experienced functional limitations, 19% reported impacts on emotional well-being, and 17% impacts on social well-being. The extent scores also indicate that the main impacts concerned functional limitations. CPQ11-14 severity scores ranged from 4 to 69, with a mean score of 22.3 (SD = 14). If a less stringent definition of prevalence is used, one that includes responding 'Sometimes' as well as 'Often' or 'Everyday/almost everyday' to one or more items, then 88.9% experienced one or more impacts in the previous 3 months, and the mean number of impacts rises to 5.9. The prevalences for the four sub-scales become: oral symptoms – 72.2%; functional limitations – 77.8%; emotional well-being – 41.7%; and social well-being – 58.3%.

Table 1. Prevalence, extent, and severity scores for oligodontia patients: CPQ11-14 and its sub-scales.

Scale/sub-scale	Prevalence (%)*	Extent†	Severity‡
CPQ11-14	77.8	1.75	22.3
Oral symptoms	27.8	0.28	5.0
Functional limitation	61.1	0.78	6.4
Emotional well-being	19.4	0.42	5.4
Social well-being	16.7	0.28	5.7

*Per cent with one or more items scored 'Often' or 'Everyday/Almost everyday'.

†Mean number of items scored 'Often' or 'Everyday/Almost everyday'.

‡Mean additive score.

Table 2 represents prevalence estimates for each of the items comprising the questionnaire. Two prevalence estimates are shown. The first is the per cent of children who reported experiencing the event described by each item 'Often' or 'Everyday/Almost everyday' during the previous 3 months. The second includes those children who reported experiencing the event 'Sometimes', 'Often', or 'Everyday/Almost everyday' during the previous 3 months. Irrespective of the definition of prevalence used, the most common impacts reported for each of the four sub-scales were as follows: oral symptoms – bad breath and food catching between teeth; functional limitations – difficulty chewing and slower than others in

Table 2. Prevalence of CPQ11-14 items.

Item	Prevalence 1* (%)	Prevalence 2† (%)
Oral symptoms		
Pain	0	23.7
Bleeding gums	2.7	10.8
Mouth sores	0	17.9
Bad breath	10.5	45.7
Food stuck in/between teeth	15.4	38.5
Food stuck in palate	0	5.4
Functional limitations		
Mouth breathing	33.2	64.8
Slow completing meal	12.8	30.7
Sleep disturbance	5.1	12.8
Chewing difficulty	10.3	28.2
Speech difficulty	2.6	7.7
Difficulty opening mouth wide	0	0
Diet restriction	0	5.1
Difficulty eating hot/cold foods	0	10.3
Emotional well-being		
Irritable/frustrated	5.1	20.5
Feel unsure of self	2.7	8.1
Shy/embarrassed	2.6	10.0
Concerned what other people think	12.9	23.2
Worried about appearance	10.3	20.6
Upset	7.7	18.0
Nervous/afraid	0	10.8
Worried that is less healthy than other people	0	0
Worried that is different than other people	2.7	10.8
Social well-being		
Missed school	0	15.4
Low concentration in school	0	10.3
Difficulty doing homework	0	7.7
Not wanted to speak/read out loud in class	2.6	12.9
Avoided school or leisure activities	2.6	2.6
Not wanted to talk to children	2.6	5.2
Avoided smiling/laughing when with children	0	15.8
Difficulty playing musical instrument	2.7	8.1
Not wanted to spend time with children	0	5.3
Argue with family/other children	5.4	21.6
Been teased by children	7.9	10.5
Left out by children	2.7	8.1
Asked questions by other children	2.6	17.4

*Per cent reporting item 'Often' or 'Everyday/almost everyday'.

†Per cent reporting item 'Sometimes', 'Often' or 'Everyday/almost everyday'.

completing a meal; emotional well-being – concerned about what other people think and worried about appearance; and, social well-being – arguing with family and other children and being asked questions about the oral condition by other children.

There were no age or gender differences in the prevalence, extent, or severity of impacts.

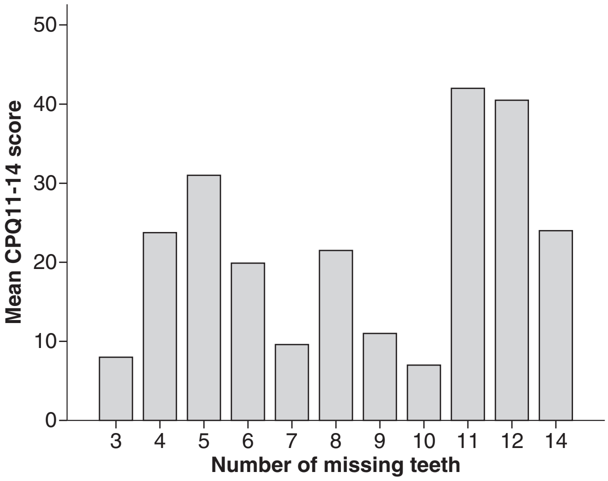

Fig. 1. Mean CPQ11-14 scores by number of missing teeth.

Correlations between scale and sub-scale scores and the number of missing teeth were weak and nonsignificant. For example, the Spearman's r was 0.04 for CPQ11-14 scores and the number of missing teeth, and 0.15 for CPQ11-14 scores and the number of missing anterior teeth. Figures 1 and 2 confirm that there was no clear pattern of association between the number of missing teeth or the number of missing anteriors and overall CPQ11-14 scores. When sub-scales scores were examined, the strongest correlations observed were between the emotional well-being sub-scale score and the number of missing teeth ($r = 0.22$), and the emotional well-being sub-scale score and the number of missing anterior teeth ($r = 0.32$). There were

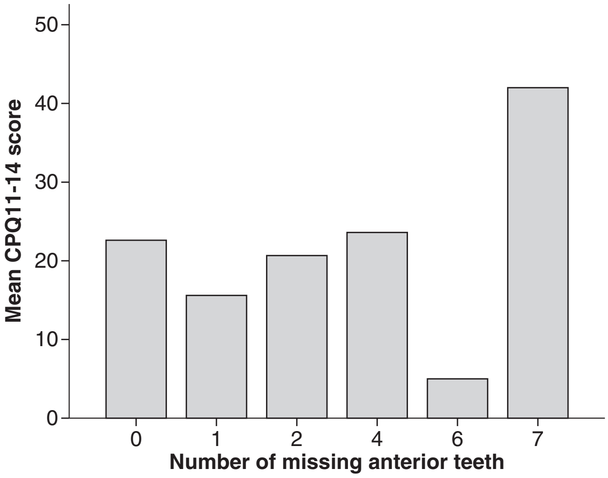

Fig. 2. Mean CPQ11-14 scores by number of missing anterior teeth.

no differences in CPQ11-14 scores or in subscale scores for children with less than five and five or more missing teeth, the cut off used to determine which children with oligodontia are eligible for public funding of orthodontic treatment in Ontario.

The children's ratings of their oral health were as follows: excellent – 5.6%; very good – 25.0%; good – 33.3%, and fair/poor – 36.2%. Just over half, 58.3%, said that the condition of their teeth and mouth had no or very little impact on their life overall, 30.6% said it had some impact, and 11.1% said their life overall was affected a lot or very much.

Discussion

This study provides some additional data on the functional and psychosocial impacts of oligodontia in a group of children aged 11–14 years about to begin orthodontic treatment and supplements that provided by Wong *et al.*[13] A substantial percentage of these children experienced impacts on their daily life with the most common relating to functional limitations and emotional well-being. This is perhaps to be expected as the absence of posterior teeth can compromise chewing and the absence of anterior teeth can compromise appearance.

In this regard, the results agree with those reported Wong *et al.*[13] Both studies found that very high proportions of subjects reported functional and psychosocial impacts as a result of congenitally missing teeth. Moreover, the impact among the population recruited in Hong Kong was more extensive and severe than the impacts reported by our Canadian subjects. For example, all of the Hong Kong subjects reported one or more impacts and all reported one or more social impacts. Among the Canadian subjects, the percentages were 77.8% and 16.7% respectively. This may be due to the use of a less stringent threshold for defining prevalence. We only counted impacts reported 'Often' or 'Everyday/Almost everyday' in assessing prevalence. If the Hong Kong study included the 'Sometimes' response option then the percentage of children with impacts would be higher. When we included the 'Sometimes' response option, prevalence estimates were closer but still higher in Hong Kong. That children in Hong Kong experience a more severe impact on quality of life is suggested by the mean overall CPQ scores. In Hong Kong the mean score was 29.0, whereas in Canada it was lower at 22.3. This may be because the Hong Kong children had more missing teeth. It is also possible that cultural factors are exerting an influence but this cannot be determined from these two studies.

One difference between the two studies is that there were very high correlations between CPQ scores and the number of missing teeth in Hong Kong but only weak correlations in Canada subjects. This is difficult to explain but may be due to differences in the number of missing teeth and/or differences in the types of teeth that were congenitally absent.

A comparison of the prevalence of impacts in this group of children with oligodontia with children with other oral conditions who were also recruited from clinical settings in Canada suggests that the congenital absence of teeth has a greater impact on oral health-related quality of life than more common conditions, such as dental decay and malocclusion. For example, in a study by Jokovic *et al.*[15] that used the CPQ11-14, 43.7% of a group of children attending public clinics for the treatment of dental caries reported impacts, whereas 61.5% of children attending orthodontic clinics experienced impacts, somewhat less than the 77.8% of the children taking part in this study. Moreover, our sample of children with oligodontia had somewhat better oral health-related quality of life than the children with oro-facial conditions, such as cleft-lip and palate, 84.6% of who reported impacts[15]**.** Consequently, the two studies provide some data on the relative significance of different oral conditions that can affect children in the age range 11–14 years.

Moreover, the interpretation of clinical group differences in CPQ11-14 scores is complicated because the minimal important difference for the CPQ11-14 has yet to be established[20]. This is the minimum difference in scores on a questionnaire that patients perceive as important and would lead them to report an improvement or deterioration in health status over time or as a result of therapy. This allows the ‘clinical’ as well as the statistical significance of differences within and between groups to be better appreciated.

One indication that group differences in impact prevalences and mean CPQ11-14 scores may be misleading in and of themselves is the apparent anomaly that children with oro-facial conditions had the highest prevalence and severity of impacts than children with other oral conditions but in response to a global item were less likely to report that these impacts affected their lives overall[15]. This may be explained by the fact that oro-facial conditions are present at birth so that children with these conditions have received long-term clinical and psychosocial care at the hospital setting where they were recruited. It is likely that such care engenders an ability to cope so that the kinds of impacts reported by these children do not have a major impact on their quality of life. This is consistent with contemporary models of health which suggest that outcomes such as well-being and quality of life are the product of an interaction between health conditions and personal and environmental factors, and not a direct response to the severity of the clinical condition[21]. Consequently, individual variations in responses to oral conditions are to be expected because of variations in the psychological characteristics of children, such as self-esteem and resilience, and variations in the socio-economic environments in which they live. These variations in individual and environmental characteristics have been used by others to explain the weak associations between clinical measures and measures of quality of life outcomes[22–24].

Moreover, comparisons between the scores obtained from this and other studies need to be viewed with a degree of caution as most of these studies are based on small, convenience samples recruited from clinical settings. Although population-based studies can and have been used to compare the impact of common conditions such as dental decay and malocclusion in random samples of children[25], severe oligodontia, cleft-lip and palate are not nearly so prevalent and recruitment from the clinics in which they are treated is the only feasible option. Consequently, further studies of children recruited from clinical settings in different locations are required to confirm these findings.

What this paper adds

- This paper provides additional data on the functional and psychosocial impacts of congenitally absent teeth to supplement that provided by Wong *et al.*[13]
- The study also suggests that oligodontia has more of an impact than more common conditions such as dental decay and malocclusion.

Why this paper is important to paediatric dentists

- The concept of patient-centred care involves understanding patients’ views and concerns with respect to the clinical condition being treated and its effect on their daily life. Questionnaires such as the CPQ11-14 have a role to play in clinical practice as a relatively efficient means by which clinicians can obtain information on the specific functional and psychosocial issues affecting their patients. Resolution of these issues is likely to enhance patient satisfaction with the care received.

References

1 Rølling S. Hypodontia of permanent teeth in Danish schoolchildren. *Scand J Dent Res* 1980; **88**: 215–217.

2 Dhanrajani PJ. Hypodontia: etiology, clinical features, and management. *Quintessence Int* 2002; **33**: 294–302.

3 Aasheim B, Øgaard B. Hypodontia in 9-year-old Norwegians related to need of orthodontic treatment. *Scand J Dent Res* 1993; **101**: 257–260.

4 Magnussen TE. Prevalence of hypodontia and malformations of permanent teeth in Iceland. *Community Dent Oral Epidemiol* 1977; **5**: 173–178.

5 Brand RW, Isselhard DE. *Anatomy of Orofacial Structures*. St Louis, MO: Mosby, 1997.

6 Mattheeuws N, Dermaut L, Martens G. Has hypodontia increased in Caucasians during the 20th century? A meta-analysis. *Eur J Orthod* 2004; **26**: 99–103.

7 Dermaut LR, Goeffers KR, De Smit A. Prevalence of tooth agenesis correlated with jaw relationship and dental crowding. *Am J of Orthod Dentofacial Orthop* 1986; **90**: 204–210.

8 Vastardis H. The genetics of human tooth agenesis: new discoveries for understanding dental anomalies. *Am J Orthod Dentofacial Orthop* 2000; **117**: 650–656.

9 Arte S, Niemien P, Apajakahti S, Haavikko K, Thesleff I, Pirinen S. Characteristics of incisor–premolar hypodontia in families. *J Dent Res* 2001; **80**: 1445–1450.

10 Carter NE, Gillgrass TJ, Hobson RS *et al.* The interdisciplinary management of hypodontia: orthodontics. *Br Dent J* 2003; **194**: 361–366.
11 Meechan JG, Carter NE, Gillgrass TJ *et al.* The interdisciplinary management of hypodontia: oral surgery. *Br Dent J* 2003; **194**: 423–427.
12 Jepson N, Nohl FS, Carter NE *et al.* The interdisciplinary management of hypodontia: restorative dentistry. *Br Dent J* 2003; **194**: 299–304.
13 Wong ATY, McMillan AS, McGrath C. Oral health-related quality of life and severe hypodontia. *J Oral Rehabil* 2006; **33**: 869–873.
14 Locker D, Jokovic A, Stephens M, Kenney D, Tompson B, Guyatt G. Family impact of child oral and oro-facial disorders. *Community Dent Oral Epidemiol* 2002; **30**: 438–448.
15 Jokovic A, Locker D, Stephens M, Kenny D, Tompson B, Guyatt G. Validity and reliability of a questionnaire for measuring child oral-health-related quality of life. *J Dent Res* 2002; **81**: 459–463.
16 Jokovic A, Locker D, Stephens M, Kenny D, Tompson B, Guyatt G. Measuring parental perceptions of child oral-health-related quality of life. *J Public Health Dent* 2003; **63**: 67–72.
17 Jokovic A, Locker D, Tompson B, Guyatt G. Development and evaluation of a questionnaire for measuring oral-health-related quality of life in 8-10-year-old children. *Pediatr Dent* 2004; **26**: 512–518.
18 Marshman Z, Hall M. Oral health research with children. *Int J Pediatr Dent* 2008; **18**: 235–242.
19 Slade GD, Nuttall N, Sanders A, Steele J, Allen PF, Lahti S. Impacts of oral disorders in the United Kingdom and Australia. *Br Dent J* 2005; **198**: 489–493.
20 Locker D, Jokovic A, Clarke M. Assessing the responsiveness of measures of oral health-related quality of life. *Community Dent Oral Epidemiol* 2004; **32**: 10–18.
21 Wilson I, Cleary P. Linking clinical variables with health-related quality of life: a conceptual model of patient outcomes. *JAMA* 1995; **273**: 59–65.
22 Locker D, Slade GD. Association between clinical and subjective indicators of oral health status in an older adult population. *Gerodontology* 1994; **2**: 108–114.
23 Humphris G, Freeman R, Gibson B, Simpson K, Whelton H. Oral health-related quality of life for 8-10 year-old children: an assessment of a new measure. *Community Dent Oral Epidemiol* 2005; **33**: 326–332.
24 Marshman Z, Rodd H, Stern M. An evaluation of the Child Perceptions Questionnaire in the UK. *Community Dent Health* 2005; **22**: 151–155.
25 Foster-Page LA, Thomson WM, Jokovic A, Locker D. Validation of the Child Perceptions Questionnaire for 11–14 year olds in a population-based study. *J Dent Res* 2005; **84**: 649–652.