Self-Assessed Impact of Oral Health on the Psychological Wellbeing and Depressive Symptoms of Older Adults Living in Melbourne

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Abstract

Objectives: This study aimed to investigate oral health related factors affecting the self-assessed Psychological Wellbeing (PW) and depressive symptoms of independent-living Australians aged 79 years and over living in the community in metropolitan Melbourne.

Methods: The Melbourne Longitudinal Studies on Healthy Ageing (MELSHA) program was used as the data source in this study and includes data on the health and wellbeing of older participants. The MELSHA baseline data collection occurred in 1994, the current study used data from the 2008 data collection and included 201 participants, who remained in the study. Data were analysed using multiple linear regression analysis (MLR) with a stepwise procedure to identify the variables that accounted for a significant proportion of the variance in the participants’ PW scores.

Results: Present findings indicate that oral health may play a significant mediating role in PW through maintaining a presentable and acceptable physical appearance. Some 16.4% of participants reported feeling concerned about their dental appearance, either ‘Sometimes’, ‘Often’ or ‘Very often’. Multivariate analysis showed significantly influences on PW positive and negative affect scores (p<0.0001); and depressive symptoms (p<0.0001) by participants’ dentition status, enjoyment of meals, self-reported feeling of concern about the appearance of the mouth, social activity and self-assessment of general health. Final models explained 17.8%; 20.1% and 24.6% of the variance of PW positive, negative affect scores, and depressive symptoms, respectively.

Conclusions: Oral health, specifically the appearance of the mouth and dentition, plays a significant role in the PW of older Melburnians. Future cross-sectional and longitudinal
studies are indicated to raise awareness on the changes required to improve QoL of the older population.

**Key Words:** oral health; psychological wellbeing; depressive symptoms; oral health–related quality of life; older adults; independent living, self-assessed

**Introduction**

Demographic trends in Australian society, as in many countries, indicate that adults aged 65 years and older are becoming an increasingly larger proportion of society. Currently, they account for 15% of the Australian population (1). It is expected that by 2056, this proportion will be 22% with the old-old group (85 + years) the fastest growing group in the Australian population (1,2). Furthermore, many countries worldwide are also currently experiencing an epidemiologic transition towards a larger proportion of aged citizens retaining more natural teeth. Ongoing research and improvements in oral health care are critical to appropriately catering for new cohorts of older adults (3).

There is mounting evidence that independence and well-being in later life can be maintained or improved through physical activity, social involvement, adequate eating patterns and other individual and social actions (4). Poor oral health increases the risk of frailty, and may precipitate or exacerbate other medical conditions, such as pneumonia, diabetes, cerebrovascular and cardiovascular disease, and nutritional deficiencies (5,6). Oral health status has a crucial impact on older adults’ physical, emotional and social well-being (7-13). Oral diseases and conditions not only contribute to the decline in physical wellbeing (i.e. systemic diseases, pain, etc.) (14,15), they also have implications for one’s appearance and
function, and impact on eating, speech and communication, sleep, work, social roles, and psychological wellbeing (16,17). Furthermore, self-confidence and capacity for social interaction and intimacy can be affected (18), leading to social isolation and further diminishment of social well-being (10,14,15).

The oral health of older people and their well-being can be improved through different health strategies including primary, secondary, and tertiary prevention (5). Advances in medicine and dentistry have contributed to a decreasing rate of edentulism and an increasing rate of retention of natural teeth into old age (19-23). Still, edentulism and denture use are higher among Australian older adults and they have more missing teeth compared to younger cohorts (14). Older adults reported being more uncomfortable with their appearance and were more likely to avoid eating certain foods due to problems with their teeth (14,24).

While oral diseases can be prevented and managed, how to maintain oral health and well-being in an ageing population, particularly the old-old, represents an important challenge to oral healthcare providers and the broader Australian society. The diverse nature of this rapidly expanding sector of the Australian population translates to an increased variation in their oral health needs (25). This epidemiological and demographic transitions have led to an increased need for a clinical and research focus on factors related to the oral health of older adults and its relation to overall well-being (19-21). Consequently, there is a pronounced need to investigate the oral health of older people, to increase current knowledge and understanding of the relevant factors affecting older population’s oral health and to draw accurate conclusions about their role in determining well-being.

This study aims to investigate oral health factors affecting the Psychological Wellbeing (PW)
and depressive symptoms of independently living Australians aged 79 years and over, living in metropolitan Melbourne, and to place these results in perspective with the existing Australian literature on the topic. An improved understanding of these factors would help to better inform health policies and interventions specifically targeted to address and improve the oral health of this population. This analysis will provide insight into the oral health experiences of older adults in Melbourne and of the interplay between oral health and psychological wellbeing, assisting in the identification of areas of concern and allowing implementation of interventions regimes to improve oral health, the quality of life and the overall well-being of older Melbournians.

**Methods**

This study analysed data collected as part of the 2008 wave of the Melbourne Longitudinal Study on Healthy Ageing (MELSHA). The last wave of MELSHA was conducted in 2010. The 2008 wave of data collection was the latest wave of MELSHA that included oral health related questions. A total of 201 independent-living older Melbournians participated in this wave. The MELSHA program initially received ethics clearance from Monash University (Ethics ID 1646495.1), with the University of Melbourne gaining ethics approval for this specific study (Ethics ID 1646495.1). Written consent was obtained from participants at each wave of data collection.

The first wave of MELSHA data collection was conducted in 1994 on a sample of 1000 (533 female, 467 male) independently living Australians aged 65 years and over in metropolitan Melbourne, selected using the Australian state of Victoria’s electoral roll. The MELSHA study methodology is described in detail elsewhere (26). Data-collection was performed by means of
a face-to-face interview (with a proxy if necessary) in the participants’ homes by trained interviewers, using structured questionnaires.

At baseline (1994), participants were relatively healthy, as those who were ill and unable to participate were excluded from the study. Data collected during the interviews included data on health, health behaviours (nutrition, exercise, social activity), well-being and service use (health services, community services, and residential care). A self-completed questionnaire covered attitudes and life histories. A clinical examination conducted in the home measured variables such as weight, height, eyesight and hearing (27). Within each wave of data collection, non-respondents were identified, and death records were updated (27).

The present analyses included: five socio-demographic variables: age, sex, income, level of education, and marital status. Participants were classified according to their educational level using four categories: ‘Left school at age $\leq 14$ years’; ‘Left school at age $\geq 15$ years’; ‘Trade/apprenticeship’ and ‘Bachelor’s degree or higher’. Marital status was classified into four groups: ‘Never been married’; ‘Divorced/Separated’; ‘Widowed’; and ‘Now married/Living with a partner’. Participants were also asked if they have a health benefits card (Yes/No) and private insurance (Yes/No).

Participant were also asked questions regarding self-perception of dental status and oral health problems and conditions including:

- **Self-assessed natural dentition status**: ‘No natural teeth missing’; ‘Some natural teeth missing’; and ‘All natural teeth missing’;
- **Self-assessed dental pain (Dentate only)**: was assessed by asking the participants to indicate whether “In the last 12 months, how often have you had a toothache?” Responses were
coded in the categories of ‘Very often’; ‘Often’; ‘Sometimes’; ‘Hardly ever’; and ‘Never’.

- Use of dentures (Yes/No); and

- Dental appearance assessed by asking the participants to indicate whether “In the last 12 months, how often have you felt concerned about the appearance of your teeth, mouth (or dentures)?”. Responses were in the categories of ‘Very often’; ‘Often’; ‘Sometimes’; ‘Hardly ever’; and ‘Never’. In order to facilitate interpretation of the data, dental appearance was also regrouped into two groups according to whether a participant had felt concerned or not.

- Participants were also asked to classify themselves on a 5-point ordinal scale ranging from ‘Very often’ to ‘Never’, according to frequency of problems with their mouth (or dentures) during the last 12 months.

Patterns of use of oral and medical health care services were assessed by asking the participants how long since the last dental visit as: ‘12 months or less’; ‘12 months to 2 years’; ‘3 years to 4 years’; ‘More than 5 years’; and ’Never’.

General health status variables included:

- Self-assessment of general health and medical history. To keep results comparable with other studies, participants were asked to classify themselves using a one-item measure on general health: “In general, would you say your health is…?”. Respondents answered on a five-point ordinal scale ranging from ‘Excellent’ to ‘Poor’.

- Medical history was measured by the presence or absence of 24 medical conditions (including diabetes, arthritis, stroke, lung diseases, psychiatric conditions, kidney problems,
arthrit, heart conditions, liver diseases, etc.) and was used to compute a medical history score by summing up the positive answers to these conditions.

- Social activity was evaluated by asking the participants to self-assess the amount of activity as: ‘Not enough; ‘Right’; and ’Too much’.

The concept of psychological wellbeing is complex and multidimensional (28). In order to investigate PW, a combination of instruments, covering aspects of psychological well-being and depression, were used (4). The selected instruments have well-documented psychometric properties and have been used extensively with older people (See Appendix A). The Philadelphia Geriatric Centre Affect Scale is a ten-item scale on a five-point response set ranging from ‘Rarely’ to ‘Very frequently’ (29). The scale focused on the distinction between positive and negative affect (28). To measure positive affect the respondents were asked how often over the past year they felt: ‘Happy’, ‘Interested’, ‘Energetic’, ‘Content’, and ‘Warm-hearted’. To measure negative affect the respondents were asked how often over the past year they felt: ‘Sad’, ‘Annoyed’, ‘Worried’, ‘Irritated’, and ‘Depressed’. The range of possible scores for the positive and negative affect scores was 5 (lowest) to 25 (highest) (29). The Depression Scale from the Psychogeriatric Assessment Scales (30) comprises 12 items with responses categories: ‘No’; ‘Depends on situation’; and ‘Yes’.

**Data analysis**

Data were analysed to compare results between PW and depressive symptoms scores and various socio-demographic, and self-assessed oral and general health variables. Chi-squared analysis was performed on variables that were nominal or ordinal. For variables on an interval
scale, results were analysed using a one-way analysis of variance (ANOVA). A significant one-way ANOVA was followed by post-hoc comparisons using Tukey’s Honest Significant Difference test. Pearson’s correlation analysis was performed on associations between continuous variables and PW scores. Finally, the data were analysed using a series of multivariate linear regression analysis with a stepwise procedure to identify whether participants’ well-being could be predicted by their physical disabilities, social activity and illnesses, including oral health conditions and characteristics. To assess the importance of individual variables, these variables were entered into the equation after controlling for the influence of socio-demographic variables (i.e., age, gender, marital status, and level of education). The effects of oral health and other independent variables on the dependent variables were isolated to determine the unique contribution of each oral health outcome on well-being, using semi-partial regression coefficient. The data were examined for violation of the assumptions underlying the multivariate methods prior to the analysis. Only valid responses were used throughout the analysis procedure, and missing variables were excluded. The IBM SPSS statistics package was employed to analyse the data.

**Results**

Participants had a mean age was 83.9 years (s.d. 3.6 years) with a range from 79 to 96 years old; with the majority (61.7%) being 79-84 years of age. The majority (52%) were male (Table 1). By marital status, 53.5% were married or in a de-facto relationship; 36.9% were widowed; 7.1% were divorced or separated and 2.5% never married. In terms of education level, 51% had no formal qualifications while 11% had trade or apprenticeship qualifications. The remaining 38% had higher levels of education, including 9% with a Bachelor or higher degree.
As for general health, 70.4% of participants assessed their general health from Good to Excellent, while 24.0% assessed it as Fair. The remaining 5.6% self-assessed his/her health as being ‘Poor’. The majority had a health benefits card (70.4%). Selected demographics of the participants are presented in Tables 1.

Insert Table 1 about here

The majority (65.1%) self-reported their dental status as being partially dentate, 31.3% as edentulous and 3.6% had all their natural dentition (See Table 2). The majority (69.3%) reported no problems with their teeth, mouth or dentures in the last 12 months. Only 8.8% expressed ‘Often’ or ‘Very Often’ having problems with their teeth and dentures. Similar results were found when participants were asked about eating difficulty related to problems with teeth and dentures, with 17.2% of participants reporting difficulty eating, while the majority (82.8%) reported no eating issues. Furthermore, of the valid respondents, most of the participants (71.4%) mentioned that they ‘Never’ had to avoid eating certain foods due to problems with their teeth, mouth or dentures. Only 7.8% reported ‘Often’ or ‘Very often’ having problems.

Insert Table 2 about here

Concerning the appearance of their teeth, mouth or dentures, 74.7% reported ‘Never’ feeling concern, while 8.9% indicated they ‘Hardly ever’ felt concern about their dental appearance. Another, 7.9% reported they ‘Sometimes’ by the appearance of their teeth and 8.5% said that occurred ‘Often’ or ‘Very often’. When asked to report on their experiences of toothaches in the last 12 months, 92.4% reported ‘Never’ or ‘Hardly ever’ having toothaches, while 6.8%...
‘Sometimes’ experienced pain, and only 0.8% reported having toothaches ‘Very often’.

About half (47.7%) of respondents reported visiting the dentist in the previous 12 months. Another 32.1% reported no visits for more than 5 years (including ‘Never’ attending) (See Table 2). In contrast, all participants had visited a medical practitioner within the last 12 months.

With regard to health conditions, 13 participants (6.6%) reported none of the selected medical conditions, 10.9% reported one condition, 17.4% reported two, another 17.4% reported three, and 16.9% reported four conditions. The remainder (30.8%) reported between five and fourteen medical conditions. Among those who reported a medical condition (n=188), the most commonly reported conditions were; high blood pressure (51.7%); osteoarthritis (30.7%); 35.8% reported problems with their feet and legs; 23.8% had cataracts; and diabetes (15.6%) Cancer was reported in 42 participants (22.0%). Prostate problems were reported by 29.3% of males.

The positive affect score ranged from 11 to 25 with a mean score of 19.7 (s.d. 2.7). As shown in Table 2, “feeling concern with dental appearance (teeth, mouth or denture) in the last 12 months” was significantly related to the positive affect, negative affect and depression. Those who indicated ‘Never’ having concern about dental appearance had significantly higher positive affect scores than those who indicated ‘Very often’; ‘Often’ or ‘Sometimes’ (p<0.001). They also had significantly lower scores on negative affect (p<0.01) and depressive symptoms (p<0.001). Frequency of problems with teeth or mouth were significantly associated with lower positive affect scores (p<0.01); and depressive symptoms (p<0.001). Frequency of avoiding certain food due to dental problems was significantly associated with lower positive affect.
scores (p<0.05); negative affect (p<0.01) and depressive symptoms (p<0.001). In the same way, presence of difficulties eating due to problems in the mouth or teeth was significantly associated with lower positive affect scores (p<0.05) and depressive symptoms (p<0.001).

Additionally, those who assessed their general health as ‘Excellent’ had significantly higher positive affect scores than all other participants (p<0.001). On the other hand, those who self-assessed their general health as ‘Poor’ had significantly higher negative affect scores than those who self-assessed as ‘Excellent’ or ‘Good’ (p<0.05). In the same manner, those who self-assessed their general health as ‘Poor’ had significantly higher depressive symptoms scores than all other groups (p<0.001) (See Table 1). There were no significant differences in PW by self-reported number of natural teeth, wearing dentures, or toothache. Interestingly, the only socio-demographic characteristic that was significantly associated with PW scores was sex, with females generally in the more positive direction than males.

Predictors of positive affect, negative affect and depressive symptoms scores were analysed using multiple linear regression procedure to explain the variance in these three PW measures. Scores were examined using multivariate linear regression in relation to socio-demographic (i.e., sex); oral health (i.e., number of natural teeth, frequency of problems with teeth or mouth, avoiding food due to dental problems, dental visits); and general health (i.e., Self-assessed general health status, number of health conditions), and psychosocial variables (i.e., oral health appearance, social activity).

Multivariate results indicated that positive affect scores were significantly influenced by self-
reported feelings of concern about the appearance of the mouth, enjoyment of meals, social activity, and self-assessment of general health (F(4,176)=10.772; p<0.0001) (See Table 3). Results showed that after controlling for other variables in the model, participants who did not report concerns regarding their dental appearance; did not self-assess their general health as ‘Poor’; enjoyed their main meal ‘A lot’; and considered that their usual social activity was ‘About right’ had the highest positive affect score. These four independent variables accounted for 17.8% of the variance of positive affect (adjusted r²=0.178). Self-reported feelings of concern about the appearance of the mouth accounted for 8.7% of the variance in positive affect. Enjoyment of meals accounted for 5.4% of the variance and, self-assessment of general health and social activity, accounted for 3.5% and 2.1%, respectively.

Negative affect scores were significantly influenced by self-reported feelings of concern about the appearance of the mouth, avoiding eating meals, income, and gender (F(5,162)=9.393; p<0.0001) (See Table 4). Results showed that self-reported feelings of concern about the appearance of the mouth and avoidance of eating some foods because of problems with teeth or mouth, had the highest negative affect score. Also, higher income increased negative affect scores. On the other hand, those who considered that their usual social activity was ‘About right’ and were male had lowest negative affect score. These four independent variables accounted for 20.1% of the variance of a negative affect score (adjusted r² = 0.201). Self-reported feelings of concern about the appearance of the mouth accounted for 9.0% of the variance in negative affect. Social activity accounted for 5.5% of the variance and sex, income and avoiding meals accounted for 3.0%; 2.7%; and 2.3%, respectively.

Depressive symptoms scores were significantly influenced by self-reported feelings of concern...
about the appearance of the mouth, avoiding eating meals, income, and sex (F(4,177)=15.729; p<0.0001) (See Table 5). Results showed that after controlling for other variables in the model, those who self-reported feelings of concern about the appearance of the mouth and had increasing general health conditions had the highest depressive scores. On the other hand, those who reported walking difficulties and were dentate had the lowest depressive score. These four independent variables accounted for 24.6% of the variance of a depressive symptoms score (adjusted $r^2 = 0.246$). Walking difficulties accounted for 17.2% of the variance in the depressive score. Self-reported feelings of concern about the appearance of the mouth accounted for 4.2% of the variance in negative affect. Number of health conditions and having natural dentition accounted for 2.9% and 2.0% % of the variance, respectively.

Discussion

Analysis of the MELSHA data reveals that for this cohort of older Melbournians, there was a significant association between oral health related variables (i.e., mouth and dental appearance) and PW and depressive symptoms. This is consistent with Australia’s National Oral Health Plan which places oral health is an integral aspect of general health and as fundamental to general health, as well as wellbeing and quality of life (16,31). Furthermore, it provides further indication that older adults remain cognisant of their mouth and dental aesthetics, even at an advanced age. Clinicians and gerontologists need to further understand the impact that oral health has on PW and position oral health within the healthy living goals of older people. They also need to be aware that interventions designed to improve the oral health status of older adults, particularly the appearance of older adult’s dentition or dentures, would have a significant impact on older adult’s general well-being.
On the other hand, the results illustrated that more than 80% of the participants reported more than one health condition, with 31% suffering five or more - emphasising the extensive systemic health burden affecting the older population. A significant proportion of the participants were afflicted with osteoarthritis, as well as feet and leg problems, potentially hindering their ability to perform oral hygiene practices, as well as accessing oral health care services. Moreover, more than half of the participants reported high blood pressure (51.7%). This is important because medications to reduced blood pressure are associated with reduced salivary function and cause dry mouth (32). Cancers were also prevalent. Many chemotherapy agents used in cancer therapy, may as side effects, reduce salivary and can cause dry mouth (33). Dry mouth or xerostomia ought not to be considered a trivial problem, as salivary dysfunction can lead to an increased risk of dental caries and periodontal disease and eventually tooth loss; pain; decreased enjoyment of food; and decreased tolerance to prosthetic appliances (34). Diabetes was also somewhat prevalent in this study.

Analysis revealed that the participants exhibited a reduced frequency of dental visits (47.7%). Visits to oral health care services are important as they provide opportunities for health promotion, oral hygiene instructions and for the maintenance of a good oral health status (35). Increasing dental awareness and education among the older population as well as their carers may be a crucial component in improving PW of this group of the Australian population. In so doing, it is important that oral health professionals understand their older patients’ past experiences, misconceptions and potential negative views of dentistry to better engage older populations, and improve their reception to treatment and oral health promotion (36).

In interpreting the present findings, several limitations were identified, including the cross-
sectional design and the self-reported nature of the data, and a population bias towards relatively healthy, independent-living and English-speaking individuals. In addition, there were limitations imposed due to the lack of clinical data to assess the oral health status of the participants. For example, although this study illustrated the potential negative impacts of poor oral health on the psychological well-being of older Melbournians, there was no clinical data to verify self-reported “Little” or “No” oral problems.

Nonetheless, the self-assessed health status data reported here is similar to that reported by the Australian Bureau of Statistics (37) for people aged 75 years and over 2015, when 34.5% self-rated their health status as being excellent or very good, compared to 36.7% in the MELSHA sample. Additionally, the 2008-MELSHA data show consistency, although no similarities due to discrepancy in the age ranges of participants, to the Victorian results for the metropolitan 55 years and older respondents of the NSAOH (22). For example, 19.2% of MELSHA participants reported avoiding certain foods due to problems with their mouth or dentures, while 18.2% of metropolitan adults aged 55 or older, in the NSAOH sample, reported avoiding foods due to dental problems.

Furthermore, the present study comprised a sample of older adults 79 years or more living independently in the community, which is quite uncommon. This is the fastest growing age group in Australia and in many countries, better information on the oral health and wellbeing of old-old populations is needed. Present findings indicate that psychological well-being is not merely influenced by an absence of oral disease or oral pain (16,38,39), suggesting that oral health may still play a significant mediating role through maintaining a presentable and acceptable physical appearance, which if affected may lead, as reported in the literature, to
experiences of social and emotional distress [14,40]. In this way, we used the best available data for this group of the Australian population to expand the findings on the role of oral health in psychological well-being.

Thus, despite limitations, we believe that, due to the breadth of data collection, assessments using validated instruments, the size of the population whose data was collected and the longitudinal design of the MELSHA study, our study represents a substantial study of older Melbournians. As such, the present results extend current research in oral health and contribute to an understanding of how older adults place oral health in the context of their well-being and provide information that may serve to develop effective oral health services and oral health promotion programs to ensure that interventions are designed to improve the oral health of older adults, and through this their psychological well-being.

In order to further explore the oral health, well-being of older adults, future longitudinal studies assessing the general health of the population should include additional and more detailed oral health-related questions, including oral health behaviours and clinical assessments, to increase the quality of data, allowing for a better understanding of Australia’s oral health needs. Additionally, further exploration of these issues using qualitative methods would allow better understanding of the meaning of oral health status and appearance in this growing group of the population to identify how to better intervene to improve appearance and thus, psychological well-being.
Acknowledgements

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 References
   
   

   


Table 1. Distribution of sociodemographic variables, self-assessed general health, oral health care visits pattern, use of dental prosthetics and means and standard deviations psychological wellbeing scores among MELSHA 2008 participants.

<table>
<thead>
<tr>
<th></th>
<th>% (n=201)</th>
<th>Positive affect score</th>
<th>Negative affect score</th>
<th>Depressive symptoms score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>52.0</td>
<td>19.8 (2.8)</td>
<td>12.7 (3.3)</td>
<td>1.6 (2.2)</td>
</tr>
<tr>
<td>Female</td>
<td>48.0</td>
<td>19.5 (2.6)</td>
<td>11.6 (2.9)</td>
<td>1.0 (1.4)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-84 years</td>
<td>61.7</td>
<td>19.5 (2.6)</td>
<td>12.3 (3.3)</td>
<td>1.2 (2.0)</td>
</tr>
<tr>
<td>85 years or more</td>
<td>38.3</td>
<td>19.9 (2.8)</td>
<td>11.9 (2.9)</td>
<td>1.3 (1.7)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left school at age 14 or less years</td>
<td>28.5</td>
<td>19.5 (2.5)</td>
<td>12.1 (3.2)</td>
<td>1.4 (2.4)</td>
</tr>
<tr>
<td>Left school at age 15 or more years</td>
<td>23.0</td>
<td>19.6 (2.9)</td>
<td>12.3 (3.5)</td>
<td>1.0 (1.4)</td>
</tr>
<tr>
<td>Trade/apprenticeship</td>
<td>10.5</td>
<td>20.0 (2.7)</td>
<td>11.8 (2.8)</td>
<td>1.2 (1.8)</td>
</tr>
<tr>
<td>Certificate/diploma</td>
<td>29.0</td>
<td>19.7 (2.8)</td>
<td>12.3 (3.3)</td>
<td>1.3 (1.7)</td>
</tr>
<tr>
<td>Bachelor’s degree or higher</td>
<td>9.0</td>
<td>19.6 (2.8)</td>
<td>12.1 (3.2)</td>
<td>1.3 (1.5)</td>
</tr>
<tr>
<td><strong>Self-assessed general health</strong></td>
<td></td>
<td>***</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>Excellent</td>
<td>9.2</td>
<td>22.1 (2.4)</td>
<td>10.8 (2.9)</td>
<td>0.4 (0.7)</td>
</tr>
<tr>
<td>Very good</td>
<td>27.5</td>
<td>20.2 (2.2)</td>
<td>11.6 (2.7)</td>
<td>0.8 (1.2)</td>
</tr>
<tr>
<td>Good</td>
<td>33.7</td>
<td>19.3 (2.7)</td>
<td>12.3 (3.3)</td>
<td>1.3 (2.2)</td>
</tr>
<tr>
<td>Fair/Poor</td>
<td>29.6</td>
<td>18.4 (2.7)</td>
<td>13.2 (3.3)</td>
<td>2.3 (2.1)</td>
</tr>
<tr>
<td><strong>Time since last visit to dentist</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within a month</td>
<td>8.3</td>
<td>19.7 (2.4)</td>
<td>12.1 (2.1)</td>
<td>1.7 (2.2)</td>
</tr>
<tr>
<td>1 - 5 months ago</td>
<td>19.2</td>
<td>19.9 (2.8)</td>
<td>12.1 (3.3)</td>
<td>1.1 (1.7)</td>
</tr>
<tr>
<td>6 - 11 months ago</td>
<td>20.2</td>
<td>20.1 (2.7)</td>
<td>11.7 (2.9)</td>
<td>0.7 (1.2)</td>
</tr>
<tr>
<td>1 - 2 years ago</td>
<td>12.4</td>
<td>19.3 (2.6)</td>
<td>11.8 (2.6)</td>
<td>1.3 (1.7)</td>
</tr>
<tr>
<td>3 - 4 years ago</td>
<td>7.8</td>
<td>19.7 (1.8)</td>
<td>13.0 (2.7)</td>
<td>1.3 (2.9)</td>
</tr>
<tr>
<td>5 or more years ago</td>
<td>29.0</td>
<td>19.4 (2.9)</td>
<td>12.4 (3.5)</td>
<td>1.7 (2.0)</td>
</tr>
<tr>
<td>Never</td>
<td>3.1</td>
<td>20.2 (3.0)</td>
<td>11.3 (4.7)</td>
<td>1.2 (1.5)</td>
</tr>
</tbody>
</table>

Dental prosthetics
| Wearers | 75.0 | 19.7 (2.7) | 12.1 (3.2) | 1.3 (2.1) |
| Non-wearers | 25.0 | 19.7 (2.7) | 12.1 (2.9) | 1.1 (1.2) |

* p< 0.05; ** p< 0.01; *** p< 0.001
Table 2. Oral health-related variables and means and standard deviations psychological wellbeing scores Among MELSHA 2008 participants.

<table>
<thead>
<tr>
<th></th>
<th>% (n=201)</th>
<th>Positive affect score</th>
<th>Negative affect score</th>
<th>Depressive symptoms score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural teeth missing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No natural teeth missing</td>
<td>3.6</td>
<td>19.4 (2.6)</td>
<td>12.4 (3.5)</td>
<td>1.7 (2.4)</td>
</tr>
<tr>
<td>Some natural teeth missing</td>
<td>65.1</td>
<td>19.7 (2.8)</td>
<td>11.9 (2.9)</td>
<td>1.1 (1.6)</td>
</tr>
<tr>
<td>All natural teeth missing</td>
<td>31.3</td>
<td>19.4 (3.5)</td>
<td>12.1 (2.6)</td>
<td>0.7 (1.0)</td>
</tr>
<tr>
<td>Difficulty eating due to problems with mouth or teeth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>17.2</td>
<td>18.6 (3.0)</td>
<td>12.9 (3.0)</td>
<td>2.3 (2.6)</td>
</tr>
<tr>
<td>No</td>
<td>82.8</td>
<td>20.0 (2.6)</td>
<td>11.9 (3.1)</td>
<td>1.1 (1.6)</td>
</tr>
<tr>
<td>Toothache (Frequency past 12 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>80.3</td>
<td>19.8 (2.5)</td>
<td>11.9 (2.8)</td>
<td>1.2 (1.7)</td>
</tr>
<tr>
<td>Hardly Ever</td>
<td>12.1</td>
<td>19.9 (2.5)</td>
<td>12.3 (2.8)</td>
<td>1.0 (1.8)</td>
</tr>
<tr>
<td>Sometimes/ Often/ Very often</td>
<td>7.6</td>
<td>19.0 (3.8)</td>
<td>11.3 (4.1)</td>
<td>1.2 (1.7)</td>
</tr>
<tr>
<td>Problem with mouth or denture (Frequency past 12 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>69.3</td>
<td>20.1 (2.5)</td>
<td>11.7 (3.0)</td>
<td>1.0 (1.6)</td>
</tr>
<tr>
<td>Hardly Ever</td>
<td>11.5</td>
<td>19.6 (2.9)</td>
<td>12.6 (2.6)</td>
<td>1.2 (2.1)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>10.4</td>
<td>18.1 (2.7)</td>
<td>12.4 (2.8)</td>
<td>1.5 (1.7)</td>
</tr>
<tr>
<td>Often/</td>
<td>3.6</td>
<td>20.1 (2.0)</td>
<td>13.7 (2.4)</td>
<td>1.9 (1.6)</td>
</tr>
<tr>
<td>Very often</td>
<td>5.2</td>
<td>18.0 (3.4)</td>
<td>14.1 (5.0)</td>
<td>3.6 (3.4)</td>
</tr>
<tr>
<td>Concern about dental appearance (Frequency past 12 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>74.7</td>
<td>20.2 (2.4)</td>
<td>11.5 (2.8)</td>
<td>0.9 (1.4)</td>
</tr>
<tr>
<td>Hardly Ever</td>
<td>8.9</td>
<td>19.9 (2.6)</td>
<td>12.9 (3.4)</td>
<td>1.5 (2.2)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>7.9</td>
<td>17.9 (2.7)</td>
<td>14.1 (3.7)</td>
<td>2.2 (2.5)</td>
</tr>
<tr>
<td>Often</td>
<td>5.8</td>
<td>16.7 (2.7)</td>
<td>14.3 (3.3)</td>
<td>2.8 (3.2)</td>
</tr>
<tr>
<td>Very often</td>
<td>5.8</td>
<td>18.0 (3.1)</td>
<td>14.2 (4.4)</td>
<td>2.4 (2.5)</td>
</tr>
<tr>
<td>Avoiding certain foods due to dental problems (Frequency past 12 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>71.4</td>
<td>20.0 (2.5)</td>
<td>11.6 (2.8)</td>
<td>1.1 (1.6)</td>
</tr>
<tr>
<td>Frequency</td>
<td>9.4</td>
<td>20.0 (2.9)</td>
<td>12.6 (2.8)</td>
<td>0.7 (1.3)</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----</td>
<td>------------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Hardly Ever</td>
<td>11.4</td>
<td>19.0 (3.1)</td>
<td>12.9 (3.6)</td>
<td>1.5 (1.9)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>5.2</td>
<td>17.6 (3.1)</td>
<td>13.8 (3.0)</td>
<td>2.8 (2.6)</td>
</tr>
<tr>
<td>Often</td>
<td>2.6</td>
<td>18.0 (2.2)</td>
<td>15.2 (5.1)</td>
<td>4.6 (4.1)</td>
</tr>
<tr>
<td>Very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p< 0.05; ** p< 0.01; *** p< 0.001
Table 3: Predictors of Psychological Wellbeing (positive affect) score in MELSHA 2008 participants.

<table>
<thead>
<tr>
<th>Concerns about appearance of their mouth and teeth Self-assessment of general health</th>
<th>B</th>
<th>r²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would you say you enjoy your main meal of the day? (A lot)</td>
<td>1.15</td>
<td>0.054</td>
<td>0.02</td>
</tr>
<tr>
<td>Self-assessment of general health</td>
<td>1.00</td>
<td>0.035</td>
<td>0.05</td>
</tr>
<tr>
<td>Social activity ‘About right’</td>
<td>1.00</td>
<td>0.021</td>
<td>0.05</td>
</tr>
<tr>
<td>Constant</td>
<td>17.61</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adjusted $r^2 = 0.178$
Table 4: Predictors of Psychological Wellbeing (negative affect) score in MELSHA 2008 participants.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>$r^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns about appearance of their mouth and teeth Self-assessment of general health</td>
<td>1.33</td>
<td>0.090</td>
<td>0.02</td>
</tr>
<tr>
<td>Social activity ‘About right’</td>
<td>-2.01</td>
<td>0.027</td>
<td>0.001</td>
</tr>
<tr>
<td>Sex (Male = 1)</td>
<td>-1.48</td>
<td>-0.055</td>
<td>0.01</td>
</tr>
<tr>
<td>Income</td>
<td>0.28</td>
<td>0.030</td>
<td>0.01</td>
</tr>
<tr>
<td>Avoid eating some foods due to problems with your teeth, mouth</td>
<td>1.12</td>
<td>0.027</td>
<td>0.05</td>
</tr>
<tr>
<td>Constant</td>
<td>12.47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adjusted $r^2 = 0.201$
Table 5: Predictors of Depressive symptoms score in MELSHA 2008 participants.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>$r^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking difficulties</td>
<td>-1.43</td>
<td>0.090</td>
<td>0.0001</td>
</tr>
<tr>
<td>Concerns about appearance of their mouth and teeth Self-assessment of general health</td>
<td>0.93</td>
<td>0.027</td>
<td>0.001</td>
</tr>
<tr>
<td>Dentate (1=Yes)</td>
<td>-0.64</td>
<td>0.055</td>
<td>0.02</td>
</tr>
<tr>
<td>Number of health conditions</td>
<td>0.11</td>
<td>0.030</td>
<td>0.03</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adjusted $r^2 = 0.246$
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Author/s:
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