Evaluation of Oral Stereognosis in Relation to Tactile Ability and Patient Satisfaction

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We investigated the oral stereognostic ability (OSA) of dentate individuals, conventional complete denture patients, and maxillary implant-supported complete denture patients with bar attachments. Stereognosis tests were carried out, and the relationship between OSA and patient satisfaction was assessed with a satisfaction survey: the Turkish version of the oral health impact profile-14 (OHIP-TR-14). To compare differences in oral sensory function among individuals with natural dentition, complete denture wearers, and maxillary implant-supported complete denture wearers, tactile awareness (thickness perception threshold) and pressure awareness (threshold of lateral loading) were assessed. According to the results, the oral perception level of natural dentate patients was higher than that of the complete denture group and maxillary implant-supported complete denture group at the end of the study. There was no statistically significant difference in OHIP-TR-14 scores between the maxillary implant-supported complete denture group and the complete denture group (P < .05). The control group perceived the applied lateral and vertical forces statistically earlier than the other groups (P < .001). There was no statistically significant difference between the complete denture and maxillary implant-supported complete denture groups in terms of lateral pressure threshold or thickness tactile threshold (P > .05). At the end of the study it was concluded that there was no correlation between oral perception levels and satisfaction in patients with complete dentures and patients with maxillary implant-supported complete dentures. The control group, compared with the complete denture and maxillary implant-supported complete denture groups, perceived the lateral and vertical forces statistically earlier than the other groups.

Key Words: implant-supported prosthesis, oral stereognostic ability, thickness perception, lateral loading, patient satisfaction

INTRODUCTION

Patients using complete dentures do not have periodontal receptors; thus, the perception functions of these patients in the oral cavity are reduced compared with those having natural teeth.1,2 Rehabilitation of the oral cavity is as important as the restoration of chewing function because taste perception is closely related to dental prostheses.3 Several researchers have studied perceptual differences between patients with natural teeth and implant-supported dentures.1–4 Additionally, there has been significant debate about oral tactile function and the sensibilities of patients treated with implants.2–5

Oral stereognosis is achieved by a certain amount of motor activity, manipulation of objects within the mouth, and the sensing of surfaces by the tongue, lips, teeth, and palate.3–5 Knowledge should be associated with oral sensations obtained from visual and sensory experiences.5 The oral tactile skills of individuals play a vital role in providing data to dentists.6,7 The oral stereognosis test provides information about a patient’s oral disintegration ability.3,4 Performing these tests takes little time, and no special treatment is required by the clinician.4,5 Clinicians use this information to assess how patients will respond during and after treatment.6

Patients using complete dentures are expected to have less tactile function in the oral cavity than normal teeth individuals due to the absence of periodontal membranes and the need to coat the palate for prostheses retention.6,7 Although some studies have shown that implant placement in a toothless jaw with a complete denture on top of that increased oral awareness compared with patients using traditional complete dentures, this treatment plan cannot be applied to every toothless patient because of the cost of treatment, and, in some cases, systemic contraindications.6,8 Although these studies have separately investigated oral perception and satisfaction, studies assessing oral perception, pleasure, and oral tactile function all at once are lacking.4–8

In this study, oral cognitive abilities were measured by stereognosis tests in a total of 126 patients with teeth and using traditional complete dentures and in patients with maxillary implant-supported complete dentures. The validated
We compared the level of oral tactile ability and satisfaction between patients with natural teeth and patients using traditional complete dentures or maxillary implant-supported complete dentures. This clinical prospective study was conducted at Erciyes University, Faculty of Dentistry, Department of Prosthodontics. Prior to this study, ethics committee approval was obtained from the Erciyes University Clinical Research Council (no. 2014/510).

The process was as follows: selection of patients according to appropriate criteria; calling patients for appointments and taking informed consent from patients; control of the patients’ dentures by 2 prosthodontists, with adjustments if necessary; application of a stereognosis test; completion of the OHIP-TR-14 questionnaire; completion of the thickness threshold test; and completion of the lateral pressure threshold test.

**Group I selection criteria**

The group I selection criteria were as follows: absence of teeth; absence of local inflammation and oral mucosal diseases or any symptoms; absence of history of temporomandibular disorder; and absence of excessive cigarette consumption (more than 10 cigarettes a day). Angle class I occlusion was classified as the subject group I. Group I consisted of 50 full dentate persons (male, 27; female, 23; average age, 26.52 ± 5.04 years).

**Group II selection criteria**

The group II selection criteria were as follows: absence of local inflammation and oral mucosal diseases; absence of drug habits and diseases that threaten life; absence of excessive parafunctional activity due to denture use and fractures in the existing dentures; being full edentulous; and absence of excessive cigarette consumption (more than 10 cigarettes a day). Fifty maxillary and mandibular conventional complete denture wearers were placed in group II (male, 24; female, 26; average age, 65.12 ± 8.09 years).

**Group III selection criteria**

The group III selection criteria were as follows: absence of local inflammation and oral mucosal diseases; absence of drug habits and diseases that threaten life; absence of excessive parafunctional activity due to dentures use and fractures in the existing dentures; being full edentulous; and absence of excessive cigarette consumption (more than 10 cigarettes a day). The number of maxillary implant-supported prostheses wearers (opposing mandibular implant-supported dentures with bar attachments) was 26 (male, 16; female, 10; average age, 57.38 ± 13.07 years), and these subjects were classified as group III. The 26 patients with maxillary implant-supported complete dentures had 4 implants located in the region of the laterals and first premolars with bar attachments. The denture type of group II and group III was the same with full palatal coverage. A total of 126 patients were evaluated. The number of the patients, sex distribution, and average age values are shown in Table 1.

The patients included in this study had used their dentures for at least 2 and almost for 8 years. All of the patients were selected from those who had been treated at Erciyes University, Dentistry Faculty, Prosthetic Dentistry Department. All the subjects were fully informed of this study, and written consents were obtained.

The patients’ dentures were evaluated by 2 prosthodontists. In this evaluation, occlusion, articulation, rest vertical dimension, interocclusal distance, side lengths, retention, and stability were evaluated. Patient occlusion control was performed with T-Scan III (a computerized occlusal analysis system) to eliminate premature contact in the patients’ dentures. After all necessary adjustments had been made, the test phases were initiated.

Ten different test samples were used to assess oral stereognostic ability. The test samples were plastic with a diameter of 5–10 mm. The patients’ eyes were covered, and the small test specimens were placed on each patient’s tongue.

**TABLE 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group I (n = 50)</th>
<th>Group II (n = 50)</th>
<th>Group III (n = 26)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>26.52 ± 5.04a</td>
<td>65.12 ± 8.09b</td>
<td>57.38 ± 13.07c</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>27 (54.0)</td>
<td>24 (48.0)</td>
<td>16 (61.5)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>23 (46.0)</td>
<td>26 (52.0)</td>
<td>10 (38.5)</td>
<td>.527</td>
</tr>
</tbody>
</table>

The values indicate the mean ± SD and n (%). The different letters state the statistical difference between the groups.
with the aid of a tongue depressor, after which the patient was shown large duplicates of the pretest samples (Figure 1a and b). Later, with the help of a stopwatch, the number of seconds it took for the patients to respond was noted. All patients included in the study were subjected to this test without dentures first to ensure standardization. Later, the same test was repeated while the patients’ dentures were in their mouths.

The OHIP-TR-14 test was applied to all patients after completion of the stereognosis test procedure. The OHIP-14-TR was evaluated using a 5-point Likert scale (ranging from “4 = very often” to “0 = never”).

Articulation papers with a thickness of 8 μm were used to measure the thickness perception threshold of the patients. These papers were placed between each patient’s lower and upper teeth, and the number of the papers was increased until the patient began to feel the height. The normality assumption was assessed with histograms, q-q plots, and the Shapiro-Wilk test. The assumption of homogeneity of variance was tested using the Levene test. To compare differences between groups, a 2-sided independent samples t-test, paired t-test, or 1-way analysis of variance was used. Tukey’s test was used for correlation analyses. All analyses were conducted using R software (ver. 3.4.0; http://www.r-project.org). P < 5% was considered to indicate statistical significance.

RESULTS

The results of the oral stereognosis test from group I, group II, and group III are shown in Table 2. The control group patients perceived all stereognosis patterns earlier, except for the cone shape, and in a statistically significant manner vs the other groups (P < .001). When we compared group II and group III, the patients with implant-supported dentures (group III)
perceived pyramid and drop shapes (round shapes tested: circle, pyramid, window, drop, and cone) statistically significantly earlier (P < .001). Compared with patients in group II, patients in group III perceived smooth, 1-rill, 2-rill, and chessboard shapes (square shapes tested: smooth, 1-rill, 2-rills, 4-rills, and chessboard) statistically significantly earlier (Table 2; P < .001). Additionally, when Table 2 was examined, there was no statistically significant difference between the groups in terms of stereognostic tests performed when the dentures were inserted and when the patients were toothless (for group II and group III; P > .05). However, group III was found to perceive the shapes statistically significantly earlier (except for circles and drops) than group II when the stereognosis test was performed without dentures (Table 2; P < .05).

A comparison of the OHIP-TR-14 questionnaire responses between the groups is shown in Table 3. A statistically significant difference was found only at the 7th and 13th questions (“Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures in last six months?” and “Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures in last six months?” respectively) between group II and group III (P < .05; Table 3).

A comparison of the OHIP-TR-14 questionnaire overall scores between the groups is shown in Table 4. There was no statistically significant difference in OHIP-TR-14 scores between group III and group II (P < .05; Table 4). As shown in Table 5, when the lateral pressure and thickness tactile threshold values of the groups were examined, the control group (group I) perceived the applied lateral and vertical forces statistically significantly earlier than the other groups (P < .001). There was no statistically significant difference between group II and group III in terms of lateral pressure or thickness tactile threshold (P > .05; Table 5). As shown in Table 6, there was no correlation between oral tactile level and patient satisfaction in group II and group III.

The correlations between the stereognostic forms and the OHIP-TR-14 questions are presented in Tables 7 and 8. In group III, there was a medium-level correlation between the circle of stereognostic shapes and the 8th question (“Have you had to interrupt meals because of problems with your teeth, mouth or dentures in last six months?”), 10th question (“Have you been a bit embarrassed because of problems with your teeth, mouth or dentures in last six months?”), and 11th question (“Have you been a bit irritable with other people because of problems with your teeth, mouth or dentures in last six months?”) (0.416, 0.477, and 0.444, respectively; Table 8).

There was a weak and statistically not significant correlation between the age variable and OHIP-TR-14 score (r = −0.108, P = .352).

Additionally, when the data in Table 9 were examined, there was no statistically significant difference between sexes in terms of OHIP-TR-14 scores (P = .748).

**Discussion**

In our study, an oral stereognostic ability (OSA) test was used to assess oral tactile sensitivity and its effects. Furthermore, whereas the sense of touch between mandibular and maxillary dentures was examined based on the thickness tactile threshold value, sensitivity in terms of pressure was assessed by the lateral load threshold test on the tooth or denture.

The shapes chosen for the OSA test had sufficiently difficult ratings. The figure that elicited the fastest response was the circle, whereas the test shape that required the most time for a response was the chessboard.

The control group patients (group I), compared with the other groups, perceived all stereognostic patterns statistically significantly earlier, except for the cone shape (P < .001). Thus, the oral cognitive abilities of individuals with natural dentition can be seen to be significantly higher than those using complete dentures or implant-supported complete dentures. When group II and group III were compared, the patients in group III perceived the pyramid and drop shapes (among round shapes) and smooth, 1-rill, 2-rill, and chessboard stereognosis shapes (among square shapes) statistically significantly earlier. Thus, we reject the first hypothesis of our study. This can be attributed to the fact that implant-supported complete dentures exhibit greater retention and stabilization than complete dentures; thus, our result may be related to the tongue, which is the main factor in defining oral stereognosis shapes and which moves more easily in patients with implant-supported complete dentures. A literature review revealed that our results are consistent with those of other studies.11,12 There were no statistically significant differences between

<table>
<thead>
<tr>
<th>Groups</th>
<th>Variables</th>
<th>Group II (n = 50; mean ± SD)</th>
<th>Group III (n = 26; mean ± SD)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>1.58 ± 0.93</td>
<td>1.31 ± 0.74</td>
<td>.168</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>1.40 ± 0.83</td>
<td>1.15 ± 0.61</td>
<td>.148</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>1.34 ± 0.80</td>
<td>1.19 ± 0.69</td>
<td>.427</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>1.34 ± 0.80</td>
<td>1.19 ± 0.64</td>
<td>.416</td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>1.22 ± 0.71</td>
<td>1.31 ± 0.74</td>
<td>.615</td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>1.42 ± 0.93</td>
<td>1.19 ± 0.49</td>
<td>.166</td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>1.70 ± 1.07</td>
<td>1.23 ± 0.51</td>
<td>.012</td>
<td></td>
</tr>
<tr>
<td>Q8</td>
<td>1.42 ± 0.95</td>
<td>1.12 ± 0.43</td>
<td>.059</td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>1.40 ± 0.95</td>
<td>1.12 ± 0.33</td>
<td>.059</td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>1.18 ± 0.69</td>
<td>1.35 ± 0.80</td>
<td>.349</td>
<td></td>
</tr>
<tr>
<td>Q11</td>
<td>1.12 ± 0.52</td>
<td>1.19 ± 0.69</td>
<td>.611</td>
<td></td>
</tr>
<tr>
<td>Q12</td>
<td>1.34 ± 0.77</td>
<td>1.15 ± 0.61</td>
<td>.256</td>
<td></td>
</tr>
<tr>
<td>Q13</td>
<td>1.66 ± 0.98</td>
<td>1.23 ± 0.51</td>
<td>.015</td>
<td></td>
</tr>
<tr>
<td>Q14</td>
<td>1.08 ± 0.34</td>
<td>1.15 ± 0.61</td>
<td>.501</td>
<td></td>
</tr>
</tbody>
</table>

The different letters indicate statistical difference between the groups.
the groups in terms of the stereognosis tests performed when the dentures were inserted and when the patients were toothless among the complete denture and implant-supported complete denture patients \( (P > .05) \). However, the maxillary implant-supported denture patients (group III) perceived the shapes statistically significantly earlier (except for circles and drops) than the other patients in the stereognosis test when it was performed without dentures (Table 2; \( P < .05 \)). Periodontal neural receptors play an important role in oral tactile function.\(^{13} \) The vast majority of receptors can be found in the periodontal ligament, and these ligaments are not near dental implants. Perception sensibility observed in intraosseous implants can be attributed to endo-osseous and periosteal neural endings around the implant. Studies indicate that the transmitter of perception is endo-osseous and/or periosteal receptors around implants.\(^{7,14} \) The implant-supported complete denture patients without dentures in their mouths responded earlier to many shapes relative to the complete denture patients because of increased sensory function due to periosteal receptors around the implants.

In some studies, an increase in the estimation of OSA was observed when complete denture patients removed their dentures.\(^{15–20} \) The reason for this is that a superior complete denture helps to define shapes by playing a rigid supportive role against the tongue, and the palate area does not play an effective role in perception, having no sensory receptors. Similarly, a previous study\(^{21} \) reported that if the dentures were removed, the response time on the OSA test increased by \( \sim 1 \) second. In contrast, a different study\(^{22} \) reported that, shortly after complete denture insertion, patients who had many problems and were not satisfied with their dentures demonstrated OSA at a higher level than patients who had fewer or no problems with their dentures. In our study, the OSA values of patients using complete dentures and complete implant-supported dentures were also examined after denture removal. According to our findings, no statistically significant difference was observed in the estimation of OSA in patients who removed their dentures than when patients had their dentures. This suggests that the main factor in perceiving stereognostic shapes is the tongue. The role of the tongue in stereognosis is much more important than that of palatal receptors.\(^{19,20} \)

A statistically significant difference was found only at the 7th and 13th questions ("Has your diet been unsatisfactory because of problems with your teeth, mouth or denture in last six months?" and "Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures in last six months?", respectively) between implant-supported complete denture and complete denture \( (P < .05; \) Table 3). According to this result, we reject the third hypothesis of the present study (there is no correlation between oral tactile level and patient satisfaction in the groups of this study). Patient satisfaction studies related to implant-supported complete dentures have generally been conducted using patients with mandibular implant-supported complete dentures and mandibular complete dentures.\(^{23,24} \) According to the results of these studies conducted with the OHIP questionnaire, mandibular implant-supported complete dentures increased patient satisfaction significantly compared with mandibular complete dentures.\(^{23,24} \) In the mandibula, the implant-supported complete denture is more elaborate because it is more difficult to restrain and stabilize (due to anatomical reasons) than the maxilla. Moreover, when maxillar retention is not achieved or when the patient’s expectations regarding retention and stabilization are very high, maxillary implant-supported complete dentures are an alternative to treatment. A few reports have assessed the impact of implant-supported complete dentures on patient satisfaction.\(^{25,26} \) Kuoppala et al\(^{25} \) reported that retention type, portion of the palate covered by the denture, having an open or closed design, and the number of implants did not affect satisfaction in maxillary implant-supported denture patients with different implant numbers and different types of holders (bar, O-ring, or locator) according to the OHIP-14 questionnaire. In our study, when overall OHIP-TR-14 scores were evaluated in maxillary complete denture and maxillary implant-supported denture patients, there was no statistically significant difference between the groups.

One of the purposes of this study was to assess whether
patients’ satisfaction with the dentures they used affected their oral tactile ability. Multiple studies have examined the correlation between satisfaction and oral perception in patients using complete dentures,\textsuperscript{15,22,27,28} and some studies have found that patient satisfaction with complete dentures was correlated positively with oral cognitive ability.\textsuperscript{15,28} Other studies suggest that the oral cognitive level of patients who are having problems with complete dentures does not differ from that of patients who are satisfied with their complete dentures.\textsuperscript{22,27} In this study, a correlation analysis was used to determine that there was no relationship between satisfaction with one’s dentures and oral perception ability in the complete denture and maxillary implant-supported complete denture groups.

In our study, individuals with natural dentition had an occlusal thickness tactile threshold of 8 μm. This level was found to be 31.84 μm in patients using complete dentures and 19.12 μm in patients using implant-supported complete dentures. Some studies have shown that the occlusal thickness tactile threshold in natural teeth is 8–30 μm.\textsuperscript{2,29} However, this value is 30–600 μm for people using dentures.\textsuperscript{29,30} Toothless patients have difficulty recognizing small occlusal forces during eating as a result of the distribution of occlusal stress to tissues supporting the denture over a large area. Manly et al\textsuperscript{11} reported that complete denture patients experienced greater problems in perceiving thin materials than dentate patients. In our study, similar to these previous studies, the thickness tactile thresholds of denture patients were significantly higher than those of dentate patients (\( P < .05 \)). However, there was no statistically significant difference in the thickness tactile threshold between the complete denture group (group II) and the maxillary implant-supported complete denture group (group III; \( P > .05 \)).

In our study, the lateral perception threshold values were lower in group I than in group II and group III. However, there was no statistically significant difference in the lateral perception threshold values between the complete denture and implant-supported denture groups. According to this result, we accepted the second null hypothesis of the present study (using a traditional complete denture or implant supported complete denture does not affect the lateral tactile threshold values and thickness tactile threshold values of the patients).

This, similar to previous studies, suggests that bone quality does not have a definite effect on the oral perception mechanism in people using implant-supported dentures.\textsuperscript{13}

It is important to recognize the limitations of this study. The 2 groups were completely edentulous, and the control group consisted of full dentate patients; there was an age difference between the groups. Beside this, the study population was a relatively small number of convenient individuals who were cognitively healthy and able to visit a clinic by themselves. Consequently, the results reported here may be specific to this

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
Variable & Q1 & Q2 & Q3 & Q4 & Q5 & Q6 & Q7 & Q8 & Q9 & Q10 & Q11 & Q12 & Q13 & Q14 \\
\hline Circle & 0.202 & -0.062 & -0.113 & 0.084 & 0.231 & 0.115 & -0.036 & 0.416 & 0.040 & 0.477 & 0.444 & 0.141 & 0.111 & 0.221 \\
Pyramid & 0.274 & 0.267 & 0.052 & 0.229 & 0.258 & 0.041 & 0.026 & -0.124 & 0.265 & 0.111 & -0.234 & 0.047 & 0.150 & 0.072 \\
Window & 0.158 & 0.092 & 0.001 & 0.048 & -0.122 & -0.098 & -0.220 & -0.253 & 0.104 & -0.270 & -0.031 & -0.167 & 0.145 & 0.227 \\
Drop & 0.068 & 0.290 & 0.147 & 0.250 & 0.201 & 0.012 & 0.264 & 0.006 & 0.185 & 0.119 & 0.024 & 0.013 & -0.131 & 0.207 \\
Conus & 0.227 & 0.124 & 0.187 & 0.020 & -0.013 & -0.082 & 0.146 & 0.090 & 0.361 & 0.041 & -0.215 & 0.142 & 0.150 & 0.022 \\
Smooth & -0.133 & -0.070 & 0.256 & 0.078 & 0.152 & 0.211 & 0.125 & 0.209 & 0.313 & 0.303 & 0.024 & 0.115 & 0.182 & 0.155 \\
1-rill & -0.143 & 0.121 & 0.290 & 0.232 & 0.190 & -0.071 & -0.002 & 0.104 & 0.361 & 0.087 & 0.025 & 0.047 & 0.132 & 0.078 \\
2-rills & 0.330 & 0.010 & -0.132 & 0.125 & 0.095 & -0.078 & 0.251 & 0.198 & 0.249 & 0.182 & 0.225 & 0.047 & 0.020 & 0.347 \\
4-rills & 0.060 & 0.127 & 0.184 & 0.070 & 0.112 & 0.178 & 0.120 & 0.065 & 0.442 & -0.029 & 0.074 & 0.330 & 0.369 & 0.210 \\
Chessboard & 0.105 & -0.216 & -0.076 & -0.151 & -0.130 & 0.103 & -0.112 & 0.196 & 0.185 & -0.010 & -0.017 & 0.089 & 0.391 & 0.169 \\
\hline
\end{tabular}
\caption{Correlation results of patient satisfaction and oral tactile ability level in group III}
\end{table}
study sample and should not be generalized until these associations have been confirmed in other studies of a similar population.

**CONCLUSIONS**

The following conclusions can be reached within the constraints of this study. The control group patients, compared with the complete denture and maxillary implant-supported complete denture groups, perceived all stereognosis shapes statistically significantly earlier (P < .001). When group II and group III were compared, the patients in group III perceived the pyramid and drop shapes (among round shapes) and smooth, 1-rill, 2-rill, and chessboard stereognosis shapes (among square shapes) statistically significantly earlier. According to this result, we rejected the first null hypothesis of the present study.

The control group, compared with the complete denture and maxillary implant-supported complete denture groups, had statistically significantly lower applied lateral tactile threshold values and thickness tactile threshold values (P < .05). However, there was no statistically significant difference in the thickness tactile threshold between the complete denture group (group II) and the maxillary implant-supported complete denture group (group III; P > .05). According to these findings, we accepted the second null hypothesis of the present study.

There was generally no correlation between oral tactile level and overall OHIP-TR-14 scores in the complete denture group or the maxillary implant-supported complete denture group. However, a statistically significant difference was found only at the 7th and 13th questions between implant-supported complete denture and complete denture (P < .05). Therefore, we rejected the third null hypothesis of the present study.

**ABBREVIATIONS**

OHIP-TR-14: Oral Health Impact Profile-Turkish-14
OSA: oral stereognostic ability

**ACKNOWLEDGMENTS**

The authors thank Dr Gokmen Zararsiz and Meltem Unlusavur-an (Department of Biostatistics, Erciyes University, Kayseri, Turkey) for assistance with the statistics in this study. This study was supported by Project 2145587 from The Scientific and Technological Research Council of Turkey.

**NOTE**

Author Ikbal Leblebicioglu Kurtulus, Kerem Kilic, Ravza Eraslan, Damla Unlu, Ahmet Çalışkan, Bulent Kesim and Stephan Etter state that there are no conflicts of interest.

**REFERENCES**


<table>
<thead>
<tr>
<th>Variable</th>
<th>Male (n = 40)</th>
<th>Female (n = 36)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHIP-TR-14 score</td>
<td>17.0 (14.0–56.0)</td>
<td>17.0 (14.0–35.0)</td>
<td>.748</td>
</tr>
</tbody>
</table>

The values indicate the median (minimum–maximum).