Relationship between orthodontic expertise and perception of treatment needs for maxillary protrusion: Comparison of dental students, residents, and orthodontists

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Introduction: The aims of this study were to assess the peer assessment rating (PAR) index in relation to perceived treatment needs for maxillary protrusion in Japanese subjects and to investigate how perceived orthodontic treatment needs change with increased experience in dentistry and orthodontics. Methods: The subjects were 155 persons (73 men, 82 women; mean age, 24.2 years; SD, 4.7 years) including dental students, residents, and orthodontists. We showed them casts from 10 patients with untreated maxillary protrusion and gave them a questionnaire with a 100-point visual analog scale (VAS), concerning their perceptions of orthodontic treatment needs. The PAR index was used for cast evaluation. Results: The PAR index showed significant correlations with the VAS scores. On the casts evaluated with a PAR index below 17, there was no difference in VAS scores between the 3 groups; however, orthodontists perceived significantly greater treatment needs than did students and residents on casts with a PAR index of 18 or 19. The VAS scores were significantly increased when casts with a PAR index of more than 20 and overjet above 5.0 mm were evaluated. Conclusions: The PAR index is clinically useful to evaluate malocclusion, and the perception of treatment needs was significantly greater when the maxillary protrusion cast had a PAR index of more than 20 and overjet above 5.0 mm. Perceived needs for orthodontic treatment for maxillary protrusion changed with increasing experience and skills in dentistry and orthodontics. (Am J Orthod Dentofacial Orthop 2010;137:340-5)
The peer assessment rating (PAR) index was developed to provide a single summary score for all occlusal anomalies in a malocclusion and is often used by orthodontists to evaluate malocclusions objectively. Recently, the PAR index has also been used as an assessment tool to evaluate orthodontic treatment outcomes. In addition, the PAR index is considered an excellent predictor of orthodontic treatment needs by orthodontic experts. Nevertheless, it is still unknown whether the PAR index reflects the perception of treatment needs of laypersons and dentists except for orthodontists.

The aims of this study were to assess the PAR index in relation to the perceived treatment needs for maxillary protrusion in Japanese subjects and to investigate how this perception changes with increasing experience and skills in dentistry and orthodontics.

**MATERIAL AND METHODS**

The subjects in this study were 155 persons (73 men, 82 women; mean age, 24.2 years; SD, 4.7 years), including 99 undergraduate students (47 men, 52 women; mean age, 21.8 years; SD, 1.6 years) from Okayama University Dental School and 29 residents (9 men, 20 women; mean age, 25.4 years; SD, 1.8 years) and 27 orthodontists (17 men, 10 women; mean age, 31.8 years; SD, 5.8 years) from Okayama University Hospital. No undergraduate student had received clinical training.

Dental casts of 10 patients with untreated maxillary protrusion were selected to show an increase in overjet sequentially (1.8-11.6 mm); those with moderate or severe crowding were excluded (Fig 1). The PAR index was calculated 3 times for each dental cast by 3 investigators (S.U., M.S., R.K.) who had been calibrated. We randomly displayed the casts and gave a questionnaire.
to the subjects with a 100-point visual analog scale (VAS) concerning perception of orthodontic treatment needs. The VAS was a 100-mm line with anchors at each end of “no need to treat” (0 mm) and “strongly perceived treatment needs” (100 mm).

### Statistical analysis

Analysis of variance (ANOVA) and the Fisher protected least-significant difference were used to compare the PAR and VAS scores of the casts and the perception of treatment needs between subjects. The Spearman rank correlation was used to evaluate correlations between PAR index, overjet, and VAS scores. A value of $P >0.05$ was considered not significant. The analysis was carried out with statistical analysis software (StatView, SAS Institute, Inc, Cary, NC).

### RESULTS

The PAR index showed significant correlations with the VAS scores for evaluating the casts (Tables I and II). Generally, the greater the PAR index, the greater the perceived treatment needs on cast evaluation (Table I). The VAS score was significantly higher when the cast had a PAR index of more than 20 and an overjet above 5.0 mm. Significant correlations were also observed between PAR and VAS scores, and between overjet and VAS scores on cast evaluation (Table II).

The perception of treatment needs from the dental casts was significantly different based on the subjects’ professional experience. In the evaluation of casts with a PAR index below 17 (Fig 1, A-C), there was no significant difference in VAS scores between the 3 groups (Fig 2, Table III). Orthodontists perceived significantly greater treatment needs than did students and residents on casts with a PAR index of 18 or 19 (Fig 1, D and E); these are generally considered borderline by orthodontic professionals (Fig 2, Table III). In addition, orthodontists and residents perceived significantly greater treatment needs than did the students in evaluating casts with severe malocclusion with a PAR index of more than 28 (Fig 1, G-J).

### DISCUSSION

The PAR index has been developed and used for objective rating for several kinds of malocclusion by orthodontists. However, it is still unknown whether it reflects the perception of treatment needs estimated by general dentists and laypersons. We found significant correlations between the PAR index and the perception of treatment needs by not only orthodontists but also residents and dental students. The greater the PAR index of the cast, the greater the perceived treatment needs on cast evaluation. Consequently, we suggest that the PAR index is clinically useful as the evaluation standard of malocclusion because it reflects the perception of treatment needs by subjects with no orthodontic expertise.

In the evaluation of casts with a PAR index below 17, the perception of treatment needs was similar among students, residents, and orthodontists. This indicates that the perceived needs for treatment of normal occlusion to mild maxillary protrusion do not depend on the level of professional expertise. Orthodontists recognized the treatment needs more effectively than students in casts with a PAR index of 18 or 19. In addition, the perception of treatment needs in the 3 groups was significantly increased when the cast had a PAR index greater than 20. The optimal cutoff score for determining orthodontic treatment needs with the PAR index, maximizing agreement based on the decisions of orthodontic experts in white subjects, is 17 for the PAR in both the United States and the United Kingdom. In Asian subjects, Soh et al reported that a PAR index of 17 was the optimum cutoff for presumed compromised dental health and a PAR index of 20 for esthetic impairment. These investigations suggest that the casts with a PAR index of 18 and 19 in this study might be considered borderline cases for orthodontic treatment by orthodontists and were perceived to require little treatment by residents and students. According to our results, the cutoff score of 17 in the PAR index might
be adequate for orthodontists but might be slightly low for patients’ perceptions regarding maxillary protrusion in Japanese subjects.

Regarding overjet, the perceived needs for orthodontic treatment were significantly greater in all 3 groups when the casts had an overjet of more than 5 mm. The greater the overjet, the greater the perceived treatment need on cast evaluation. These findings suggest that the cutoff value for the perception of orthodontic treatment needs in overjet might be 5 mm in Japanese. Soh et al.16 used intraoral photographs and reported that an overjet over 6 mm was perceived to indicate poorer dental esthetics by Asian laypersons. Several studies on facial esthetics in Japanese subjects indicated that maxillary protrusion was generally more favored than mandibular protrusion, and bimaxillary protrusion was viewed as highly attractive and well accepted.17-19 In addition, the Japanese cephalometric norm has a tendency toward maxillary protrusion compared with white subjects.20-23 However, the Japanese norm concerning overjet was stated as 2.8 to 3.3 mm in previous cephalometric studies, and overjet more than 5 mm was strongly recognized as requiring orthodontic treatment in our study.20-23 These findings lend further support to the previous report that overjet was the major occlusal trait that influenced perceptions of dental esthetics.16

Residents’ recognition of treatment needs on observing casts with a PAR index of approximately 20 were similar to those of students but not equal to orthodontists. Residents perceived similar treatment needs with orthodontists for subjects with severe maxillary protrusion with a PAR index of more than 30. These results suggest that the perception of treatment needs based on cast assessment might be changed by increasing experience and skills in dentistry and orthodontics in students, residents, and orthodontists. Several researchers indicated that orthodontists and general practitioners strongly agree in the evaluation of orthodontic treatment needs.8,9 Berk et al.9 previously reported that orthodontists, general dentists, and pediatric dentists had high levels of agreement on orthodontic treatment needs in dental cast assessments. Therefore, the level of dentistry experience might influence the perception of orthodontic treatment needs based on occlusion, compared with orthodontic experience.

In this study, the students’ perception of treatment needs differed from that of other professionals when they evaluated moderate to severe maxillary protrusion casts. The students’ perceived treatment needs in this study might be similar to those of the general public, because most of these students had not received professional dental education. A future study involving the public or dental patients would be necessary to

**Fig 2.** Comparison of the perception of treatment needs between the 3 groups.

**Table III.** VAS score for perception of treatment needs

<table>
<thead>
<tr>
<th>Cast</th>
<th>PAR index</th>
<th>Students</th>
<th>Residents</th>
<th>Orthodontists</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<td>14.0</td>
<td>12.8</td>
<td>16.1</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>15.3</td>
<td>13.7</td>
<td>21.6</td>
</tr>
<tr>
<td>C</td>
<td>16</td>
<td>33.2</td>
<td>24.2</td>
<td>16.6</td>
</tr>
<tr>
<td>D</td>
<td>18</td>
<td>27.9</td>
<td>28.6</td>
<td>27.1</td>
</tr>
<tr>
<td>E</td>
<td>19</td>
<td>26.4</td>
<td>21.9</td>
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<td>F</td>
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<tr>
<td>G</td>
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<td>72.9</td>
<td>16.9</td>
</tr>
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<td>H</td>
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<tr>
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</tr>
<tr>
<td>J</td>
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<td>17.8</td>
</tr>
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</table>

* *P<0.05, vs resident
** P<0.05, vs student
substantiate this inference accurately, but these findings indicate that the recognition of treatment needs might be different between patients and dentists. These findings lend further support to previous studies indicating that perceptions of dental esthetics were different between orthodontists and laypersons. Additionally, some previous studies used the aesthetic component of the index of orthodontic treatment needs as a tool to determine dental esthetics. Hunt et al. concluded that the current use of the aesthetic component cutoff score to establish treatment needs does not reflect society’s dental esthetic expectations in an adult cohort. Another report also indicated that professional ratings based on the current criteria of the aesthetic component scale did not improve the precision and reliability of matching the esthetic requirements of professionals and 12-year-olds. Thus, these studies suggest a difference in dental esthetic acceptability between professionals and laypersons. Orthodontists should realize that there are differences in perceived treatment needs between professionals and the general public and consider them in diagnosis and planning in orthodontic treatment.

CONCLUSIONS

1. The PAR index is clinically useful for evaluating malocclusions, because it is significantly correlated with the perception of treatment needs based on occlusion.
2. The perception of treatment needs is significantly increased in Japanese subjects when the cast of maxillary protrusion shows a PAR index of more than 20 and overjet above 5.0 mm.
3. The perception of treatment needs for normal occlusion to mild maxillary protrusion was not related to the level of expertise in dentistry; however, the perceived treatment needs for moderate to severe maxillary protrusion were different among dental students, residents, and orthodontists.
4. The perception of orthodontic treatment needs based on occlusion changed with increasing expertise in dentistry and orthodontics.

REFERENCES


