

The Psychological Status and Patient Self-Esteem During Orthodontic Treatment

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Abstract

In the last decades, the awareness of individuals for oral health, shape and position of the teeth alongside the facial appearance and smile has increased enormously and this can affect their mental health status and well-being. Orthodontic treatment has a significant psycho-social impact on patients that suffer from malocclusions. Despite the widespread expectation that orthodontic treatment improves psychological well-being, there is little objective evidence to support this. The

aim of the study was to determine the psychological impact of orthodontic treatment in patients by evaluating their perception and self-esteem before and after the treatment. A number of 100 patients, 44 males and 56 females, were addressed with a closed answer questionnaire of nine simple questions that was distributed in dental clinics and social media platforms, in paper and electronic forms; one question was left as an open answered question to give a better insight on how the orthodontic treatment has affected the participant's quality of life. The participants in the study were eighteen years of age or older to be able to mentally assess and discuss the psychological process of their treatment. The answers were rated as follows: "strongly agree", "agree", "neither agree or disagree", "disagree" and "strongly disagree". Statistical analyse was performed in order to find any significant differences between male and female patients' self-esteem and self-worth before and after receiving orthodontic treatment. All the answers were included in the fourth category, "agree".

A positive correlation between orthodontic treatment and an increase in self-esteem and self-worth was found in both genders, with a slight, but not significant difference in women's favour.

Introduction

In recent decades, the awareness of individuals for oral health, shape and position of the teeth alongside the facial appearance has increased tremendously and this can affect the mental health status and well-being [1,2]. Orthodontic treatment has a significant psycho-social impact on patients that suffer from malocclusions. Malocclusion is perceived by many people as a deviation from society's beauty norms. Dental appearance can cause significant positive or negative effects on one's psyche; poor dental appearance without any treatment can cause low self-esteem for children up to adult. Self-esteem translates a person's sense of self value or personal worth [3]. It can be hindered by a number of factors such as physical appearance, childhood traumas, neglect, constant negativity, doubt, childhood upbringing, cultural or socio-economic status that may cause different beliefs and emotions in society [4]. Thus, is confirming that the total appearance of an individual's teeth and face can have a positive or negative impact on their mental image, which contributes to personal satisfaction and self-esteem [2]. Due to the mind state children and adolescent teenagers are in, differences in physical or dental appearances can lead to teasing and bullying by others around them. This can cause a distressed state of mind, which can compromise their psycho-social development leading to anxiety and low self-esteem [5,6]. Despite the widespread expectation that orthodontic treatment improves psychological well-being, there is little objective evidence to support this [7,8]. Whilst there is a positive impact on a patient's self-esteem and quality of life after orthodontic treatment, the quality of life seems to decrease during treatment. Pain or discomfort during orthodontic treatment could make individuals with malocclusions hesitant to undergo it even though the outcome would be more beneficial in the long term [9]. Although improvement in facial attractiveness of patients is obtained, there is a lot of statistical inconsistencies of the patient's psychosocial mental state [9-13].

The aim of the study was to determine the psychological impact of orthodontic treatment in patients by evaluating their perception and self-esteem before and after the treatment.

Materials and Methods

The approach behind the survey was to assess the patients with simple questions that could be used on a wide scale in analysing any difference between a patient's self-esteem before and after any orthodontic treatment. The self-esteem was assessed using a closed answer questionnaire in patients that have undergone orthodontic treatment.

The questionnaire was designed with nine closed answered questions using the Likert scale. The answers were rated as follows: "strongly agree", "agree", "neither agree or disagree", "disagree", "strongly disagree" [14]. One question was left as an open answered question; this was to give a better insight on how the orthodontic treatment has affected the participant's quality of life. The questionnaire was given to patients that were eighteen years of age or older that could mentally assess and discuss the psychological process of their treatment. In order to purely assess the participants' self-esteem and well-being no other factors were taken into consideration, except participants' gender.

The questionnaires were distributed in various dental clinics and social media platforms in both paper and electronic form. Overall, 100 participants completed the survey, 44 of these were males and 56 were females. There were no other differentiating factors. Statistical analysis on the overall Likert scale was performed in order to find any significant differences between male and female patients' self-esteem before and after receiving orthodontic treatment. The median values of the Likert scores were also calculated for each question, together with the represented percentiles for each 5-1 scale.

The survey questions were formulated as follows:

- Q1. Are you satisfied with the orthodontic treatment you received?
- Q2. Do you believe your dental condition has improved after treatment?
- Q3. Does your treatment outcome reflect your expectations?
- Q4. How satisfied are you with your facial appearance?
- Q5. Do you feel more confident with your smile after your treatment?
- Q6. Would you say your self-esteem has improved after treatment?
- Q7. Did the treatment improve your quality of life? How?
- Q8. Would you recommend orthodontic treatment to others in need?
- Q9. Do you take extra care in your daily dental routine after your treatment?
- Q10. Are you more inclined to regularly visit your dental practitioner?

Statistical Analysis

Due to the Likert scale and multiple answers to each question, the data collected are known as ordinal data. In order to get a P value less than 0.05, a chi-square test was conducted. The open answered question underwent sentimental analysis [15].

As the data obtained was nominal, the median Likert scale answer (i.e., “agree” is 4 on the Likert scale) was calculated by using the estimated equal distribution scale seen in table 1 (Table 1).

Table 1: Estimated equal distribution of Likert scale scores

Likert scale	Estimated distribution score
Strongly agree (5)	4.5 – 5.49
Agree (4)	3.5 – 4.49
Neither agree or disagree (3)	2.5 – 3.49
Disagree (2)	0.5 – 2.49
Strongly disagree (1)	0.5 – 1.49

Results

Statistical analyse on the overall Likert scale answers was performed in order to find any significant differences between male and female patients’ self-esteem and self-worth before and after receiving orthodontic treatment.

The median values of the Likert scores were also calculated for each question, alongside the represented percentages for each 5-1 scale (Table 2). Chi-square statistical analysis was used for ordinal data to test the independence of collected data, for both male and female participants. This statistics test analyses the P value (P >0.05) to determine the significance of data obtained. For this study, the null hypothesis indicates that there is no significant difference between the male and female patients that completed the questionnaire. In order to reject the null hypothesis, the calculated value per question needs to be P < 0.05 (Table 3).

Table 2: The overall percentage and median Likert score for closed-answered questions

	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 8	Question 9	Question 10
Strongly agree (5)	35%	40%	25%	30%	47%	32%	49%	30%	25%
Agree (4)	48%	49%	51%	52%	36%	47%	40%	39%	32%
Neither (3)	12%	7%	18%	14%	14%	18%	10%	21%	33%
Disagree (2)	4%	3%	5%	3%	2%	2%	-	10%	10%
Strongly disagree (1)	1%	1%	1%	1%	1%	1%	1%	-	-
Median Likert Score	4.19	4.30	4.01	4.12	4.42	4.12	4.48	3.99	3.72

Table 3: Median Likert Score and Chi-square independence test results for all participants to closed answered questions

Questions	Population (n=100)	N	Median Likert score	P value (p<0.05)
Q1. Satisfied with received orthodontic treatment	Male	44	4.15	0.469
	Female	56	4.21	
Q2. Improvement of dental condition after treatment	Male	44	4.08	0.0489
	Female	56	4.49	
Q3. Treatment outcomes reflecting expectations	Male	44	3.83	0.182
	Female	56	4.13	
Q4. Level of satisfaction with overall treatment	Male	44	3.92	0.0610
	Female	56	4.29	
Q5. Confident of smiling after treatment	Male	44	4.20	0.229
	Female	56	4.60	
Q6. Increase in self-confidence after treatment	Male	44	4.05	0.819
	Female	56	4.17	
Q8. Recommending treatment to others in need	Male	44	4.15	0.0108
	Female	56	4.68	
Q9. Taking care in dental routine after treatment	Male	44	3.50	0.00039
	Female	56	4.36	
Q10. More inclined to visit dental clinicians after treatment	Male	44	3.30	0.0401
	Female	56	4.00	

Research Question 1

Participants answered the question regarding the patients’ satisfaction with their received orthodontic treatment. The median Likert score was 4.15 for male participants and 4.21 for females, both being included in category 4. The Chi-square result was 0.469 which exceeds the given P value (P>0.05). Thus, the null hypothesis cannot be rejected.

Overall, the highest response percentage for question one was 48% in category 4 and the lowest percentage overall was 1% falling into category 1 and showing that the majority of participants were satisfied with the orthodontic treatment they have received. The median Likert score was 4.19, representing a continuous random variable assumption in the 5-point scale. The question falls into category 4 “agree”.

Research Question 2

Participants were asked if their dental condition has improved after receiving orthodontic treatment. The median for male participants was 4.08 falling between the evenly distributed category 4 on the Likert scale.

Female participants median score was 4.49 which is on the higher end of category 4. The P value calculated by chi-square was 0.0489 which is smaller ($P < 0.05$), therefore the null hypothesis is rejected.

The highest response percentage for question 2 was 49% including it in category 4 and the lowest percentage was 1% falling into category 1. Thus, most patients agreed that their dental condition had improved after receiving orthodontic treatment. The calculate median Likert score was 4.30 representing a continuous random variable assumption in the 5-point scale. This question falls into category 4 “agree”.

Research Question 3

Participants were asked if their treatment outcomes reflected their expectations. The median for male participants was 3.83 which falls between the evenly distributed category 4 on the Likert scale. Female participants median score was 4.13 which also falls in category 4 on the Likert scale. The P value calculated by chi-square was 0.182 which is much higher than the given P value ($P > 0.05$), therefore the null hypothesis cannot be rejected.

The highest response percentage for question 3 was 51% placing it in category 4 and the lowest percentage was 1% falling into category 1. Thus, most patients agreed that their treatment outcomes have reflected their expectations after treatment. The median Likert score was 4.01. This question falls into category 4 “agree”.

Research Question 4

Participants have scored their level of satisfaction with the overall orthodontic treatment they received. Male participants median score was 3.92 falling between the evenly distributed category 4 on the Likert scale. Female participants median score was 4.29 which also falls into category 4 on the scale. The calculated P value was 0.0610 ($P < 0.05$), therefore the null hypothesis cannot be rejected.

The highest response percentage for question 4 was 52% falling into category 4 and the lowest percentage was 1% falling into category 1; this reflects that most patients were satisfied with the overall treatment they received. The median Likert score calculated was 4.12. This question falls into category 4 “agree”.

Research Question 5

Participants noted their confidence in smiling after receiving orthodontic treatment. Male participants median score was 4.20 which falls into the Likert scale category 4. Female median score was 4.60 which corresponds to category 4 on the scale. The calculated P value was 0.229 which is much higher ($P > 0.05$), therefore the null hypothesis cannot be rejected.

The highest response percentage for question 5 was 47% placing it in category 5 and the lowest percentage was 1% falling into category 1. This shows that most patients strongly agreed that their confidence in smiling increased after orthodontic treatment. The median Likert score was 4.42. The question falls into category 4 “agree”.

Research Question 6

Participants scored their increase in self-esteem after receiving orthodontic treatment. Male participants median score was included in the Likert scale category 4. Female participants median score was 4.17 including them in category 4, also. The calculated chi-square value was 0.819 ($P > 0.05$), so the null hypothesis cannot be rejected.

The highest response percentage for question 6 was 47% corresponding to category 4 and the lowest percentage was 1% including it in category 1. Most patients agreed that their overall self-esteem increased after receiving treatment. The median Likert score calculated was 4.12. This question falls into category 4 “agree”.

Research Question 8

Participants answered if they would recommend orthodontic treatment to others in need. Male participants median score was 4.15 falling into the Likert scales category 4. Female participants median score 4.68 falling into category 5. The calculated chi-square value was 0.0108 ($P < 0.05$), so the null hypothesis can be rejected.

The highest response percentage for this question was 49% corresponding to category 5 and the lowest percentage was 1% falling into category 1 and showing that most patients strongly agreed that they would recommend orthodontic treatment to others, too. The median Likert score was 4.48 including this question in category 4 “agree”.

Research Question 9

Participants answered if they take more care in their daily dental routine after receiving orthodontic treatment. Male participants median score was 3.50 falling into the Likert scale category 4. Female participants median score was 4.36 falling into category 4. The chi-square value was 0.00039 which is substantially below the given P value ($P < 0.05$) therefore the null hypothesis can be rejected.

The highest response percentage for question 9 was 39% corresponding to category 4 and the lowest percentage was 10% falling into category 3 and reflecting that most patients agreed that they gave extra care to their daily dental routine after receiving orthodontic treatment. The median Likert score was 3.99. This question falls into category 4 “agree”.

Research Question 10

Participants noted if they were more inclined to visit their dental clinicians after receiving orthodontic treatment. Male participants median score was 3.30 which falls into the category 3. Female participants median score was calculated at 4.00 which falls into category 4. The chi-square value obtained was 0.0401 ($P < 0.05$). Thus, the null hypothesis can be rejected.

Overall, the highest response percentage for question 10 was 32% falling into category 4 and the lowest percentage overall was 10% falling into category 2, reflecting that most patients said that they were more

inclined to visit their dental clinician regularly after receiving orthodontic treatment. The median Likert score was 3.72. This question falls into category 4 “agree”.

Question 7 (Open-Answered). Sentiment Analysis

Question 7 has given the participants an open-answer platform to express themselves without any restrictions. This question had an 68% response rate out of the overall participants.

Fine-grained sentiment analysis showed different answers grouped in; “very positive”, “positive”, “neutral”, “negative”, “very negative” alongside emotion detection. Written answers were analysed and evaluated on the emotional written tone carried (Table 4).

Table 4: Fine-grained sentiment analysis

	Participants	Male	Female
Very Positive	8	3	5
Positive	42	15	27
Neutral	8	8	0
Negative	10	3	7
Very Negative	-	-	-

The chi-square test value was 0.0056 ($P < 0.05$) showing a positive correlation between increased quality of life and orthodontic treatment.

Discussions

The aim of this study was to determine self-esteem and well-being before and after orthodontic treatment. The questionnaire entailed specific questions that make participants sub-consciously assess their self-esteem and mental state before treatment and how it has affected their life overall.

The questionnaire was given out across different platforms and numerous dental clinics over a period of 6 months. The final number of participants was 100 with each participant completing the survey successfully. As the targeted audience was niche, being over the age of 18 and patients have undergone orthodontic treatment previously, the outcome response rate was anticipated to reach minimum requirements at 100 responses. Studies have shown that survey topics play a great role in response rates [16]. By making the survey more specific to a smaller population, participants feel more inclined to fully participate in the study. The survey was given out both, paper-form and electronically, to people who had previous orthodontic treatment upon asking. Having both forms of survey makes the study cost-effective and easier to replicate in future studies. A previous comparative study showed that, mailed surveys alone or combined web-linked electronic surveys have resulted in larger response rate [17,18]. Due to the high response rate, we can evaluate our findings as conclusive data rather than suggestive.

On the other hand, by keeping the survey concise and straight to the point, participants felt more inclined to take part of the survey as previous studies also point out [19]. Regarding male and female response, 56% of the participants were female and 44% were male. There is a higher participation rate of females for this study which was anticipated, as various studies have also confirmed that women are more likely to participate in surveys than men [20-22].

The results of our study demonstrate that all the questions fall into category 4 “agree”.

Question 1 regarding the satisfaction with the received orthodontic treatment corresponded to higher end of the category 4.

The male and female scores were 4.15 and 4.21 respectively, resulting in a minor difference between the two groups. These results point out to that the study participants were pleased with their past treatment. The slight difference between median scores indicates that female participants were more enthusiastic about the treatment they had received. Previous studies have also noted that women are more prone to have a positive outlook during and after receiving dental treatment, as they have a higher respect for their dental services and their outcome. This can also be interpreted as women are more self-motivated to undergo treatment that could improve their physical appearance [23,24].

According to the chi-square value, there was no significant difference between male and female participants' answer for this specific question within the study. Thus, the results were due to chance as they have no significant statistical value.

Question 2 asked the patients if they felt their dental condition improved after their treatments. Both groups of participants were overall satisfied with their dental improvements.

Although both genders had a positive reflection of the improvements of their dental condition, female participants had a slightly more positive perspective on the treatment they received. Other studies also confirm that female participants are more likely to have a positive attitude towards their dental condition after treatment in comparison to male participants, regardless of their orthodontic experience [25].

Question 3

The question was asked to determine if the patient's treatment outcomes reflected their expectations. While there is a small difference between the two groups, male and females, they are still in the same category of “agree”. Therefore, we can assume that most participants had expected results from their orthodontic treatment.

Clinician and patient relationship play a huge role in treatment outcomes and expectations. However, this does not only regard the treatment carried out during dental visits, yet the patient's own doing also. If the patient is keeping up with dental hygiene, staying away from certain foods that could affect their orthodontic appliance and also have an honest relationship with their dental practitioner, they have a better chance of completing their orthodontic treatment successfully, that could lead up to their expected results.

The perspective of expected outcomes can also differ in different psycho-social settings and different social-cultural backgrounds [26].

Question 4

This question asked the patients if they were satisfied with their overall treatment. It was directed to the patients as a final confirmation of the first three questions. The results are in line with the previous ones which let us assume that the participants in this study were satisfied with their treatments. These finding shows that orthodontic treatment is enhancing mental health status by reducing physical and anxiety symptoms [27]. Besides children and adolescents, the motives of late orthodontic treatment within adults should be analysed more attentively before treatment. Research on the matter, showed that the motivation behind seeking treatment for adult patients was crucial in predicting patient satisfaction during and after treatment [28].

Question 5 asked the patients how confident they felt during smiling after their treatment. The median Likert score for the male and female groups were 4.20 and 4.60 respectively. This places the female group into the category 5 of “strongly agree”. and points out that the patients are feeling more comfortable with their smiles after their treatments. The difference between the male and female group is evident in this question.

Although female beauty was taking a central place in culture and society over decades, male attractiveness has been more emphasized over the past years. Smile attractiveness plays a huge role in facial aesthetic and can influence personality traits in both, men and woman [29].

Question 6

This question was asked to determine the improvement in self-confidence after treatment. It was one of the most important in the survey and it can be assumed that the participants agree on feeling more confident after their treatments.

This question shows the underlying sub-conscious of undergoing orthodontic treatment and how it can positively affect different aspects of a patient’s life in the sense of psycho-social encounters and quality of life with increased confidence. Previous studies show that female participants have a harder time with self-esteem prior to orthodontic treatment than male patients, who seem not to be so affected by their slightly hindered physical appearance. After receiving orthodontic treatment, female patients had a higher confidence-boost than male patients [30]. However, our study did not find any statistically significant differences between male and female participants, both genders felt more confident after receiving orthodontic treatment.

Question 7

This question was answered in an open written form to give a little more insight into patients’ orthodontic treatment regarding its impact on their quality of life. The outcome of this question was anticipated as extensive research has been held on the impact of orthodontic treatment in quality of life. Lot of research has resulted in a positive perspective of receiving orthodontic treatment. Although there are many factors that could affect one’s quality of life, the boost in self-esteem and confidence plays a huge role [4,31]. This

question ties all the closed-answer questions together showing that patients' quality of life is influenced by a number of factors that were all analysed subconsciously during the survey. Many controversies have been seen between the results of previous studies on the psychosocial benefits of orthodontic treatment alongside the drastic change of the patients' quality of life which was on par with subjects without any dento-facial deformities; although improvements of facial appearances and attractiveness of patients have been obtained, yet there were a lot of statistical inconsistencies of the patient's psychosocial mental state [10-13, 32].

Previous research shows that individual psychological susceptibility is important in the perception of pain and discomfort during orthodontic treatment. Although pain was not directly correlated to the magnitude of orthodontic force exerted, the amount of pain and discomfort caused was correlated to the age and psychological well-being of the patient [33]. Thus, the patient-clinician relationship plays an immense role in treatment satisfaction [34]. Patients with self-control have adapted faster and adjusted to the stimuli causing pain during orthodontic treatment, resulting in better cooperation during treatment [35,36].

Question 8

The question asked the patients if they would recommend treatment to others in need. The median value found for this question was 4.48 with males having 4.15 and females having 4.68 median Likert score, placing it as the highest valued question in the survey. The 4.48 score only falls short by 0.02 from being in category 5 of "strongly agree". This was the second highest valued question in the survey therefore it can be affirmed that the participants wished their treatment for others, too. Female patients have a more positive outlook on dental treatment. As they were greatly satisfied with the treatment they received and that has positively affected their life in different aspects, women patients are more likely to recommend orthodontic treatment to others in need that they know.

A number of factors correlate with recommending dental treatments to others in need such as: quality of service given, the patient-clinician relationship, respect for dental profession, personal attitude towards treatment [25,37].

Question 9

This question was asked to assess the level of effort spent by the patients on their dental hygiene routines after their orthodontic treatment. The results suggest that overall, an extra care is being taken by the patients in their dental routines. The male group is placed only at the bottom limit of category 4 of "agree", so there is a difference between two groups, but not significant.

Previous studies have also shown that female patients are more likely to take extra care in daily dental routines such as brushing and flossing twice a day. Females' extra attentiveness is influenced by different factors such as a higher preoccupation for their facial aesthetic and smile, so they want to make sure that their treatment outcome will be maintained [38].

Question 10

The question was asked to determine if the patients were more inclined to visit their dental clinicians after

orthodontic treatment. This was the lowest valued question on the survey, but still being placed in the category 4 of “agree”. The male group is in category 3 “neither agree or disagree” suggesting that they do not correlate the importance of dental visits to their individual oral health.

This could be assumed as a follow-up question regarding daily dental care asked in question 8. Female participants agreed to be more inclined to visit their dental practitioner after receiving treatment. This is correlated yet again to the fact that female patients have a higher preoccupation to dental hygiene in comparison to male patients. It is thought that patients who are more inclined to visit dental clinicians were satisfied with their previous orthodontic treatment outcomes [39,40].

Conclusions

A positive correlation between orthodontic treatment and an increase in self-esteem and self-worth was found in our study, in both genders, with a slight, but not significant difference in favour of women.

The questionnaire-based research has given a small glimpse into the importance of orthodontic care that can positively affect patient's quality of life and mental-state having psycho-social impact.

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Conflicts of Interests

None

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