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Adolescents' experiences of using removable functional appliances

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Structured Abstract

Objectives – The aim of this qualitative study was to explore and describe adolescents' experiences of treatment with removable functional appliances.

Setting and sample population – Public Dental Service, Gothenburg, Sweden.

Material and methods – Individual interviews focusing on adolescents' experiences of using a removable functional appliance were held with 21 adolescents (12 girls and nine boys). The mean age of the participants was 13.2 years (range 11–15, SD 1.25) at the interview occasion. Interviews were transcribed verbatim and analysed according to a qualitative research approach, phenomenography.

Results – Outcomes of data analysis emerged in five categories with totally 12 subcategories that describe the adolescents' various conceptions of the treatment. The adolescent's experiences of using removable functional appliance appeared to have a large variation, comprising of the individual approach, feelings and strategies, the dentist role and receiving external support.

Conclusion – Participants developed their own strategies of measurement to see improvement. An active involvement of the adolescents' in the treatment seems to be needed, supported by the dentist at coming appointments, using overjet measurement as a tool for motivation. Furthermore, efforts should be made by clinicians to listen and understand adolescents' needs and requirement before the treatment start.

Key words: angle class II; functional appliances; interview; phenomenography; qualitative



Introduction

Reduction of large overjet in children and adolescents is a treatment that has the key goal of preventing dental injuries and to increase psychosocial well-being. Overjet has been found to be a significant predictor of the decision to seek orthodontic correction (1). Shaw et al. (1980) (2) and Seehra et al. (2011) (3) have reported that the appearance of teeth is a common target of bullying. It has been reported that overjet, extreme deep bite and crowding are associated with the most unfavourable self-perceptions of teeth (4). According to O'Brien et al. (2003) (5), early treatment with removable functional appliances results in an increase of self-concept and a reduction of negative social experiences.

Patient cooperation is the single most important factor every orthodontist must put up with (6-8). Failure to hold on to prescribe schedules of removable appliance wear will result in either slow treatment response or no response at all (9). Appliance wear is determined by treatmentrelated factors such as routine and perceived comfort, as well as by external factors such as patient and parental attitudes. Patient attitudes are the critical link between these influences (10). Several studies have been performed to investigate and explain the main reasons for poor compliance (7, 9, 11). The interview study by Trulsson et al. (12) illustrates the importance of more parental involvement for younger children's compliance than older children, who seem to have a higher degree of internal motivation for treatment and less need for parental support. Trulsson et al. (2004) (12) also suggested that if treatment compliance cannot be ensured through parents' enthusiastic involvement, it seems better to delay treatment until the child is older and more motivated.

To our knowledge, no studies have approached the dilemma of compliance with qualitative interviews, that is by asking adolescents about their own experience of using removable functional appliances. It seems reasonable that the dentist/orthodontist would like to be able to predict patient cooperation especially when the adolescents' treatment is to be paid by public health funds (11). The aim of this qualitative study was therefore to explore and describe adolescents' experiences of the treatment with a removable functional appliance for reduction of large overjet.

Subjects and method

The study was approved by the Research Ethics Committee at the University of Gothenburg, Sweden (Dnr: 437-07). Written and verbal information was given to the participants and parents prior to the interviews.

Participants

The first 50 adolescents participating in an ongoing multicentre RCT were invited to participate in this study. The subjects were using, for at least 6 months, either a prefabricated functional appliance (Myobrace ®) or a modified Andresen activator (see Fig. 1) for overjet reduction. Totally 21 Swedish-speaking adolescents agreed to take part. Eleven subjects (six girls, five boys) from the success group (S) and 10 subjects (six girls, four boys) from the failure group (F) agreed to share their experiences of the treatment with a functional removable appliance for reduction of large overjet. The mean age of the participants was 13.2 years (range 11-15, SD 1.25) at the interview occasion (Table 1). Success (S) was defined as positive results in overjet reduction and failure (F) as no positive results in overjet reduction. Thereby a variation of informants and their experiences in addition to gender and age was included.



Fig. 1. Appliances used in the study.

Participants	Myobrace (M) Activator (A)	Success (S) Failed (F)	Girl (G) Boy (B)	Age (years)
1	Μ	S	G	13
2	Μ	S	В	12
3	Μ	S	G	15
4	Μ	S	В	14
5	Μ	S	В	15
6	Μ	F	В	13
7	Μ	F	G	13
8	Μ	F	G	14
9	Μ	F	G	13
10	А	S	В	12
11	А	S	G	11
12	А	S	G	15
13	А	S	G	15
14	А	S	В	14
15	А	S	В	14
16	А	F	В	13
17	А	F	В	13
18	А	F	G	13
19	А	F	G	11
20	А	F	G	12
21	А	F	В	12
Total	M = 9, A = 12	S = 11, F = 10	G = 11, B = 10	Mean 13.19 SD \pm 1.25

Table 1. Overview of the participants' characteristics at the interview occasion

Study approach and design

The study was performed as a qualitative study with a phenomenographic approach. The aim is to discover and describe the qualitatively different way people experience, observe, understand and imagine various phenomenon and aspects in the world around them (13–15). The most essential outcome of phenomenographic research is descriptions of differences and similarities in conceptions of phenomena in the surrounding world (14, 16–18). In this study, the *phenomenon* was the adolescent's experiences of the treatment with a removable functional appliance for reduction of large overjet.

Data collection interviews

The 21 participants were individually interviewed by the first author (EC), and the interviews were

tape-recorded. The main open question for the interview was '*Can you please tell me about your experiences of the treatment with and using your removable functional appliance*?' Each interview lasted for an average of 30 min with a range of 15–50 min.

Data analysis

The interviews were transcribed verbatim and analysed according to a phenomenographic approach (15–17). The analysis was carried out according to Alexandersson's four steps (1994) (19). At the initial stage, all the transcribed interviews were read carefully several times to get a general idea of the data. The second stage was dedicated to find similarities and differences in the data. At the third stage, the statements were classified into descriptive categories of conceptions. In the fourth and final stage, the categories and subcategories were defined and emerged, all describing the adolescent's experience of using removable appliance.

Trustworthiness

To ensure reliability in qualitative research, examination of trustworthiness is crucial. The categories should represent the participants' perceptions and not only a construction of the researcher (13, 20–24). To make sure of truthful data analysis in this study, two co-examiner independently assigned quotations to the correct subcategory. Agreement was almost unanimous between the author and the co-examiners. The quotations from the interviews are inserted to help the readers to evaluate the trustworthiness of the analysis.

Results

Outcomes of the data analysis emerged in five main categories with 12 subcategories that describe the adolescents' various conceptions of the treatment. The categories are summarized in Table 2.

Initial individual approach

This category contains two subcategories that include statements related to the participants' conceptions of their experiences at the start of the treatment – approving or disapproving.

Approving the treatment and willing to see improvement

Participants claim that they were aware of the problem with large overjet, either that they had noticed it by themselves or parents or dentist pointed it out. According to the statements, they also had knowledge about the appliance and how it works to decrease the overjet.

It felt good and I was happy to get it. I even had it on as I left the dentist's office. (male no.21)

Participants described how they were looking forward to see improvement of the teeth. They also mentioned curiosity if the appliance will really work or not.

I really wanted to see if it worked, whether there would be an improvement or if it was waste of time. (female no.13)

Disapproving the treatment and not being bothered

The conceptions in the category covers statements related to the participants' adverse approach to the treatment and not being concerned.

No I don't really want the appliance, but I know it's in my best interest to have it. It's going to be difficult and I know I'm very unorganised and often late. (female no.20)

Table 2. Overview of the results divided into categories and subcategory

Category	Subcategory
1. Initial individual approach	1.1. Approving the treatment and willing to see improvement
	1.2. Disapproving the treatment and not being bothered
2. Feeling of individual discomfort	2.1. Getting used to pain at the beginning of the treatment
	2.2. Keeping the appliance in the mouth is difficult
	2.3. Ashamed and bullied
3. Developing individual strategies	3.1. Remembering the appliance
	3.2. Seeing improvement encourages motivation
4. Meeting the dentist	4.1. Individually adapted information is required
	4.2. Receiving encouragement is helpful
	4.3. Not being listened to is disappointing
5. Getting external support	5.1. Parents promotion necessary
	5.2. Friends attention differs

Participants stated that they were aware of the problem with large overjet, but they did not care or did not bother about it.

I had a large overjet. I've always known that, but wasn't really bothered by it. It was nice though to get rid of it though. (male no.16)

Feeling of individual discomfort

The second category consists of three subcategories related to statements of individual discomfort correlated with the treatment.

Getting used to pain at the beginning of the treatment

According to the statements, much pain was experienced especially at the very beginning of treatment. The improvement occurred after first couple of weeks and participants had to work hard to get used to the appliance.

No, well I used it in the morning, and had like loads of pain. I woke up at 1 am and was in a lot of pain so I took it out and I continued the next day and maybe the day after, the same thing happened again. After a while though you get used to it and can keep it in your mouth. (female no.12)

It was stated that after getting used to the appliance, it was easier to continue, unless discomfort was due to sourness that needed help from the dentist to solve. According to some remarks, pain thresholds were never overcome and they did not get used to the appliance.

Yes, well I mean I wanted it, I've always thought my teeth look very ugly. But when I finally got it, I thought it was really tough to wear. It gave me a lot of soreness and we had to grind it quite a lot but it sort of never really worked. (female no.7)

Keeping the appliance in the mouth is difficult

According to several statements, the most difficult thing was to keep the appliance in the mouth especially in the beginning of the treatment. However, after a couple of weeks and adolescents' hard work, they had worked out how to keep the appliance in the mouth.

The first night was really difficult. It was really uncomfortable having something in my mouth. When I went to bed there was this big thing in my mouth, but I managed to fall asleep and the next day it wasn't in my mouth anymore. My mouth must have spitted it out. It happened for a week or so but since then it's been absolutely fine.(male no.14)

Being tired of the appliance due to not getting it to stay in the mouth during the night was a common reason for not continuing the treatment, as stated below:

I got a bit tired. Couldn't really hold it, or to bite together on it. And at night when I was sleeping, it would just fall out, or well I wasn't biting that hard on it then. (male no.6)

Ashamed and bullied

Some statements indicated how embarrassing it was having an appliance and how it was a reason to get bullied. According to the statements, being adolescent in school can be tough, on top of that having orthodontic appliance can be rather impossible to share with others.

...Well didn't want to be embarrassed because of the appliance, that's why. In our school we call people with braces for geeks or bookworms. They say that people that wear braces do nothing but study. That's a myth. (male no.14)

Developing individual strategies

The third category consists of two subcategories covering statements associated with developing different individual strategies.

Remembering the appliance

According to the statements, one of the most difficult tasks was to remember the appliance, as removable appliances are not supposed to be in the mouth all the time. Participants developed different strategies how to manage remembering the appliance.

It was a bit difficult to remember sometimes, so I would put up like little Post it notes in the apartment to remind me to wear it. It worked well. (female no.4)

It was indicated as rather common to forget the appliance, for example while moving from one parent to the other when parents were separated.

It's that I have forgotten to use it or if I have forgotten it at mum or dads place. Obviously I should have taken it with me, so sometimes I would go back and get it. (female no.8)

Some participants went back to get it or parents helped them, while some postponed wearing it.

But when I go to dads, I do sometimes forget it. It can happen then that I don't use it for a day until we go back and get it. (female no.13)

Seeing improvement encourages motivation

According to the statements, seeing improvement was very important as motivation to continue the treatment.

It worked well. I had almost 1 cm of an overjet and when I was done, I had like 3 millimetres or something. So it really worked. (female no. 4)

One of the most essential requests to continue using the appliance was when the participants noticed that the overjet was reduced. Participants developed their own strategies of measurement to see improvement.

It helped loads. I even noticed myself how well it worked. I was pleased with it. And because of that I was motivated to continue using it. I had a little thing with my thumb which I used to measure it with, and it always improved, or the space became less. It worked really well. (male no. 5)

Even though the dentist also made measurements of the overjet, the participants had their own methods of comparing the overjet with the start condition.

No the dentist measured, but I could put my little finger in my mouth, between them (teeth), and could feel that I could fit it although I wanted it not to fit. After a while you feel that it doesn't fit in the space anymore and you get happy. (female no. 20)

Meeting the dentist

The fourth category consists of three subcategories associated with experiences from the visits at the dentist.

Individually adapted information is required

Giving information about treatment was mentioned as important. It was requested to be adapted to the adolescent's age. According to some adolescents, they experienced that it was difficult to concentrate while dentist was giving instructions for appliance use and at the same time handing over the appliance to the patient.

When you are as small as me, you should be given the appliance and then shown how it works. When you're bigger, like I am now, it's enough to give the appliance and talk at the same time. (female no.19)

Receiving encouragement is helpful

According to some statements, a meeting with the dentist could encourage to behavioural changes and motivate to continue use of the appliance. This was explained as one of the motivating factors to continue the treatment.

In the beginning it wasn't fun. But after I saw the dentist for the first time, and had seen how it had changed a bit, I felt like it was changing, and I finally felt that I was on the way. (female no.13)

Furthermore, it seems to be essential to visit the dentist and to see whether there was any improvement in overjet reduction. The measurements taken by the dentist were noticed by the participants and they realized the progress.

I didn't really notice that the overjet got better. I noticed it once I went to the dentist. (female no. 8)

Not being listened to is disappointing

Not being listened to created disappointing experiences according to the statements. This could be a major predisposing factor for failure of treatment.

As I said, I would have preferred to have fixed braces. He had already decided that it (myobrace) was the best choice. In the beginning, I tried to use it as much as possible. After a while though, I got tired of it. (female no. 9)

There were also statements about not being listened to and dentists urged to give an appliance even though no own interest existed for treatment. Personally I think my teeth work well and I don't really feel like I need braces. Well they want me to wear the appliance, but for me, they (the teeth) are fine as they are. (male no.17)

Getting external support

This category resulted in two subcategories that covered the participants conceptions related to the external influence and support.

Parents promotion necessary

The statement about parental support was presented as a positive experience including nagging as helpful

They used to remind me, mum and dad, I mean. Especially in the evenings they would tell me to use it. (female no. 9)

The adolescents accepted reminder from parents to use the appliance and this was experienced as an extra support and help in the treatment.

They reminded me: do your homework and wear your appliance. Anyway I used it when I was watching TV on Friday night. So if I was tired, dad said: go and get your appliance now. (female no. 20)

Even when being tired of the treatment, parents' support and care could initiate motivation to continue.

Because it was hard. I couldn't be bothered to wear it, but mum forced me. (male no. 6)

Friends attention differs

Another important external support was friends. Having the appliance could be a big thing, especially being the first person among his/her peers to get it. According to the statements, they were enjoying all attention they could get.

So I was the first. That was massive for me. That I was the first, you always want to be the first in everything. I liked that because I kind of like attention. (female no.7)

For some participants, it was the opposite and they did not want to share anything about the appliance with their friends, as it was no big deal.

Well not many people knew or it was mostly my closest friends and it wasn't a big deal then. (female no.4)

Discussion

The aim of this study was to explore and describe adolescents' experiences of treatment with removable functional appliances and a qualitative method was chosen. This allows researchers and clinicians to explore and deeper understand the adolescents' experiences of the treatment and also the impact that removable functional appliance can have on the patient.

The advantage of using a phenomenographic approach was the ability to explore the variation in the phenomena; adolescents' experiences of the treatment with a removable functional appliance. A pilot study, including both individual and focus group interviews, was carried out to test interview outline and questions. This gave the study greater impact ensuring proper design for exploring the phenomena by individual interviews. Additionally to make sure of reliability, examination of trustworthiness was performed. Truth-value is subject-oriented, not defined a priori by the researcher (20-22). However, there are some limitations with qualitative research that are important to underline. Qualitative studies are not generalizable to the whole population, although relevant to provide insight into the specific group and their experience of the phenomena studied. Compared to quantitative studies, investigations with а qualitative approach generally have fewer participants. A search for a variation in experience of the phenomena is essential. Sample size usually varies among 15-25 participants (23).

A weakness of this study was, however, that the interviewer (EC) had pre-knowledge about the appliances and the treatment, but the adolescents' did not know her in advance. There are few studies found in the literature using qualitative methods to provide information about adolescents' perception on treatment with removable functional appliances. An interview study by Trulsson et al. (2004) (12) was looking at age differences and illustrated the importance of more parental involvement for younger children's compliance. They suggested that if treatment compliance cannot be ensured through parents' enthusiastic involvement, it seems better to delay treatment until the child is older. This is in agreement with the present study, and the adolescent's experiences using removable functional appliance appear to have a large variation, comprising of individual approach, dentist role and external support as illustrated in Fig. 2. One of the most difficult tasks was to remember to wear the appliance and to accommodate to the discomfort and pain at the initiation of treatment. As seen in one of the categories, adolescents developed their own strategies, for example putting 'post it' notes around in the apartment and placing the appliance on the pillow to overcome this problem. An active involvement of the adolescents' in the treatment seems to be needed.



Fig. 2. Adolescents' experiences using removable functional appliance appear to have a large variation.

Another subcategory revealed that if clinicians' do not listen to the adolescent opinion about their own teeth, this could create a disappointing experience and be a predicting factor that could negatively influence the acceptance of the appliance and compliance. Therefore, the dentist's ability to listen, pass on enthusiasm, concern and knowledge could play an important role in the success of treatment as illustrated in Fig. 3. Even if adolescents seem to have a high level of motivation at the very beginning, extra support from the dentist at coming appointments is needed. Lewit and Virolainen (1968) (25) reported that compliance is greater among patients who view their orthodontic condition as severe. It is important to note, however, that it is the patient's personal perception of the severity of the malocclusion and not the objective severity as rated by clinician that is related to improved treatment adherence (26,27). The results of the present study also highlight the importance of parental involvement for adolescents' compliance. The parents' support was presented as a positive experience including nagging. This is in agreement with previous research (9, 12, 28) especially the study by Gross et al. (1985) (28) who tested a reward programme for compliance, which seems to have a positive effect on parentchild relationships. Furthermore, additional outcome reveals the importance of both adolescents and parents participating in the treatment, making clear that the family, and not only the adolescent, is going to be responsible for its success. An encouraging finding in the present study was the importance of using overjet measurement as a tool for motivation both internal and external.



Fig. 3. Overview of different factors contributing to successful treatment experienced by adolescents'.

Finally, efforts should be made by clinicians to really listen and understand adolescents' needs and requirement before the treatment start.

Conclusions

The results revealed the importance of internal motivation and external support during the treatment and also the importance of using a overjet measurement as a tool for motivation. An active involvement of the adolescents in the treatment seems to be needed and not being listened to seems to be a major predisposing factor for failure of the treatment.

Clinical relevance

This qualitative study is exploring and describing adolescents' experiences of the treatment of large

References

- Kilpeläinen PV, Phillips C, Tulloch JF. Anterior tooth position and motivation for early treatment. *Angle Orthod* 1993;63:171–4.
- 2. Shaw WC, Meek SC, Jones DS. Nicknames, teasing, harassment and the salience of dental features among school children. *Br J Orthod* 1980;7:75–80.
- Seehra J, Fleming PS, Newton T, DiBiase AT. Bullying in orthodontic patients and its relationship to malocclusion, self-esteem and oral health-related quality of life. *J* Orthod 2011;38:247–56.
- Helm S, Kreiborg S, Solow B. Psychosocial implications of malocclusion: a 15-year follow up study in 30-year-old Danes. *Am J Orthod* 1985;87:110–8.
- O'Brien K, Wright J, Conboy F, Chadwick S, Connolly I, Cook P et al. Effectiveness of early Orthodontic treatment with the Twinblock appliance: a multicenter, randomized, controlled trial. Part 2: Psychosocial effects. *Am J Orthod Dentofacial Orthop* 2003;124:488–94 ; discussion 494–5.
- 6. Brattström V, Ingelsson M, Aberg E. Treatment co-operation in ortho-

dontic patients. Br J Orthod 1991;18:37-42.

- Nanda RS, Kierl MJ. Prediction of cooperation in orthodontic treatment. *Am J Orthod Dentofacial Orthop* 1992;102:15–21.
- Bartsch A, Witt E, Sahm G, Schneider S. Correlates of objective patient compliance with removable appliance wear. *Am J Orthod Dentofacial Orthop* 1993;104:378–86.
- 9. Gross AM, Samson G, Sanders S, Smith C. Patient noncompliance: are children consistent? *Am J Orthod Dentofacial Orthop* 1988;93:518–9.
- Stewart FN, Kerr WJ, Taylor PJ. Appliance wear: the patient's point of view. *Eur J Orthod* 1997;19:377– 82.
- Slakter MJ, Albino JE, Fox RN, Lewis EA. Reliability and stability of the orthodontic patient cooperation scale. *Am J Orthod* 1980;78:559–63.
- Trulsson U, Lindälv L, Mohlin B, Strandmark M. Age dependence of compliance with orthodontic treatment in children with large overjet. An interview study. *Swed Dent J* 2004;28:101–9.
- 13. Marton F. Phenomenography describing conceptions of the world

overjet with removable functional appliances. The results underline the importance of overjet measurement as a tool for motivation both internal and external. Additional outcome in this study reveals the importance of cooperation with both adolescents and parents participating in the treatment. Moreover, making clear that the family, and not only the adolescent, is going to be responsible for its success. Finally, efforts should be made by clinicians to listen and understand adolescents' needs and requirements before the treatment starts.

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around us. *Instr Sci* 1981;10:177–200.

- Marton F. Phenomenography a research approach to investigating different understanding of reality. *Int J Thought* 1986;21:28–49.
- Lepp M, Ringsberg KC. Phenomenography: a qualitative research approach. In: Hallberg L R-M, editor. *Qualitative Methods in Public Health Research*. Lund: Studentlitteratur; 2002. pp. 105–35.
- 16. Sjöström B, Dahlgren LO. Applying phenomenography: a qualitative research approach for exploring understanding in health care. *Qual Health Res* 1999;9:212–26.
- Sjöström B, Dahlgren LO. Applying phenomenography in nursing research. J Adv Nurs 2002;40: 339–45.
- Patton MQ. Qualitative Research Evaluation Methods, 3rd edn. London: Sage; 2002.
- Den AM. fenomenografiska forskningsansatsens fokus (The phenomenographic research approach in focus). In: Starrin B, Svensson PG, editors. *Kvalitativ metod och vetenskapsteori (Qualitative Method and Scientific Theory)*. Lund: Studentlitteratur; 1994. pp. 111–32.

- 20. Sandelowski M. The problem of rigor in qualitative research. *Adv Nurs Sci* 1986;8:27–37.
- Shenton AK. Strategies for ensuring trustworthiness in qualitative research projects. *Educ Inform* 2004;22:63–75. IOS Press.
- 22. Krefting L. Rigor in qualitative research: the assessment of trust-worthiness. *Am J Occup Ther* 1991;45:214–22.
- 23. Kvale S. Interviews. An Introduction to Qualitative Research Interviewing.

Thousand Oaks: Sage Publications; 1997.

- 24. Seale C. Quality in qualitative research. *Qual Inq* 1999;5:465–78.
- Lewit DW, Virolainen K. Conformity and independence in adolescents' motivation for orthodontic treatment. *Child Dev* 1968;39:1188–200.
- 26. Witt E, Bartsch A, Sahm G, Schneider S. The determinants of wear behaviour in treatment with removable orthodontic appliances. *Fortschr Kieferorthop* 1992;53:322–9.
- Sergl HG, Klages U, Zentner A. Functional and social discomfort during orthodontic treatment effects on compliance and prediction of patients' adaptation by personality variables. *Eur J Orthod* 2000;22:307– 15.
- 28. Gross AM, Samson G, Dierkes M. Patient cooperation in treatment with removable appliances: a model of patient compliance with treatment implications. *Am J Orthod* 1985;87:392–7.

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