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School Time Experiences of Adolescents with Spinal Deformities during Brace Treatment: A Qualitative Study

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Abstract

Background: Adolescent idiopathic scoliosis (AIS) and Scheuermann kyphosis (SK) are the most common spinal deformities in adolescents aged 10 to 16. During the past 50 years, brace treatment has been suggested as the most common nonsurgical treatment for AIS and SK. The brace efficacy strongly depends on wearing time. Also, previous studies indicated that patients with spinal deformities undergoing brace treatment experience deformity-related emotional distress. This study aimed to comprehend the experiences of braces-treated adolescents during school time using a qualitative approach.

Methods: This descriptive qualitative research was used with an interpretative framework and enlisted the help of children with spinal deformities who have been prescribed "brace wearing." This study was conducted using semi-structured, face-to-face, in-depth interviews and phone conversations from September 2020 to May 2021. Additionally, content analysis was employed.

Results: A total of 64 participants were interviewed, including 32 adolescents with spinal deformities under brace treatment and their parents (27 mothers, and 5 fathers). Three main categories—concerns, actual problems, received support—6 subcategories, and 278 codes were discovered following data analysis about participants' experiences.

Conclusion: Special school-based programs are required for such tortious conditions. This qualitative study motivates a better understanding of these special children and their hidden problems and suggests developing a supportive protocol.

Keywords: Adolescent Idiopathic Scoliosis, Brace, Scheuermann's Kyphosis, School Time, Socializing, Content Analysis

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Introduction

The most common types of spinal deformities in adolescence are adolescent idiopathic scoliosis (AIS) and Scheuermann kyphosis (SK). AIS and SK affect 0.5% to 5.2% (1) and 1% to 8% (2) of children aged 10 to 16 years old,

↑What is "already known" in this topic:

- ○ Adolescents with spinal deformities experience some emotional burdens and distress induced by the deformity and treatment interventions.

→What this article adds:

- ○ According to the current study's findings, participants encountered 3 distinct levels of challenges with school attendance while wearing a brace.
- ○ The adolescents need some emotional and logical support to overcome their challenges at school.
- ○ Parents should explain to their teenagers why and how they wear braces in response to their peers' curiosity.
- ○ Parents, orthotists, physical therapists, school administrators, physical education teachers, and support staff should have contributed to a greater understanding of the importance of physical-psychosocial support.

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respectively. The deformities may be progressive and associated with psychosocial consequences (3).

Bracing and exercises are the most common nonsurgical treatments for adolescents with AIS and SK to control further curve progression and improve cosmetic appearance (4-6). However, dedication to the treatments and regular visits for modifying brace fit were the most important aspects that contributed to their success (7-9).

According to the bracing committee of the Scoliosis Research Society, high-risk AIS patients should be braced for a minimum of 18 hours per day to achieve optimal results (10). However, emotional disorder (11), an increase in stress and anxiety (6, 12-14), and a decrease in self-esteem and self-image (15) are known as the common conditions affecting the daily brace-wearing time of AIS and SK adolescents during social and school functions significantly. The problems may be highly associated with the feedback children receive from their peers (16).

In addition, spinal deformity progression influences adolescents' body image and mental health (17, 18). Adolescents with spinal deformities have varying levels of negative self-esteem and inferiority complex, which may lead to adverse effects on the psychological condition, friendship development, and social adaptation ability of adolescents (14, 19). Approximately 40% of patients with AIS experience loneliness and depression during and after treatment (20).

Further, being seen with a brace has been detected as one of the sources of discomfort and anxiety among adolescents undergoing brace treatment (21). The patients experience anxiety and low self-esteem because of the lack of family and social support; thus, there is a low expectation for brace treatment success (12).

The socialization of adolescents depends on their participation in school since it acts as a model community where they spend a lot of time and are exposed to peers and their viewpoints. Extensive research has been performed on psychological and physical issues of adolescents with spinal brace treatment (12, 22-25), and they showed a need for a better perception of adolescents' situation with a brace at school. Also, much uncertainty still exists about the relationship between brace compliance and the in-school experiences of adolescents with spinal deformities. Addressing this research gap is even more important, bearing in mind that adolescent brace compliance is a critical issue for brace efficacy and curve treatment.

In order for school administrators and nurses to help adolescents treated with braces, it is important to understand several aspects of their attendance condition. This is due to the significant psychosocial and physical vulnerability of adolescents treated with braces. This study explored the adolescents' brace-wearing physical-psychosocial experiences during school time. The findings may help us gain a better understanding of how children with braces experience their time at school. These findings can help the family and the rehabilitation team's therapists and medical personnel communicate more effectively.

Methods

Study Design

Bradshaw et al. suggested employing qualitative description methods for in-depth comprehension of participants experiencing a phenomenon in health care research when there is a shortage of knowledge regarding a health concern (26). In this regard, we used this methodology to help us comprehend adolescents more fully who are directly affected by diseases and who are wearing spinal braces at school (27). In-depth, semi-structured face-to-face interviews (28) and phone calls were used to collect the data, which were then analyzed using content analysis. The ethics committee of Iran University of Medical Sciences approved the study protocol (NO.IR.IUMS.REC.1399.428).

Recruitment

The participants were invited from three orthotic and prosthetic centres that attended brace treatment. According to the predefined selection criteria, the potential participants were asked about their willingness to participate. If they accepted verbally, informed written parental agreement and adolescent assent were obtained.

Research Team

Three in-person meetings with all of the study authors and others with knowledge in health-related studies were held prior to the interviews in order to explain the study's theoretical framework and establish interview questions. Also, the interviews were performed by using a set of guide questions devised by the research team (Appendix). One of the team members (F. Gh.) with expertise in spinal orthosis and brace treatment protocol was responsible for the interviews of children and their parents. She was a PhD candidate who attended several workshops about qualitative research and interviewing.

Participants

The adolescents had to meet the following criteria in order to be included: (1) AIS or SK; (2) be between the ages of 10 and 14 when brace treatment began; (3) have worn a brace for more than 3 months; and (4) have no prior history of spinal surgical treatment or mental illness. Additionally, the parents of adolescents were asked to participate in the interviews to obtain triangulation and more information beyond the adolescents' statements. By choosing families from a variety of socioeconomic classes, educational levels, and religious backgrounds, the study's generalizability was improved.

Data Collection

The interviews and data collection were conducted from September 2020 to May 2021. Data analysis was performed simultaneously as the interviews proceeded. Data saturation was defined as completing all the categories identified by the gathered data with no further data or conceptual material extracted, which determined the sample size. Children were informed about having the option to end the interview at any time. In order to start a conversation with the children in person, the interviewer gave

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them some background information about herself (name, job title, and place of employment), explained the purpose of the study in terms they could understand, and asked a few introductory questions about their age and siblings to establish rapport. Then, the interview started; the interview's focus was on adolescents wearing braces in a school environment. Over time, additional follow-up questions were added depending on the information provided by the participants to enhance openness. Some of the questions include "What do you mean?", "Please clarify," or "Please tell me about your emotional experience." Furthermore, the parents were interviewed about their children's school experiences during the brace treatment period. Finally, if there was anything further they wanted to discuss, each participant was asked to conduct a phone interview with them and their parents. With the 28th interview with adolescents and their parents, the interviews produced a sizeable amount of detailed data (56 interviews). For confirmation, the process was done 64 times with 32 adolescents and their parents. The research team chose to invite additional participants to reach saturation because it was difficult to communicate with adolescents. All participants were asked to address each topic question in turn. While some participants gave detailed reports of all their events, others merely provided brief, focused answers to questions. The interviews took 28 to 56 minutes and were done in Persian.

Data Analysis

The Lundman and Graneheim method (28) was used to analyze the data, which involved writing the whole interview (verbatim). The interviewer then deleted the audio files after matching the text to the recorded audio. Furthermore, she read each interview transcript several times to obtain a general understanding of the content as well as an immersion in the data. Four authors used inductive analysis to complete the study. The most descriptive information was used to create a code, which was then reduced and code groupings were discovered. Consequently, groups of significant codes, points, or materials were created, which enabled the formation of the titles characterizing the participants' experiences. Regarding each interview, semantic units were identified in each interview, and key phrases were extracted. The concepts were generated and summarized based on the study questions and appropriate codes for each item. The extracted original codes were summarized based on their conceptual similarities in categories through ongoing data analysis and comparison. Subsequently, the research team sessions were held to combine the analysis results for representing the participants' experiences. In the case of asymmetry, the topic was selected by agreement among the research team members. All codes and categories were reviewed and approved by the authors. During the study, the research team regularly met to compare codes, subcategories, and categories.

Rigor

Lincoln and Guba's credibility, dependability, confirmability, and transferability criteria were used to certify trustworthiness (29). Building trust, rapport, and demonstrating empathy were utilized to ensure credibility. Reliability and confirmability were also supplied utilizing follow-up consideration, direct quotes, and transferability, which was represented by a comprehensive explanation and purposeful sampling (26, 29, 30).

The family caregivers were interviewed to triangulate the data source. To ensure the results' validity, participants (adolescents and parents) were asked to verify and resolve the interview-generated codes (member check). The second, third, and fifth authors evaluated and peer-reviewed all the interview transcripts, codes, and categories to guarantee the trustworthiness of the results. All stages of the inquiry were documented to ensure the reliability of the results. Also, rigor was reinforced by the research questions, methods, data analysis, and direct experiences of the participants (26).

Results

In this study, 45 families (adolescents and parents) were invited to participate. Eight parents refused to participate for various reasons such as dissatisfaction and unwillingness to talk as well as the lack of time. A total of 64 participants, including 32 adolescents with spinal deformities (28 AIS and nine SK individuals), and their parents (27 mothers, and 5 fathers) were interviewed. The details of the brace treatment are presented in Table 1. Most interviews were carried out with the mothers since they were the primary caregivers and were more aware of their children's situation.

Further, 3 main categories, 6 subcategories, and 278 codes were discovered, and the main categories extracted from the data are displayed in Figure 1.

Concerns

Draw Attention: "Draw attention" was obtained as the first subcategory of this category. The adolescents expressed worries about wearing braces to school, as well as worried about what their classmates might think, feel, or say about them. Explaining their new situation to peers

Table 1. Adolescents' characteristics

	Brace type	Girls (Boys)
AIS	Milwaukee brace	16 (2)
	TLSO	5 (1)
SK	Milwaukee brace	4 (3)
	TLSO	1 (0)
Mean age	14.2 ±3.5 years	
Mean brace-wearing time	8.5±1.4 months	
Mothers	32	
Fathers	5	

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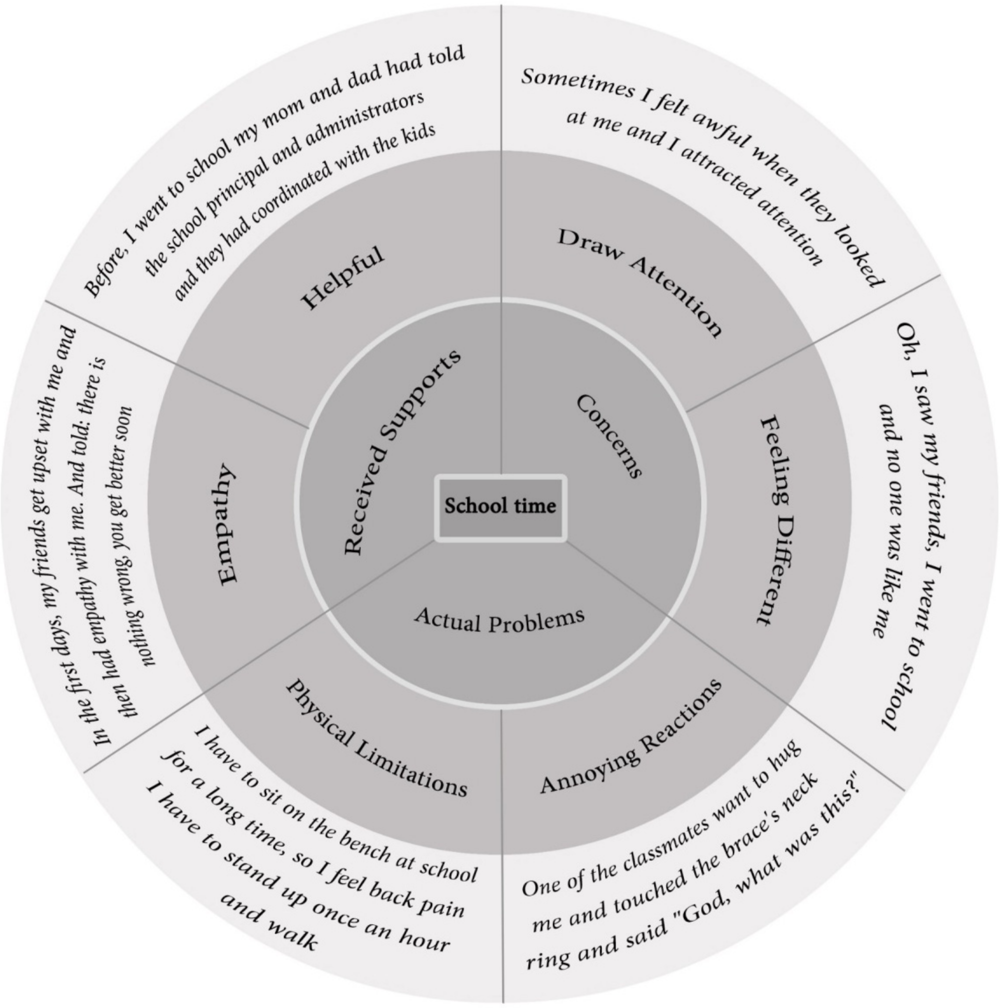

Fig. 1. Main categories and subcategories of school time experiences while wearing a spinal brace

was detected as one of their primary concerns that resulted in being ashamed. Before attending school, they guessed that peers would ridicule them if their braces were seen and were concerned about how they would be seen. Additionally, all adolescents preferred that only their close friends were aware of their brace use and intended to hide it from other classmates. Some students were concerned about being questioned at school because other brace-wearing students had already faced this issue. Additionally, parents who spoke on behalf of their children confirmed this concern.

Adolescent (A) 32. First months, it was really important for me that no one would see my brace; most people would ask me about the brace and I didn't know what should say.

Feeling Different: In the case of "feeling different," as the second subcategory, some adolescents believed that attending school with a brace made them feel different. The other concern was that other people would assume they were physically different and had a particular impairment.

A 9. Yes. You know, I could not do a lot of things like others. I do not like it at all.

A 30. For example, I felt that I was different from others and others thought I was a robot or a robot armor.

Actual Problems

Annoying Reactions: The codes related to the actual problems were categorized as "Annoying Reactions" and " Physical Limitations." Friends would not find out about braces at first if adolescents' clothes cover braces. Adolescents stated that their peers became curious about the brace, accidentally getting their hands on it. It was understood from the responses that the initial reactions and questions of the classmates were unpleasant even if the adolescents had compliance and no problem with wearing the brace. Additionally, the students made an effort to hide their brace from their classmates. In cases where the brace was worn after beginning the COVID-19 quarantine period, several participants removed their braces to attend online video classes. It became an interesting issue for peers after noticing the brace, so they got curious and asked several questions. Some of the questions were as follows: "*What is this? What is it made of? Why should you wear it? How long should you wear it? Is wearing it painful?*" The majority of adolescents believe that when others were curious about their braces, they felt uncomfortable and ashamed. Because of this, when questioned, they gave brief, informal responses. Further, they told their peers: "*I have to wear this brace, that is all*." However, asking about the brace was not that much uncomfortable in the cases where the participant was not the only person wearing a brace in class.

A 15. At first, it was strange for them, but then getting used to not having a problem with my brace.

A 8. My peers finally learned about my brace during my first few months of school; they touched me and labeled me. I found it quite challenging to handle this circumstance.

The students gave their friends an explanation in response to the rationale behind brace use. Most students did not respond to this question: "A 7. But I never liked to explain my situation to anyone." However, 3 participants disclosed nothing about developing spinal deformity and offered unrelated reasons such as *"I fell," "I have back pain,"* and *"my back was injured."* Others gave a quick description of spinal deformities to their classmates and said that many people have this problem without knowing about it.

A 5. Well, I haven't told my friends the truth yet. No one knows the fact that I have a spinal deformity. That's why they all thought it was a simple thing. I told them I used to hump so I wear this now.

Regarding the brace-wearing time, they did not address a specific time. One of the adolescents replied to her classmates: *"I have to wear it for a month and then I will get better."* They insisted on the temporariness of this treatment. Furthermore, the children declared that the situation became normal and that peers were no longer curious after acquiring information about the brace.

A 18. I said yes because I want to sit straight, then the doctor told me to take it off after a while.

Some students were ridiculed by their classmates in the first few days of school with the brace. In half of the cases, participants were nicknamed as "a clothes hanger, iron man, scaffolding, skeleton, and armor," from which most were not upset. One of the participants claimed that my peers avoided me at school due to the fear of running into me and being hit in games, leading to a profound negative effect on her mood.

The adolescents said about feeling different from others while wearing the brace, especially at school and among their friends. The feeling of being different was caused by the imposed constraints like the activities, sports, and activities in which they were no longer allowed or unable to participate while wearing the brace.

These challenges were confirmed by the parents who declared their children complained about classmates' questions and judgments.

A 11. "When I noticed that my friends did not act inappropriately, I stopped being afraid."

Physical Limitations: "Physical Limitations" was determined as the second subcategory of the actual problems. The participants referred to studying and doing homework as 2 actual problems at school while in bracing treatment. They could not devote enough time to studying because of feeling back and neck pain while doing homework. Additionally, the children felt frustrated and upset since they could not study as well as they used to. After the COVID-19 outbreak, when schools were closed, they talked about how difficult it was to study using mobile phones and tablets for online classes. Sitting on benches and seats for lengthy periods was one of the most challenging conditions for brace-wearing adolescents at school, causing back pain. Another annoying issue included overheating the inside of the brace in the classroom, especially in the absence of air conditioning system facilities.

Further, some outlined the need for assistance in carrying a school backpack and the inability to play with others at sports time after wearing the brace. Two participants complained of misunderstanding or not assisting by the sports teacher, so the teachers forced them to take off the brace and be active like others. Some complaints were related to the hardness and uncomfortableness of being alone during sports. Also, the need for assistance in carrying a school backpack was mentioned by parents, which evoked feelings of dependency in adolescents.

A 20. I was frustrated that I couldn't study well.

M 20. I could not focus on my homework with the brace.

A 27. My brace affected how I studied. I don't recall being able to study effectively after wearing a brace.

A 25. I always had to take off my brace at sport class. My sports teacher said you should do exercise like others, otherwise, your sports score would be zero.

Received Supports

Helpful: According to the adolescents and their parents, the school administrators lacked enough information about spinal deformities and brace treatment. Some parents gave the school authorities a brief description of the deformity and brace after the commencement of the treatment. They added some items to consider their children's circumstances at school. Administrators informed students about the brace wear and advised them to take into account the new circumstances because they were aware of the adolescents' conditions. Others claim that their administrators and teachers supported them and provided the appropriate reimbursement for homework. In addition, the sports teacher helped them because of the brace, allowing them to skip class or perform exercises under the teacher's guidance to avoid injury.

Mother 14. I had talked to her principal and sports teacher. I told them that my daughter's sitting and getting up is a bit different from the other kids.

Empathy: Close friends supported the adolescents educationally and emotionally. The adolescents' responses indicated that after learning about their condition, their peers expressed sympathy, were upset, and gave them hope of overcoming. Bending was addressed as one of the problems, in which the friends helped to lift stuff off the floor, move chairs, and tie shoelaces. A few of the participants claimed that after getting braces and sitting up straight, their friends complimented their stature. Some parents referred to the supportive and encouraging role of close friends when the children got nervous and upset

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while seeking to take follow-up radiographs.

A 4. My friend told me: " It is great that you look after your health and get your spine straightened."

A 1. However, as time went on and my friends became accustomed to the brace, it ceased to be absurd.

Discussion

Brace-wearing may affect AIS and SK adolescents' physical function and their perspective of appearance, which may lead to physical and social performance at school. In this study, we aimed to have a perception of what happened at school for them while wearing the brace from their point of view. Based on AIS and SK adolescents' statements, they experienced some psychosocial and physical problems as well as some support at school. Three main categories of concerns, actual problems, and received support were extracted from the interview codes. These categories contained a combination of physical-psychosocial aspects of wearing the brace at school.

Furthermore, one of the significant psychosocial concerns of the adolescents after receiving their braces was how to be judged by peers when they attended school, and they were apprehensive about their appearance among their classmates. According to the exploratory factor analysis (16), stress in AIS patients receiving brace treatment is significantly influenced by patients' anxiety about how other people will perceive them. They discovered that brace-induced stress is unrelated to age, curvature severity, pain, or management satisfaction. Thus, it seems that therapists and caregivers should be cautious about the patient's psychological status regardless of any potential stressful factor. Additionally, compared to patients who just had spinal deformities in earlier research, patients using braces reported higher stress levels (13, 14). In a study by Khoshhal et al, concluded that patients showed less stress as their curvature severity reduced (31).

Many adolescents with spinal deformities feel different and more socially limited than their peers (32). In the present study, the participants pointed out how they feel differently. Thus, it is possible to draw the conclusion that feeling different may be accompanied by bad effects on relationships with peers, decreased social functioning, lifestyle changes, and constant interruptions of daily activities due to brace use. According to a previous study, this feeling leads to social withdrawal temporarily, which declines social development despite the need for cohesive relationships with peers during this period (32). This situation may be attributed to the evocation of being different by the changes made following brace wearing.

Further, the actual problems (physical-psychosocial) the participants encountered at school were detected as one of the categories. The adolescents said that the unpleasant reactions of their peers made them uncomfortable, bothered, and ashamed. Previous research has shown that being in an environment where the adolescents were asked about the brace and illness and the duration of treatment created unpleasant stress-related conditions (24, 33). Our results also confirmed that the inappropriate reactions following attendance at peer groups might create a psychological burden for some adolescents and weaken their mood. In these cases, the adolescent is inclined to take distance from their peers and reject being in society. This result is in agreement with those of Sapountzi-Krepia et al, which reflected the participants' opinions about dealing with stress, denial, fear, anger, and embarrassment during brace treatment (12). Duramaz et al noticed the vital issue that patients are seriously concerned about the negative effect of their spinal deformity on body image. Additionally, they experience poor self-esteem and shame, which can result in pessimism, anxiety, and negative outcomes like relationship problems and social isolation (34). However, Babaee et al noticed that adolescents' self-image could be improved over time after 6 to 12 months of wearing their braces (35). It may understand that peers' annoying reactions could inevitably affect brace compliance. In a way, the adolescents desire to remove the brace as little as possible to avoid reactions and inquiries from others. Additionally, time passing could aid some teenagers receiving brace treatment in overcoming their self-image issues. Another critical problem was the physical circumstances induced by wearing the brace at school. Energetic and enthusiastic attitudes to daily life activities determine a patient's vitality (15), which directly correlates with physical function. Additionally, the brace can limit adolescents' daily movements (33). Accordingly, they exhibit less tolerance for sitting on classroom benches. Restriction on doing sports and recreational activities with classmates was another issue addressed by the participants. Daryabor et al reported a decline in exercise capacity in the patients treated with a brace after 6 months because of wearing a brace. Further, a significant reduction in walking speed and more energy expenditure were observed among the brace-wearing patients (36). Based on interview results, planning some specific ideas is mandatory to prevent brace-wearing adolescents' physical problems. To improve physical condition and muscle strength, training spinal deformity adolescents with endurance exercises is recommended to improve physical function.

The most interesting issue stated by individuals included a gradual decrease in the stress of attending school because of understanding by the school staff and receiving their support. Kyngäs (2000) suggested that certain factors, such as support from medical personnel, parents, and teachers, good motivation, and a positive attitude toward the disease and treatment, as well as giving the feeling of being normal, lead to better patient compliance in the treatment of adolescent chronic diseases (32). The previous research indicated that having psychological support can improve adolescent mental health by declining anxiety in the event of psychosocial stress (37). Since brace-wearing is a disturbing experience for adolescents, it is essential to have supportive friends as a key factor in preventing a distressing feeling that leads to adverse psychological effects.

Adolescents should make sure that their illness does not jeopardize their ability to function in society. According to the participants' views, the adolescents' new situations were gradually accepted by their classmates and the school staff, and their circumstances returned to normal. Finally, the majority of respondents thought that the com-

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passion of close friends or classmates was reassuring and helped to ease the patients' concerns.

Limitations

Some limitations of the present study are as follows: The participants discussed the requirements for attending school, taking into account the crucial time of adolescence, even though they might have had other thoughts they were hesitant to share. Due to the fact that more female teenagers than male were referred to orthotic and prosthetic facilities, the majority of the patients were female. Many participants discussed their past experiences when it was feasible to attend school full-time due to COVID-19.

Future Studies

It is recommended to compare stress levels in adolescents with spinal deformities undergoing brace treatment in 2 groups: a group with routine treatment interventions and a group that benefits from a supportive written program at school. Action research that takes into account the concerns and issues that teenagers with spinal abnormalities have at school and uses supportive intervention may be more helpful. Additionally, it is advised to evaluate the impact of therapies to reduce physical discomfort at school with interventions to lessen psychological anxiety and discomfort on the quality of life of adolescents receiving braces treatment.

Conclusion

The purpose of this study was to ascertain the conditions and issues experienced by AIS and SK adolescents who attend school while wearing a brace. The participants declared that they were fearful of being ridiculed and feeling different before attending school. Following school attendance, they realized actual problems such as annoying reactions and physical limitations. Over time, they were supported by friends and the school's administrators after adapting to the circumstances and satisfying the curiosities of their peers. It seems that considering the mental concerns of adolescents before the first appearance with the braces at school and preparing them to attend peer groups with the braces result in reducing their distress, anxiety, and physical limitations, which could help to increase compliance. To this end, a profound conversation could be performed with them about their worries. Justification for the high importance of spinal deformity treatment is considered necessary as the brace's appearance in society that could be more acceptable. This qualitative study gives researchers more motivation to offer deeper insights into securing funding for these vulnerable children.

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Conflict of Interests

The authors declare that they have no competing interests.

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Appendix. Questions for the adolescents and parents

1	What do you know about your disease?
2	Do you know the name of the device you are wearing? Can you explain how it would help you?
3	Have you ever seen the brace before? What did you think about the brace?
4	Did anyone else of your classmates or friends wear the brace? What does she/he say about bracing?
5	How did you feel when you wore a brace at school? Explain it? Like how?
6	Have you ever become more intimate with one of your friends after brace wearing? Why?
7	How did your friends treat you while wearing the brace at school? What do you feel about this?
8	What did they tell you about your situation? How much did you care about it?
9	What were the classmates' reactions after they were informed about your brace? Did you feel that it was important?
10	Have your friends helped you at school after brace wearing? Did you asked them?
11	How did you feel when you attended school wearing the brace for the first time? Tell me more about that day?
12	How do you introduce your brace to your classmates? Why did you say like this?
13	How did you answer your classmates' questions about your brace at school? Was it bothering you?
14	Has your situation changed at school after brace wearing? Explain how it has been changed?
15	Did brace wearing restrict you from doing any activities at school? Then how did you feel about that?
16	Did you want not to wear a brace so you could do some palys or hobbies? Like what?
17	Did brace wearing change the model of the games you played at school? How to become?
18	Has it ever occurred to you to cut your friendship with someone less or cut off your friendship altogether?
19	What did your friend do or say that made you make such a decision?
20	During this time, did your child have problems in school-related activities? How much was it hard for her/him?
21	Did you inform the school administrator about your child's brace wearing? How did you explain it?
22	Has your child ever complained about the classmates' reaction at school after brace wearing? How did you make her/him feel better?

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