Original Article

A Randomized Cross-over Trial of Behavior Guidance Techniques on Children with Special Needs during Dental Treatment: The Caregivers' Perceived Mannerisms

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ABSTRACT

Aim: To compare caregivers' acceptance, consent, and concern toward utilization of a combination of basic behavior guidance technique (CBBGT) and Papoose Board (PB) for their special needs children and to evaluate the impact of PB usage on the caregiver's attitude and the association between their education level, monthly household income, and previous dental experience. **Materials and Methods:** This cross-over study incorporated 90 special needs children who were recruited to receive dental treatment with two ways of behavior guidance exposures consecutively in the order of A-B/B-A design. Exposure A is CBBGT (distraction, tell-show-do, and positive reinforcement), while Exposure B is PB. The dental procedures were either dental prophylaxis or restoration with a handpiece. Caregivers need to answer a paper-based questionnaire before and after exposure. The Wilcoxon sign rank test and logistic regression were utilized in order to establish the comparability, impacts, and association. **Result:** About 88 caregivers of special needs children aged between 2 and 15 years completed the sequence. Overall, 98.9% of the children presented with neurodevelopmental disorders. Twenty-seven caregivers were significantly concerned when the combination of basic BGT was applied to their children, and 14 caregivers felt the same for PB. However, the Wilcoxon sign rank test revealed insignificant caregiver scores on acceptance and consent for both methods but significantly improved attitudes towards the use of PB after observing the placement of their children. **Conclusion:** The studied caregiver demonstrated equivalent acceptance, consent, and concern toward the use of PB and a combination of basic BGT with improved attitudes after comprehensive explanation and real-time observation of PB usage during their children's dental treatment.

Keywords: *Attitude, children with special needs, passive immobilization*

Introduction

Managing behavior in patients with special needs can be challenging due to fear, anxiety, communicational barriers, and failure to understand dental care, which may trigger them to exhibit defiant behaviors.[1] Although special needs populations receive dental care similar to healthy patients, they frequently face hurdles to regular dental care in a traditional dental setting. Thus, alternative behavior guidance strategies might be required. Passive immobilization may be beneficial in patients for whom traditional behavior guidance is insufficient.[2] Full-body passive immobilization devices, such as Papoose Board (PB),

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work on the concept of splinting the child to a stiff board in order to inhibit striving.[3] However, the use of these mechanical restraining devices in pediatric dentistry provoked controversies and debate among practitioners and parents. The use of passive immobilization devices was considered cold and nonhumanized conduct that resembled the use of tight-jacket and evoked difficult ethical evaluation while making individual assessments by the general dentist.[4,5]

Basic behavior guidance techniques (BGT) should be used as the foundation for all behavior guidance provided by dentists, but due to the diversity of children's attitudes and temperaments, the application of communicative behavior guidance only was inadequate as the techniques required bi-directional communication and active participation which were sometimes intolerant by the children with special healthcare needs who have limited psychological and emotional maturity.[6,7] To our knowledge, the study is a debut that explores caregivers' perceived mannerisms toward the utilization of passive immobilization as behavior guidance during dental treatment in special needs children. The majority of available studies used a variety of exposure methods to the parent such as audio-visual,[8-10] PowerPoint presentation,[11] verbal interview,[12] written description,[13,14] photograph[15-17] rather than real-time observation of the devices being used on their own child. Considering that caregivers' opinions about behavior guidance usage play an important role in the treatment plan, exploring caregivers' opinions is critical when identifying behavior guidance application priorities. Their acceptance of behavior guidance might depend on the way of informing the caregivers and their personal experience about these techniques.

The objectives of this study are threefold: (i) to compare caregivers' perceived mannerisms toward the use of a combination of basic behavior guidance techniques as compared to PB for their special needs children during dental treatment; (ii) to evaluate the effect of PB usage on the caregiver's attitude, and (iii) to assess the association between their education level, monthly household income, and previous dental experience. The results are expected to highlight current parental acceptance trends toward this contentious technique, which helps to improve the effectiveness and well-being of pediatrics with special needs during dental care.

Materials and Methods

Design of the study

This is a randomized cross-over study that comprised two subsequent dental appointments within 2-month intervals. The software (G*Power 3.1) was used to figure out the sample size with a medium effect size and a dropout rate of 20% Heinrich-Heine-Universität Düsseldorf, German. Conveniently recruited were 90 caregivers who brought their children with special needs to the Paediatric Special Care Dentistry Clinic for dental treatment. The research assistant applied and performed simple randomization utilizing the sequentially numbered, opaque, sealed envelopes method for allocation concealment. Blinding for the care provider and caregivers cannot be performed; however, only the research assistant who will assess the outcome is blinded. The University Research Ethics Committee approved the ethics (REC/08/2020/FB 189), and the study was also registered in the clinical trial registry of the International Standard Randomised Control Trial Number (ISRCTN) with an identifying number (ISRCTN57204958). All research activities have complied with the Declaration of Helsinki.

Sample population

Included sample

The subject group is comprised of carers of special needs children below the age of 16 years who attended the Paediatric Special Care Dentistry Clinic between October 1, 2020 and October 1, 2021. The children were either physical, developmental, behavioral, and/or sensory impaired. The caregivers also must present in the dental office to see if their children received prophylaxis treatment using a prophy brush and restorative treatment of ICDAS 03. Both treatments used slow-speed rotary handpieces. Their children also must never have any experience of using PB. The subject caregiver must be able to read and understand the language of conduct (Bahasa Malaysia/English) and was the child's legal parents or caregivers who lived in the same house.

Excluded sample

The caregivers whose children with special needs sustained acute pain, which required them to have emergency treatment, and the caregivers who refused to give consent for their child and themselves to participate in this study were excluded.

Study visits and procedures

At the preliminary consultation, standard oral examination while implementing the customary basic behavior guidance (e.g., tell-show-do) and treatment plans were proposed. The carers received a participant sheet of information outlining the details of the study and the level of commitment required. The caregivers then were allowed an option of whether to proceed with participation or not. Once they agreed, written consent was obtained. The patients received two exposures

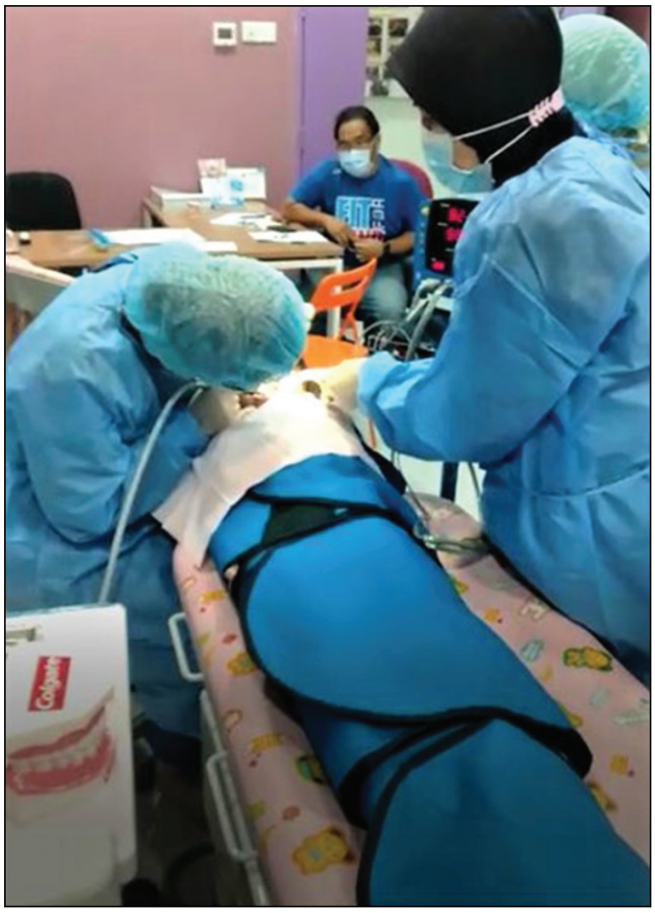

Figure 1: Subject child wrapped with Papoose Board® during dental treatment

sequentially over two visits. Following the A-B/B-A exposure sequence, the order of treatments received was randomized. A combination of tell-show-do, distraction (singing, audiovisual, books, gadgets), or positive reinforcement (praises, high-five gestures, and small gifts such as toys or stickers) is known as Exposure A, whereas Exposure B includes passive immobilization techniques using a PB [Figure 1].

Workflow protocol for sequence A-B/B-A

On the initial visit, the itemization of Exposure A was explained to the caregiver. A validated 16-item questionnaire adapted from previous studies[17,18] consists of two parts given to caregivers during preintervention. Seven questions for demographic information of both the caregivers and the child. The remaining nine questions sought to obtain information about the caregivers' understanding and views about the proposed behavior guidance and consent to its use for their child's dental treatment. The subject children were meant to receive dental procedures as planned. After completion of the treatment, caregivers were asked to complete a post-intervention questionnaire using the same set of paper-based questionnaires.

A washout time of one to two months was imposed prior to the next visit for Exposure B in order to lessen the carryover effect. The child participant proceeded in the same manner as on the first visit to the workflow. The sequence of Exposure BA sequence was the opposite of what Exposure AB as depicted [Figures 2 and 3]

Research instrument

The bi-lingual questionnaire consists of two parts: (i) demographic and (ii) caregiver's acceptance, consent, concern, and attitude. In part one, surveillance of sociodemographic information such as the age and gender of the caregiver and their children with special needs, race of caregivers (Malay/Chinese/Indian/others), the educational background of the carers (primary, secondary, diploma, bachelor's degree, postgraduate), monthly household incomes, caregivers' previous dental experience (Good/fair/bad/no experience) and type of their child's disability were recorded.

In part two, three questions, as adapted from Paryab *et al.*,[18] regarding the use of a PB and a combination of basic behavior guidance technique (CBBGT), were answered by the caregiver. The questionnaires used a 5-point Likert scale to evaluate caregivers' acceptance, consent, and concern regarding each technique. Whenever the subject child receives intervention from Exposure B, subject caregivers were required to complete six additional questions specifically focusing on attitude towards the use of PB prior to and after application of the device. These extra questions are adapted from Hill *et al.*[7]

Both parts of the questionnaire were subjected to forward and backward translation of English–Bahasa Malaysia to adapt to the culture and language of the studied country. Content and face validation processes were performed to achieve the intended questionnaire relevancy. The scale-level content validity index (S-CVI/Ave = 0.93), which is based on the average approach, was calculated to evaluate each questionnaire item's relevance and gauge the panel experts' consensus.

Statistical assessment

Data analysis was carried out using IBM SPSS software (Version 28.0, IBM Knowledge Center, New York ,USA), and a *P*-value less than 0.05 is considered statistically significant. The caregivers' acceptance, concern, consent, and attitude were analyzed per question. Comparison of paired scores median and interquartile range (IQR) were analyzed using the

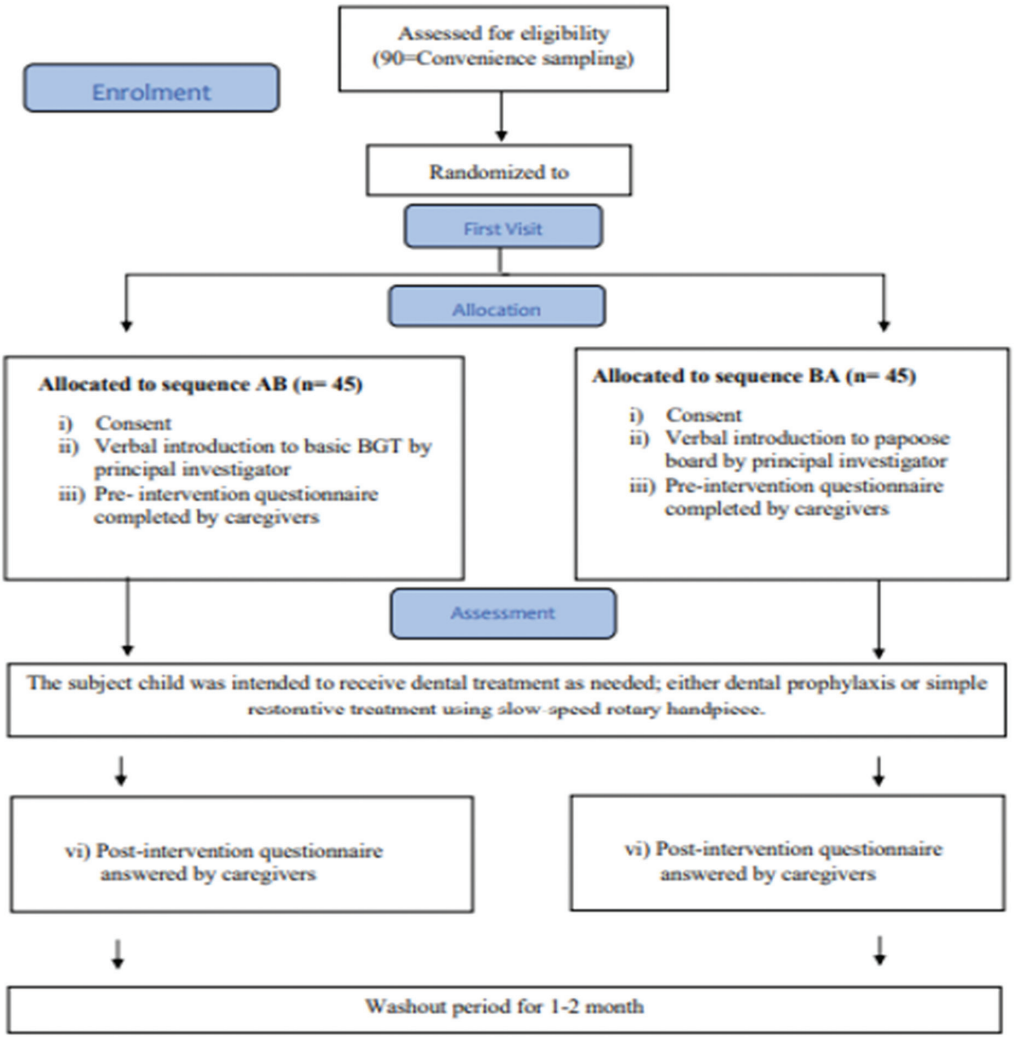

Figure 2: Workflow for AB/BA sequencing for the first visit

Wilcoxon Sign rank Test. Logistic regression was used to assess any association of caregivers' good attitude with their education level, monthly household income, and previous dental experience.

Results

Eighty-eight caregivers aged between 30 and 58 years and their children aged between 2 and 15 years completed the sequence within the time of recruitment. Two of the respondents did not attend follow-up visits, which consisted of one from each sequence, due to nonresponsive toward appointment scheduling. Most of the children who received treatment were in the category of middle childhood, which is 6–11 years old (75.6%), followed by early adolescence (18.1%), and only six children from early childhood (6.7%). About 98.9% of the children were diagnosed with a neurodevelopmental problem specifically; 62 out of 87 were autistic children, and only 1.1% had a physical disability. Two-thirds of the caregivers were female (67.0%), while only one-third were males. The majority of the caregivers were of Malay ethnicity (89.8%) and had tertiary education backgrounds (73.8%), which indicates highly educated caregivers. Moreover, 48.9% of the caregivers belonged to the middle-income category (RM4851 to RM10970). Half of the caregivers had good previous dental experience. A summary of respondents' demographics is shown in Table 1.

Eleven caregivers scored "not agree" with the effectiveness of a CBBGT, while six of them were "not sure" about the effectiveness of PB for their children with special needs. Interestingly there were five caregivers did not consent to the use of the CBBGT during dental treatment as compared to only one for PB. Twenty-seven caregivers worried about their child's treatment with CBBGT, and 14 felt the same with PB [Table 2]. However, from all the participants, there was no episode of excessive resistance by the subject child toward the use of PB, which can be detrimental to continuing the treatment as the treatment provided

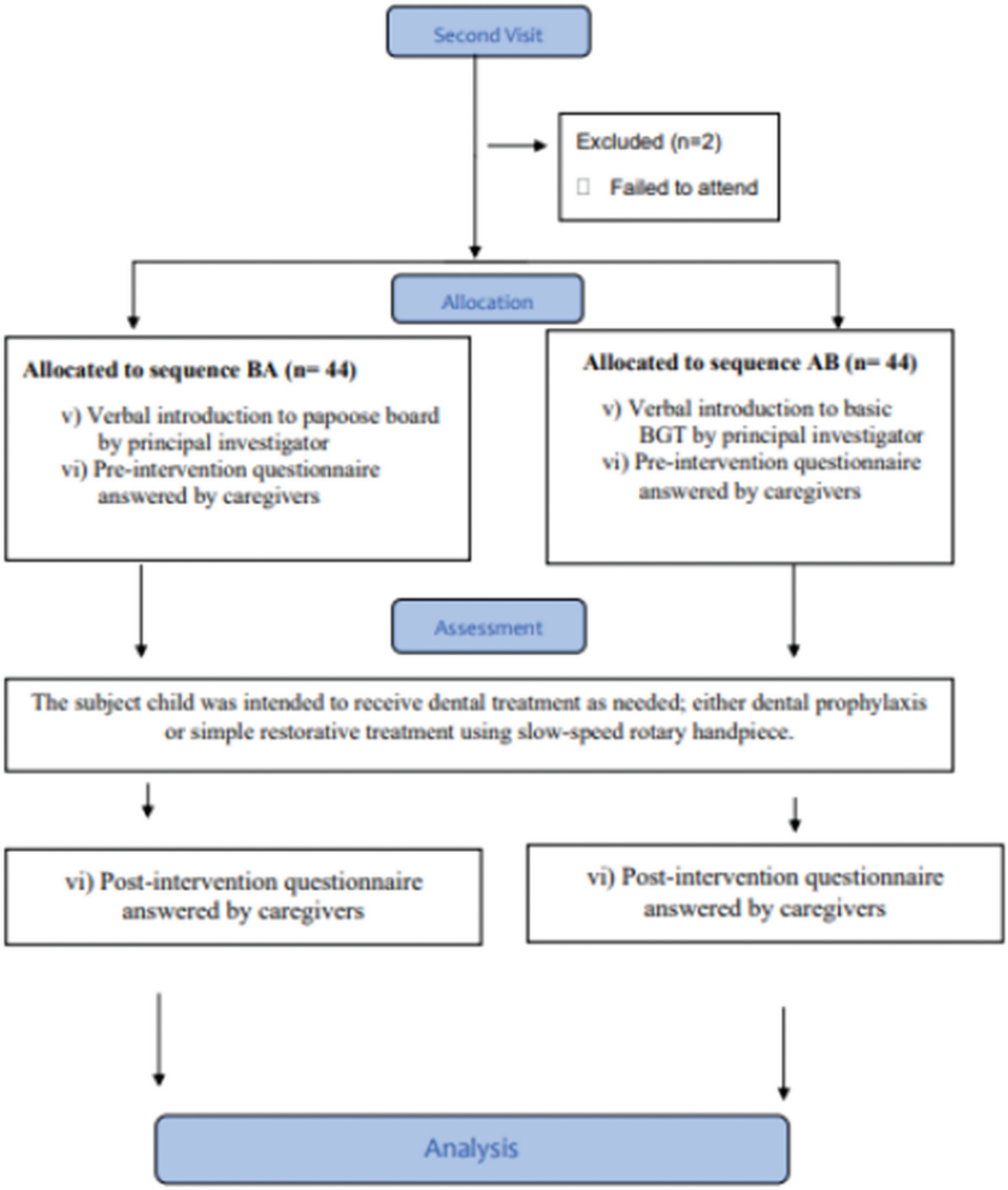

Figure 3: Workflow for BA/AB sequencing for the second visit

was either prophylaxis or restoration of tooth with ICDAS 03.

A Wilcoxon sign rank test revealed no statistical difference for paired scores median and IQR for caregiver's acceptance (P = 0.081) and consent (P = 0.546) between the CBBGT and PB as both techniques exhibited similar scores median of 5 [Table 3]. Comparing the interventions, caregivers are significantly less concerned when their child with special needs is applied with a PB as compared to CBBGT during dental procedures (P = 0.045).

Prior to the utilization of the PB, caregivers rated "agree" with its effectiveness, willingness to consent, and good attitude. However, they rated "not sure" for the concern domain. After placing the device on their child, caregivers significantly rated "strongly agree" for its effectiveness, willingness to consent, and good attitude with an improvement of concern domain where they rated as "not agree"(P < 0.001). Table 4 shows the overall result of the median score (IQR) rated by the caregiver before and after utilizing the PB with their child.

The impact of PB usage on the caregiver's attitude and the association between their education level, monthly household income, and previous dental experience, using a questionnaire,[7] items that scored 1 and 2 represent negative attitude while items scored 3 and 4 represent positive attitude. The binary cutoff point for good

Table 1: Sociodemographic characteristics of study participant

Variable	*N* (%)	Mean (SD)
Patient's gender		
Male	64 (71.1)	
Female	24 (28.9)	
Patient's age in years		9.44 (2.78)
Early childhood: 2–5 years	6 (6.7)	
Middle childhood: 6–11 years	66 (75.2)	
Early adolescence: 12–18 years	16 (18.1)	
Patient's disability		
Autism spectrum disorder	61 (69.3)	
Attention deficit hyperactivity disorder	9 (10.2)	
Intellectual disability (mild–moderate)	8 (9.1)	
Down's syndrome	6 (6.8)	
Global developmental delay	2 (2.3)	
Specific learning disability (dyslexia)	1 (1.1)	
Cerebral palsy	1 (1.1)	
Caregivers' gender		
Male	29 (33.0)	
Female	59 (67.0)	
Caregivers' age in years		41.68 (5.80)
Caregivers ' ethnicity		
Malay	79 (89.8)	
Chinese	7 (8.0)	
Indian	2 (2.3)	
Caregivers' level of education		
Primary school	1 (1.1)	
Secondary school	20 (22.7)	
Diploma	16 (18.2)	
Bachelor degree	33 (38.6)	
Postgraduate degree	15 (17.0)	
Others	2 (2.3)	
Monthly household income		
B40 (≤RM 4850)	29 (33.0)	
M40 (RM4851–RM10970)	43 (48.9)	
T20 (≥RM10971)	16 (18.2)	
Caregivers' previous dental experience		
Good	44 (50.0)	
Fair	33 (37.5)	
Poor	7 (8.0)	
No experience	4 (4.5)	

attitude was the respondent who rated at least 5 over 6 positive attitudes for all six items. These three variables were not appropriate for the multiple regression model as, according to the univariable analysis, none of the independent variables exhibited a statistically significant difference ($P < 0.25$). Therefore, we conclude that there is no association between caregivers' education level, monthly household income, and previous dental experience with their attitude toward passive immobilization.

The findings may not be representative of all carers in the nation because they are based on data from a single center and only one specific subset of carers seeking dental care for pediatric special needs. However, the recent study results offer more insight into the cohorts' varied perspectives and attitudes on the use of PB, as well as other contributing factors that could result in favorable or unfavorable outcomes. The effect is regarded to be valid within the source population.

Discussion

Passive immobilization techniques were usually located in the lowest rank of parental acceptance among healthy children.[19] However, communicative behavior guidance and protective stabilization were more accepted as compared to other strategies when a study was conducted on children with special needs.[16] This finding corroborates our result as caregivers in our study rated strongly agree on the acceptance and consent toward both techniques. In addition, as compared to basic behavior guidance, caregivers showed significantly less concern about their child's treatment as they see passive immobilization techniques are effective in managing unwanted physical movements in patients with physical, mental, and psychological disabilities who exhibit difficult behavior and with whom normal communication cannot be established.[6]

Providing caregivers with information on behavior guidance before the commencement of treatment was one of the important aspects of children's dental care. Positive verbal information improved parents' acceptance of the suggested form of dental treatment.[20] The delivery of information creates a platform for parents to engage in treatment decision-making with a thorough grasp of the aspects pertaining to their child's proposed dental care, hence lowering situational parental anxiety. The present study suggested verbal, pictorial, and physical introduction given to the caregiver prior to utilization of the PB. They are allowed to touch and feel the compartment of the board and the Velcro material to engage their optimum understanding of the indications, potential risks, and advantages of the device. It was suggested that after being provided with more information on the passive immobilization technique, caregivers were more likely to support its use.[17]

Merely a few studies explored parental attitudes on behavior management techniques after the approaches were employed on the subject's child. Parents were shown to be more tolerant of an approach after having personal experience with their own child.[21,22] Mothers responding to the survey showed positive opinions toward PB usage for their children's dental treatment. A previous study reported that most mothers responded

Table 2: Overall scores of caregivers' acceptance, consent, and concern toward the use of Papoose Board and combination of basic behavior guidance

Variable	Behavior guidance techniques	Overall respondent score *N* (%)				
		Strongly not agree	Not agree	Not sure	Agree	Strongly agree
Acceptance	† CBBGT	0 (0)	11 (12.5)	0 (0)	29 (33.0)	48 (54.5)
Do you think this technique is effective?	‡ PB	0 (0)	0 (0)	6 (6.8)	27 (30.7)	55 (62.5)
Consent	† CBBGT	2 (2.2)	3 (3.4)	1 (1.1)	27 (30.7)	55 (62.5)
Would you permit us to use the technique with your kid?	‡ PB	0 (0)	1 (1.1)	1 (1.1)	31 (35.2)	55 (62.5)
Concern	† CBBGT	27 (30.7)	29 (33.0)	5 (5.7)	15 (17.1)	12 (13.6)
Are you worried about your child's treatment?	‡ PB	23 (26.1)	39 (44.3)	12 (13.6)	11 (12.5)	3 (3.4)

†CBBGT: Combination of basic behavior guidance techniques

‡PB: Papoose Board

Table 3: Comparison of caregivers' acceptance, consent, and concern toward the use of Papoose Board and combination of basic behavior guidance

Variable	Papoose Board® (PB)			Combination of basic behavior guidance techniques (CBBGT)			*P*-value
	Median (IQR)	Percentile		Median (IQR)	Percentile		
		25th	75th		25th	75th	
Acceptance Do you think this technique is effective?	5 (1)	4	5	5 (1)	4	5	0.081
Consent Would you permit us to use the technique with your kid?	5 (1)	4	5	5 (1)	4	5	0.546
Concern Are you worried about your child's treatment?	2 (3)	1	4	2 (2)	1	3	0.045*

*$P < 0.05$ as a significant value

Table 4: Comparison of caregivers' acceptance, consent, concern, and attitude toward the use of Papoose Board before and after treatment

Variable	Before			After			*P*-Value
	Median (IQR)	Percentile		Median (IQR)	Percentile		
		25th	75th		25th	75th	
Acceptance Do you think this technique is effective?	4 (1)	3	4	5 (1)	4	5	<0.001
Consent Would you permit us to use the technique with your kid?	4 (1)	4	5	5 (1)	4	5	<0.001
Concern Are you worried about your child's treatment?	3 (2)	2	4	2 (2)	1	3	<0.001
Attitude							
•Good understanding of passive immobilization	3 (0)	3	3	4 (1)	3	4	<0.001
•Understand the risks/benefits of passive immobilization	3 (0)	3	3	3.5 (1)	3	4	<0.001
•Believe that passive immobilization may be necessary	3 (0.75)	3	3.75	4 (1)	3	4	<0.001
•Believe that passive immobilization is safe	3 (1)	3	4	4 (1)	3	4	<0.001
•Believe that passive immobilization may have a negative impact on my child	2 (1)	2	3	2 (1.75)	1	2.75	0.026
•Willing to consent to the use of passive immobilization	3 (1)	3	4	4 (1)	3	4	<0.001

that it was necessary to use a PB, although two-thirds indicated that it was stressful for their child.[22] Our result confirmed that caregivers had significantly better confidence in passive immobilization usage and considered it essential and relatively safe for their child with special needs after the real-time observation.

Despite the strong criticism of the so-called aggressive approach to managing behavior, many parents expressed a willingness to permit the technique if their use was really necessary.[13] Our respondents thought that PB was more reliable and risk-free, protecting their child from injuries during dental treatment. The high level of acceptability for this method appeared to be due to the fact that most of the parents of autistic children were more familiar with weighted blankets as a deep pressure stimulation modality for reducing anxiety during occupational therapy.[23] The similar concept of PB and weighted blanket as sensory adaptation technique devices provide a calming effect on children with special needs, especially during situations that can trigger anxiety.[24]

Respondent's expressed attitudes on passive immobilization were unrelated to their level of education, household income, or past dental experience. In contrast to caregivers whose children received treatment at a private practise, Boka *et al.* asserted that caregivers whose children received care at the university clinic and who often had lower incomes and lower levels of education were more receptive to passive immobilization as behavior guidance.[25] However, our center operates under the purview of a public university that accepts waivers for children with special needs as they are registered as a person with a disability and hold a special identification card (OKU card), which may not affect the caregivers' acceptance in terms of financial implication. In addition, most of the respondents are learned, as more than half of them received tertiary education. According to the findings of other studies, the caregiver's earlier dental experiences were not statistically significant in predicting the acceptability of the studied behavior.[21,25]

Since the child served as their own control as two behavior interventions were compared on a single participant, the current study has minimal confounding variables. Furthermore, the external environment's influence was diminished because this trial was carried out in a controlled setting by a single operator who had received extensive training in the behavior management technique.

As convenience sampling was applied to recruit participants, the sample represents a subset of the general population's caregivers and includes an imbalanced number of disability categories. This was considered as the study's limitations. Despite the differences in disabilities, we anticipate that all caregivers have similar empathy for their special needs children, and they confide in their caregivers. For future studies, we suggest focusing sample on each type of disability.

Previous literature ranked parental preferences toward different behavior management techniques in a variety of ways, such as audiotape, written, and photographs of other children, which yielded different results as the current study compared basic BGT and PB in their own child.[8,13,15] When choosing the ideal behavior management techniques in dental care, observation of the individualistic factors of the receiver is recommended. A comprehensive explanation of passive immobilization boosted the studied caregivers' acceptance of kids with special needs while receiving dental care.

Conclusion

The studied caregiver demonstrated equivalent acceptance, consent, and concern towards the use of PB and CBBGT with improved attitudes after comprehensive explanation and real-time observation of the PB usage during their children's dental treatment.

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Conflicts of interest

Nil.

Author contributions

NSI, IWM: idea conception. NSI, IWM, KAMI, SHH: design of the manuscript and data analysis. NSI, IWM: writing the original draft.

Ethical policy and Institutional Review board statement

Ethical approval by the University research committee (REC/08/2020/FB 189) and registered in the clinical trial registry (ISRCTN) with an identification number (ISRCTN57204958).

Patient declaration of consent

Written consent for publication was obtained.

Data availability statement

Due to ethical conduct, supporting data is not available.

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