Associations between overprotective parenting and children's cooperation during dental treatment, toothbrushing behaviour and dental caries experience

E. Geuns[1], M. de Jong-Lenters[1], D.Duijster[2] *

[1] *Department of Paediatric Dentistry, Academic Centre for Dentistry Amsterdam, University of Amsterdam and VU University, Gustav Mahlerlaan 3004, 1081LA, Amsterdam, The Netherlands.*
[2] *Department of Oral Public Health, Academic Centre for Dentistry Amsterdam, University of Amsterdam and VU University, Gustav Mahlerlaan 3004, 1081LA, Amsterdam, The Netherlands.*

**Corresponding author*

email: D.Duijster@acta.nl

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Abstract

Aim This study explored the association between overprotective parenting and children's behaviour during dental treatment, toothbrushing behaviour and children's dental caries experience in the Netherlands.

Study design Caregivers of five to six-year-old-children who visited general dental practices or paediatric dental referral practices for treatment were invited to participate in this cross-sectional study. They completed questionnaires about overprotective parenting and children's toothbrushing behaviour. The Venham scale was used to assess children's behaviour during dental treatment. The number of decayed, missing and filled teeth (dmft) was collected from dental records. Spearman correlation and regression analyses were used to test associations between the variables.

Results 120 children were included (65 girls). Higher levels of overprotective parenting were significantly associated with more disruptive behaviour during dental treatment ($r=0.510$, $p<0.001$) and higher dmft ($r=0.251$, $p=0.006$). Overprotective parenting was also associated with a lower frequency of daily toothbrushing ($p=0.027$), lower frequency of re-brushing by parents ($p=0.029$), more experienced problems with toothbrushing ($p=0.037$) and lower parental self-efficacy ($p=0.006$). However, associations with toothbrushing frequency, parental self-efficacy and children's dental caries experience did not remain significant after adjustment for confounders.

Conclusion Overprotective parenting is significantly associated with more disruptive behaviour of children during dental treatment and more difficult toothbrushing behaviour.

KEYWORDS Overprotective parenting, oral health behaviour, dental caries, children.

Introduction

Overprotective parenting and its influence on child development has gained increasing attention in media and science. This type of parenting is characterized by an excessive desire to protect children from failure, disappointments, and harm [Vreeke et al., 2013]. Parents with an overprotective parenting style seem to feel an inherent need to shield their children from various challenges and potential frustrations. As a consequence, parents closely monitor their child and frequently refrain from assigning them tasks and responsibilities [Ungar, 2009]. This impedes the child's ability to build resilience and to learn how to manage daily challenges and anxiety-inducing situations [Gere et al., 2012]. While a protective instinct of parents is intended to guard a child's health and wellbeing, it may inadvertently exacerbate problems in children. Studies have shown that increased levels of parental overprotectiveness were linked to lower socio-emotional functioning and more internalising problems and anxiety in children [McLeod et al., 2007; Cooklin et al., 2013; de Roo et al., 2022]. Associations have also been reported between overprotective parenting and externalising behaviour problems in children, including Attention Deficit Hyperactivity Disorder (ADHD) and conduct problems [Meyer et al., 2022]. In adulthood, parental overprotection has been significantly associated with the incidence of several mental disorders, such as depression, social phobia, panic disorders, and diminished self-efficacy [Overbeek et al., 2007; Givertz and Segrin, 2014]. While studies have examined the psychological impacts of overprotective parenting, less is known about its potential influence on children's health behaviour and health outcomes. According to a study conducted in Australia, 10 to 11-year-old-children had an increased risk of developing obesity when their mother was overprotective [Hancock et al., 2014]. Parental overprotection was also found to predict the development of somatic symptoms in children of 10 to 12 years of age [Janssens et al., 2009]. These symptoms are persistent and unspecific, but of enough concern for the patients to consult a doctor. Limited knowledge exists regarding the influence of overprotective parenting on

VISUAL ABSTRACT

Summary

The study examined the link between overprotective parenting and children's dental behaviour. It found that overprotective parenting is associated with more difficult toothbrushing and more disruptive behaviour during dental treatment

Study design

Cross-sectional study

May 2023 - January 2024

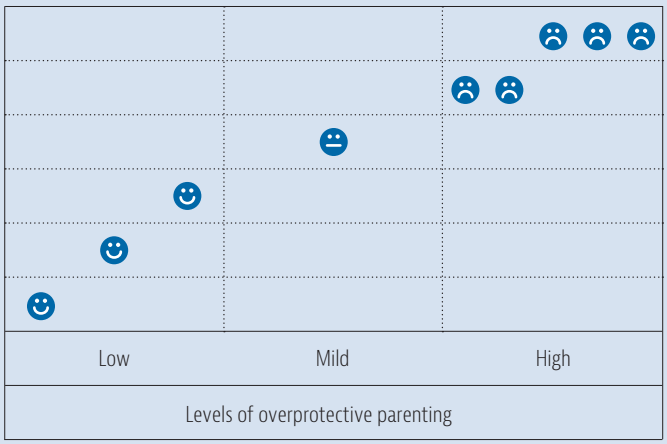
Combination of questionnaire, observational and dental health data

Population

Caregivers of five to six-year-old-children

Outcomes

Disruptive behaviour



Positive

Positively associated with high levels of overprotective parenting: disruptive behavior during dental treatment, dental caries (dmft), toothbrushing problems

Negative

Negatively associated with high levels of overprotective parenting: daily toothbrushing frequency, parent-child toothbrushing frequency, parental self-efficacy

Conclusion

Overprotective parenting is linked to more disruptive behaviour and difficult toothbrushing in children.

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children's oral health. Regular dental visits and oral hygiene practices play a crucial role in the prevention of oral diseases and children's overall well-being. It is plausible that an overprotective parenting style may affect children's oral health, for example through its influence on children's behaviour during dental visits or during toothbrushing. A study by de Jong-Lenters et al. [2023 found that overprotective parenting is associated with less cooperative behaviour of children during dental treatment in a high-risk population. Less cooperative behaviour has also been reported in children of parents with a permissive or authoritarian parenting style [Aminabadi and Farahani, 2008]. However, the existing literature on this topic presents contradictory findings, as a study conducted in the Netherlands by Krikken and Veerkamp 2008] found no significant association between parenting style, dental anxiety and children's behaviour during treatment. At home, parents face the daily challenge of taking good care for their children's oral health, which can be a source of stress [De Jong-Lenters et al., 2019; D'oria et al.,2024]. Overprotective parents may handle situations differently, for example, when children do not want to brush their teeth. They may have the tendency to be stricter about brushing their children's teeth, or, on the contrary, they might tend to give in sooner. The role of overprotective parenting has not been thoroughly investigated against this background. To date, the specific role of overprotective parenting in children's oral health has only been studied in a high-risk population [De Jong-Lenters et al., 2023]. Therefore, this study seeks to expand the existing knowledge by investigating a more general population. The aim of the study is to explore the association between overprotective parenting and children's behaviour during dental treatment specifically focusing on five to six-year-old children treated in both general and paediatric dental settings in the Netherlands. A second aim is to examine the association between overprotective parenting, toothbrushing behaviour in the home environment and children's dental caries experience.

Material and methods

The cross-sectional study was conducted between May 2023 and January 2024 and used a combination of questionnaire, observational and dental health data. Ethical approval was obtained from the Ethical Committee of the Academic Centre for Dentistry Amsterdam (ACTA) (protocol number 2022-92003).

Participants

Participants were recruited from five different general dental practices and two referral practices for paediatric dental care located throughout the Netherlands. Practices were selected from the researchers' network and these were specifically chosen to ensure variation in geographical and sociodemographic location. Participants were recruited by one participating dentist from each practice. Dentists were instructed to draw a random selection of eligible children. Children were eligible to participate if they were between five and six years old, healthy (ASA 1 or 2), and visiting the

dental practice to undergo dental treatment. Treatments included restorations, sealants, placement of stainless steel crowns or extractions, and could be provided with or without the use of local anaesthesia. Children were excluded if they had mental and/or functional disabilities, Hypomineralised Secondary Primary Molars (HSPM) and/or Molar-Incisor Hypomineralisation (MIH), Amelogenesis Imperfecta and/or teeth with symptoms of pulp pathology. Children were also excluded if their parent(s) or caregiver(s) were not proficient in Dutch. During the data collection period, children who had a scheduled dental check-up or treatment were screened to determine if they met the inclusion and exclusion criteria. Subsequently, an information letter was sent to the parents or caregivers (from here: caregivers) and they were asked to provide written consent. Based on the findings of a previously conducted study, it was estimated that 120 subjects would be sufficient to demonstrate statistically significant associations (if present) between overprotective parenting and children's behaviour during dental treatment.

Gender	n (%)
Girl	65 (54.2)
Boy	55 (45.8)
Education level	
High	68 (56.7)
Medium	34 (28.3)
Low	18 (15.0)
Migration background	
Dutch	79 (65.8)
Non-Dutch	41 (34.1)
Birth order	
1st born	43 (35.8)
2nd born	53 (44.2)
3rd born or over	24 (20.0)

TABLE 1 Sociodemographic characteristics of the study sample.

Procedure

After informed consent was obtained, the caregiver was asked to complete a questionnaire in the waiting room, while the child received treatment. Immediately following the treatment, the dentist and dental assistant, blinded from each other, scored the child's cooperative behaviour during dental treatment on separate forms. The dentist also completed a form to provide information on the child's up-to-date dental health status and about treatment specifics, such as the type of treatment and use of anaesthesia or a rubberdam. Parental presence in the treatment room and number of visits for treatment with the same dentist was also recorded.

Instruments

This research included three dependent variables: the behaviour of the child during dental treatment, toothbrushing behaviour of the child, and the child's dental caries experience. The independent variable of interest was overprotective parenting. Additionally, socio-demographic characteristics were recorded.

Behaviour of the child during dental treatment

The Venham scale was used to observe and rate children's behaviour in the dental chair during treatment. This behaviour scale was developed to observe and assess children's responses to dental stress [Venham et al., 1980]. The instrument has a high validity and reliability, and it presents significant advantages as raters can be readily trained to use the scale, and it is easily integrated into clinical practice [Moura et al., 2016]. The Venham scale has six categories, ranging from 0 (total cooperation) to 5 (no compliance or cooperation where physical restraint is required).

In order to ensure consistency among and between the participating dentists during data collection, they received an online training on how to rate the Venham scale. During this meeting, videos depicting children's behaviour during dental treatment were shown and jointly rated. Following this training, a calibration was conducted. To determine agreement, five videos illustrating different treatments were presented to the practioners. They were required to rate each video at various stages of the treatment, to a total amount of 23 scoring moments. The calculated weighted Cohen's kappa score ranged from 0.77 – 0.93 (mean = 0.85), which can be considered as excellent agreement. The dental assistants received education on the Venham scale during an informative meeting held at the dental practice.

Toothbrushing behaviour

The caregiver completed a validated questionnaire on toothbrushing behaviour, including toothbrushing frequency, skipping toothbrushing, re-brushing by a parent, problems with brushing and self-efficacy related to toothbrushing. The questions were based on questionnaires of studies by Pine et al. [2004] and Finlayson et al. [2005] with very good test-retest reliability, internal reliability and validity for different cultural locations. Toothbrushing frequency was measured with the question "How often do you brush your child's teeth?" with response options 'never', 'not every day', 'once a day', 'twice a day' or 'three times a day'. These were subsequently dichotomised into 'once or less per day' and 'twice or more per day'. Skipping toothbrushing was measured with the question "Is toothbrushing ever skipped?" with response options 'always', 'usually', 'sometimes' or 'never'. These were subsequently dichotomised into 'yes' and 'no'. Re-brushing by a parent was measured with the question "If the child brushes the teeth him/herself, do you brush the teeth afterwards?". Responses were categorised into sometimes or never', 'often' or 'always'. Problems with toothbrushing was measured with the question "How often is brushing a problem?". Responses were categorised into 'often to always', 'sometimes' or 'never'. Caregiver(s)' self-efficacy regarding_toothbrushing was measured using a modified shortened questionnaire consisting of three items [Finlayson et al. 2005]. The caregiver was asked how confident he or she would be in successfully brushing their child's teeth, if "you are bothered by your crying child?", "you notice your child is not willing to cooperate in brushing?" and "your child does not want to brush?". Answer options for all three scenarios were 'not at all certain' (1), 'not very certain' (2), 'reasonably certain' (3), 'very certain' (4). The sum of the three questions was computed. Scores could thus vary from 3 to 12 with a higher score indicating a higher self-efficacy. Scores were also categorised into 'low', 'medium' and 'high' based on tertiles.

Dental caries experience

Children's dental caries experience was obtained from their personal dental records, which was regularly updated after

	POM score							
	Full sample			General practices			Referral practices	
	Mean ± sd	p	n	Mean ± sd	p	n		p
POM score	50.6 ± 13.0		60	49.6 ± 13.4		60	51.5 ± 12.7	
Children's behaviour during dental treatments (Venham scale)		<0.001a			<0.001a			0.030a
0 (n = 66)	46.0 ± 12.0		30	41.4 ± 6.8		36	49.8 ± 14.0	
1 (n = 30)	49.9 ± 8.3		15	50.9 ± 9.1		15	48.9 ± 7.6	
2 (n = 10)	57.1 ± 12.3		8	57.5 ± 13.8		2	55.5 ± 3.5	
3 (n = 9)	69.8 ± 5.7		4	72.3 ± 7.1		5	67.8 ± 3.9	
4 or 5 (n = 5)	67.8 ± 10.5		3	74.3 ± 6.1		2	58.0 ± 7.1	
Toothbrushing frequency		0.027b			0.063b			0.217b
Once a day or less (n = 26)	55.5 ± 14.0		13	55.7 ± 14.3		13	55.4 ± 14.3	
Twice a day or more (n = 94)	49.2 ± 12.4		47	47.9 ± 12.7		47	50.5 ± 12.1	
Skipping toothbrushing		0.590b			0.691b			0.721b
Yes (n = 84)	51.0 ± 13.0		42	50.1 ± 12.8		42	51.9 ± 13.4	
No (n = 36)	49.6 ± 13.1		18	48.6 ± 15.0		18	50.6 ± 11.1	
Re-brushing by a parent		0.029a			0.334a			0.040a
Sometimes or never (n = 25)	54.3 ± 14.0		13	55.7 ± 14.3		12	54.9 ± 14.3	
Often (n = 54)	52.0 ± 13.4		29	49.8 ± 13.4		25	54.7 ± 13.1	
Always (n = 41)	46.4 ± 10.9		18	46.4 ± 12.4		23	46.3 ± 9.8	
Problems with toothbrushing		0.037a			0.006a			0.848a
Often to always (n = 13)	59.1 ± 16.2		7	63.1 ± 17.3		6	54.3 ± 14.9	
Sometimes (n = 50)	50.2 ± 12.8		33	49.6 ± 13.3		17	51.5 ± 12.3	
Never (n = 57)	48.9 ± 11.8		20	44.9 ± 8.5		37	51.1 ± 12.8	
Toothbrushing self-efficacy		0.006a			<0.001a			0.728a
Low (n = 40)	45.7 ± 11.6		22	42.1 ± 9.6		18	50.1 ± 12.5	
Medium (n = 40)	51.2 ± 12.8		21	49.1 ± 10.5		19	53.4 ± 15.0	
High (n = 40)	54.9 ± 13.2		17	60.0 ± 14.3		23	51.1 ± 11.1	
dmft		0.066a			0.233a			0.234a
0 (n = 9)	42.3 ± 4.6		9	42.3 ± 4.6		0		
1 (n = 18)	48.3 ± 13.0		14	48.5 ± 14.8		4	47.8 ± 4.1	
2 (n = 15)	50.3 ± 12.9		12	50.4 ± 13.9		3	49.7 ± 9.7	
3 (n = 13)	45.9 ± 11.9		10	48.3 ± 12.1		3	38.0 ± 7.6	
³ 4 (n = 65)	53.3 ± 13.5		15	55.3 ± 14.8		50	52.7 ± 13.1	

a. ANOVA Test, b. Independent Sample T-test

TABLE 2 Mean POM scores by Venham scale and toothbrushing variables.

every dental visit. The records included details about the presence of caries- related lesions in the enamel or dentine, as well as any past treatments such as fillings and extractions, including reasons for extraction. Based on this information, the dentist determined the number of decayed teeth (dt), missing teeth due to caries (mt), and filled teeth due to caries (ft) and recorded this on the form. The dmft index, which is the sum of decayed, filled, and missing teeth due to caries, was then calculated using this data.

Overprotective parenting

The Parental Overprotective Measure (POM) questionnaire was used to measure the extent of overprotective parenting [Edwards et al., 2010]. The questionnaire was validated and has good reliability [Clarke et al., 2013]. To ensure high construct validity, the questionnaire was translated back and forth between English and Dutch and sent to the first author of the original publication for verification. The questionnaire contains 19 questions which were answered on a five-point Likert scale ranging from 1 (not at all) to 5 (very much/very often). A sum was computed, resulting in scores varying from 19-95, with a higher score meaning more overprotective parenting.

Socio-demographic characteristics

Collected sociodemographic information included the age and sex of the child, the caregiver's relationship to the child, age of the caregiver, the country where the child as well as both parents were born, the language spoken at home, the highest level of education the caregiver has completed and questions about family composition.

The variable 'Ethnicity' was determined and classified as Dutch or Non-Dutch, based on the birthplace of both parents. If one parent was born in the Netherlands, the ethnicity was considered Dutch. Parental education level was categorised into 'low' ('no education', 'primary school', 'secondary school—lower level), 'medium' ('secondary school—higher level', 'lower vocational education') and 'high' ('higher vocational education', 'university').

	Venham score (category 0 = reference)		Toothbrushing frequency Once or less per day versus twice or more per day (reference)		Re-brushing by a parent Sometimes to never or often versus always (reference)		Problems with toothbrushing Never or sometimes versus often or always (reference)		Toothbrushing self-efficacy (scale)		dmft	
Unadjusted												
	OR (95% CI)	P*	OR (95% CI)	P**	OR (95% CI)	P*	OR (95% CI)	P*	B (95% CI)	P***	B (95% CI)	P***
POM	1.07 (1.04; 1.11)	<0.001	1.04 (1.00; 1.07)	0.031	1.04 (1.01; 1.08)	0.013	0.95 (0.91; 0.99)	0.017	-0.05 (-0.02; -0.08)	0.003	0.06 (0.02; 1.00)	0.004
Adjusted analysis												
	OR (95% CI)	P*	OR (95% CI)	P**	OR (95% CI)	P*	OR (95% CI)	P*	OR (95% CI)	P***	OR (95% CI)	P***
POM	1.07 (1.03; 1.11)	<0.001	1.03 (0.99; 1.07)	0.194	1.05 (1.01; 1.09)	0.012	0.95 (0.90; 1.00)	0.040	-0.03 (-0.07; 0.00)	0.056	0.03 (-0.01; 0.07)	0.086
Gender												
Girl	Ref		Ref						Ref		Ref	
Boy	1.21 (0.54; 2.72)	0.639	3.15 (1.14; 8.66)	0.026	0.76 (0.34; 1.68)	0.496	0.45 (0.12; 1.67)	0.234	-0.2 (-1.04; 0.59)	0.592	-0.54 (-1.45; 0.37)	0.242
Maternal education level												
High	Ref		Ref						Ref		Ref	
Medium	0.55 (0.15; 2.07)	0.375	1.07 (0.28; 4.06)	0.917	0.97 (0.26; 3.58)	0.962	0.79 (0.15; 4.09)	0.781	-0.95 (-1.90; 0.01)	0.053	0.08 (-0.99; 1.15)	0.881
Low	0.52 (0.15; 1.74)	0.288	0.19 (0.05; 0.74)	0.016	1.33 (0.40; 4.40)	0.645	3.44 (0.58; 20.35)	0.174	-0.84 (-2.04; 0.36)	0.166	0.52 (-0.82; 1.85)	0.447
Migration background												
Dutch	Ref		Ref						Ref		Ref	
Non-Dutch	0.88 (0.36; 2.16)	0.777	2.66 (0.90; 7.88)	0.078	1.43 (0.57; 3.61)	0.451	1.09 (0.26; 4.57)	0.908	-0.90 (-1.82; 0.02)	0.054	2.56 (1.53; 3.59)	<0.001
Birth order												
1st child	Ref		Ref						Ref		Ref	
2nd child	0.41 (0.16; 1.04)	0.059	1.76 (0.54; 5.70)	0.348	1.43 (0.57; 3.57)	0.447	0.44 (0.10; 1.96)	0.278	0.31 (-0.63; 1.24)	0.517	0.20 (-0.85; 1.24)	0.710
3rd child	0.40 (0.13; 1.25)	0.113	2,10 (0.53; 8.35)	0.294	1.35 (0.43; 4.24)	0.606	0.64 (0.09; 4.79)	0.667	0.32 (-0.83; 1.47)	0.580	1.58 (0.30; 2.87)	0.016

** Ordered logistic regression, ** logistic regression, *** linear regression*

TABLE 3 Regression analyses for the associations between overprotective parenting and outcome variables.

Statistical analysis

Statistical analysis was done using IBM SPSS Statistics 27.0, Chicago, USA. A p-value below $\alpha = 0.05$ was regarded as statistically significant. Analyses were conducted for the full sample and for the samples from general dental practice and referral practices separately. First, bivariate associations were tested. To assess the association between overprotective parenting (POM score) and the Venham scale, the mean POM scores were compared between the six Venham categories using the ANOVA test. For the association between overprotective parenting and toothbrushing variables, the independent samples T-test (for toothbrushing frequency and skipping toothbrushing) and ANOVA test (for problems with brushing, re-brushing by a parent, and the three categories of self-efficacy regarding toothbrushing) were used. The Spearman correlation test was used to assess correlations between overprotective parenting and the Venham scale, self-efficacy scale and the dmft-score. Logistic regression, ordered logistic regression and linear regression were used to analyse associations between overprotective parenting and the various outcome variables. These were subsequently adjusted for covariates sex, maternal level of education, migration background and number of the child in line. Regression analyses were only performed for the full sample due to insufficient power for sub-analysis.

Results

The characteristics of the study sample are shown in Table 1. A total of 120 five to six-year-old children (65 girls, 54.2%) took part in this study. Over half of the caregivers were highly educated (56.7%) and approximately two-third of the children had caregivers of Dutch origin (65.8%). The distribution of POM-scores, the Venham scale and the toothbrushing variables are shown in Table 2, for the full sample and by type of practice (general practices and referral practices). The mean dmft in the full sample was 2.9 ± 1.4. This was 2.1 ± 1.4 and 3.7 ± 0.9 for general practices and referral practices, respectively. In total, 64 sealants, 50 stainless steel crowns, 101 restorations and 9 extractions were performed. Caregivers were present in the treatment room in 46 of the cases. Approximately half of the children were treated for the first time with the operating dentist, a quarter for the second time, the remaining for more times. There were no significant differences found in children's behaviour during dental treatment according to the type of treatment, parental presence or absence during treatment and number of treatments with the same operating dentist. The inter-rater reliability of the Venham scale of the dentists and assistants was high (intraclass correlation coefficient = 0.93). In case of disagreement, the score of the dentist was used for the analysis.

Overprotective parenting and children's behaviour during dental treatment

Overprotective parenting was significantly associated with more disruptive behaviour of children during dental treatments (Table 2). In the full sample, POM scores were significantly lowest in children with a Venham category of '0' (46.0 ± 12.0), and they were highest in those with a Venham category of '3' (69.8 ± 5.7) and '4 or 5' (67.8 ± 10.5) ($p < 0.001$). A similar stepwise association was found in general practices ($p < 0.001$) and referral practices ($p = 0.030$). The Spearman correlation for the association between POM scores and the Venham scale in the full sample was $r = 0.510$ ($p < 0.001$); this was $r = 0.696$ ($p < 0.001$) in general practices and $r = 0.295$ ($p = 0.022$) in referral practices.

Overprotective parenting and toothbrushing behaviour

Overprotective parenting was significantly associated with lower toothbrushing frequency in the full sample ($p = 0.027$), but not in the two separate samples (Table 2). Higher POM scores were also significantly associated with a lower frequency of re-brushing by a parents and more reported problems with toothbrushing in the full sample ($p = 0.029$ and $p = 0.037$, respectively). The association of re-brushing was also significant in referral practices, but not in general practices. This was the other way around for the association of problems with toothbrushing. Higher POM scores were significantly associated with a lower self-efficacy regarding toothbrushing in the full sample ($p = 0.006$) and general practices group ($p < 0.001$), but not in the referral practice group ($p = 0.728$). The Spearman correlation for the association between POM scores and the self-efficacy in the full sample, and in general practices and referral practices was $r = -0.277$ ($p = 0.002$), $r = -0.536$ ($p < 0.001$) and $r = -0.005$ ($p = 0.969$), respectively, meaning that higher POM scores were associated with lower self-efficacy scores in the full sample and general practices, but not in referral practices. There was no association between overprotective parenting and skipping toothbrushing.

Overprotective parenting and dental caries experience

Overprotective parenting was significantly associated with children's caries experience in the full sample, with the Spearman correlation for the association between POM scores and dmft being $r = 0.251$ ($p = 0.006$). This association did not reach statistical significance in general practices and referral practices, with $r = 0.236$ ($p = 0.070$) and $r = 0.241$ ($p = 0.064$), respectively. When analysing differences in mean POM scores between children with 0, 1, 2, 3, or 4 or more dmft, mean POM scores appear to be higher in children with higher dmft (Table 2), but these differences were not significant for the full sample and the general and referral practices, with $p = 0.066$, $p = 0.233$ and $p = 0.234$ respectively.

Regression analysis and adjustment for covariates

Table 3 shows the regression analyses for the POM scores with the outcome variables that were significantly associated in the bivariate analyses: Venham scale, toothbrushing frequency, re- brushing, problems with toothbrushing, toothbrushing self-efficacy and dmft. First, the unadjusted association between the POM score and the outcome is shown and then the association adjusted for covariates. Ordered logistic regression showed that a higher POM score was significantly associated with 1.07 (95% CI 1.04; 1.11) higher odds of children having a higher Venham category ($p < 0.001$). The association did not alter after adjustment for confounders. Higher POM scores were also significantly associated with 1.05 (95% CI 1.01; 1.09) higher odds that parents did never, sometimes or often re-brush their children's teeth compared to always. Higher POM scores were also associated with 0.95 (0.91; 0.99) lower odds that parents did never or sometimes experienced problems with toothbrushing compared to often or always, after adjustment for covariates ($p = 0.012$ and $p = 0.040$, respectively). Or in other words, higher POM scores were associated with lower likelihood of re-brushing and a higher likelihood of experiencing problems with toothbrushing. Using logistic regression, higher POM scores were shown to be associated with 1.04 (95% CI 1.01; 1.07) higher odds of brushing children's teeth only once or less per day compared to twice or more per day ($p = 0.031$), but this did not remain significant after adjustment for covariates ($p = 0.194$). The same holds for the associations between POM scores and toothbrushing self-efficacy and dmft. Linear regression showed that a higher POM score was associated with a 0.05 (95% CI 0.02; 0.08) lower self- efficacy score ($p = 0.003$) and a 0.06 (0.02; 1.00) higher dmft ($p = 0.004$), but these associations were not significant after adjustment for covariates ($p = 0.056$ and $p = 0.086$, respectively).

Discussion

This study found that overprotective parenting was significantly associated with more uncooperative behaviour of five to six-year-old children during dental treatment in both general and paediatric dental settings in The Netherlands. Parents or caregivers with an overprotective parenting style also reported significantly more problems with toothbrushing and a lower frequency of re- brushing in the full sample. Furthermore, a higher level of parental overprotectiveness was associated with a lower toothbrushing frequency in children, a lower parental self-efficacy regarding toothbrushing and a higher dental caries experience in children, but these associations did not remain significant after adjustment for confounders. No associations between overprotective

parenting and skipping toothbrushing were found. The existing dental literature on the influence of parenting styles on children's behaviour during dental treatment, oral health behaviour and caries experience is relatively scarce. Our findings are in line with one study by De Jong-Lenters et al. [2023], who also found that children with overprotective parents showed more disruptive behaviour during dental treatments. In other studies, parenting styles have often been operationalised as three or four psychological constructs, namely authoritarian, authoritative, permissive, and uninvolved [Baumrind, 1967; Maccoby and Martin, 1983]. An overprotective parenting style combines characteristics from these parenting styles. Overprotective parenting shares elements with both authoritarian and permissive parenting. Authoritarian parents set strict rules and expect their children to uphold their standards without making errors, while permissive parenting is characterised by high responsiveness to children's needs but a lack of discipline as parents tend to give in to their child's wishes. A study by Howenstein et al. [2015] found that children of authoritative parents were more cooperative in the dental chair when compared to those with authoritarian and permissive parents. In addition, Aminabadi and Farahani [2008] found that children with an authoritarian and permissive upbringing showed significantly higher levels of discomfort during restorative dental procedures in comparison to children with an authoritative upbringing.

To our knowledge, only one other study has studied the association between overprotective parenting and children's toothbrushing behaviour at home [De Jong-Lenters et al., 2023]. This study also found that overprotective parenting was associated with a lower parental self-efficacy, but not with skipping toothbrushing. Studies on parenting styles in general have indicated that ineffective parenting, marked by a lack of warmth and involvement (similar to authorative parenting) and inadequate discipline (similar to permissive parenting), was associated with poorer toothbrushing habits in children. With regard to dental caries experience, Lopez et al. [2018] found that permissive parenting can lead to unhealthy eating habits in children, especially regarding the frequency of snacks, and therefore may contribute to higher dental caries experience. The study by Kumar et al. [2017] also found that children who lived in households where more power assertion parenting practices were used, had poorer oral hygiene behaviours and a higher dental caries experience. However, no studies have previously been conducted on the relationship between overprotective parenting and dental caries experience. There were some differences in whether significant associations were found between overprotective parenting and the oral health outcomes between the general practices and referral practices. With regard to children's behaviour during dental treatment, the association was less pronounced in referral practices than in general practices. This might be attributed to the fact that dental professionals working in a referral practice for paediatric dentistry generally had more training in and experience with behavioural management skills, potentially positively influencing the children's behaviour during dental treatment. Furthermore, being treated by a different dentist at each treatment session and parental presence during treatment might increase the chance of more disruptive behaviour in children. In the referral practices, children often have multiple appointments for treatment with the same dentist and parents are usually asked to stay in the waiting. For this reason, the number of visits at the same dentist and parental presence were taken into account in this study, but no associations with children's behaviour during dental treatment were found. Associations with toothbrushing variables and caries experience were not always significant in the subsamples from general and referral practices. This could be attributed to insufficient power of the subsamples. When interpreting the findings of this study, some strengths and limitations should be taken into consideration. One of the strengths was the use of validated instruments to measure the independent and dependent variables. In this study, POM scores ranged from 28 to 88 within the potential range of 19 to 95, which demonstrates the questionnaire's capability to distinguish between various degrees of overprotective parenting in this study. Calibrated dentists and the assistants conducted independent observations for the Venham scale and the inter-rater reliability was found to be excellent. Another strength of this study is that the children were recruited in general dental practices as well as in paediatric referral practices. As a result, both the Dutch general child population and high-risk groups were represented in the study. However, selection bias may have been introduced. Only children who visit a dental practice (which is around 85% in The Netherlands [van Ligten et al., 2023]) and those who needed treatment were included in the study, which limits the external validity of the findings. Also, the dental caries prevalence of our sample (dmft = 2.1 ± 1.4 in general practices and 3.7 ± 0.9 in referral practices) was substantially higher than the mean dmft of five-year-olds according to the most recent national oral health survey conducted in The Netherlands (dmft = 0.6 ± 1.1 in high socioeconomic groups and dmft = 0.9 ± 1.4 in low socioeconomic groups [Schuller et al., 2019]. This is likely explained by the fact that only children were included in our study if they needed dental treatment. Hence, the sample is not fully representative of the Dutch population.

A limitation of this study could be that parents or caregivers may have given socially desirable answers to the questionnaire. The tendency to provide socially desirable responses may particularly apply to questions regarding toothbrushing, since many parents have been made aware that they should brush their children's teeth twice a day, but this does not always correlate with their actual behaviour at home. Parents or caregivers of children who have been going to a referral practice for a longer time may have been educated about appropriate oral hygiene practices multiple times, potentially resulting in an overreporting of favourable toothbrushing behaviour. Furthermore, the cross-sectional design of the study has its limitations, as it does not allow to provide evidence on causal relationships or the temporal relationship between overprotective parenting and children's oral health outcomes. Parenting is a constantly evolving process influenced by various factors such as changes in family dynamics, the development of children, and life events. Caregivers must adapt to these transitions to ensure the continuous functioning of their roles. Therefore, the parenting behaviours observed in the study may not fully represent the parenting practices of preceding and subsequent years. This highlights the need for future research using a longitudinal design. Lastly, the regression analysis did not show big differences in measures of association before and after adjustment of confounders. This could indicate a actual association between overprotective parenting and children's oral health outcomes, but other relevant confounders may have been missed in this study.

The impact of overprotective parenting on children's oral health outcomes underscores the importance of considering

this factor in future interventions and to support initiatives for both parents and dental professionals. By recognising and addressing the influence of parenting styles on children's behaviour during dental treatments and their oral health behaviour, family strategies can be developed to promote better oral health practices and positive treatment experiences for young children. In conclusion, this study found that overprotective parenting was significantly associated with more disruptive behaviour of five to six-year-old children during dental treatment in both general and paediatric dental settings in The Netherlands. Overprotective parenting was also significantly associated with more problems with toothbrushing, a lower frequency of re-brushing, a lower toothbrushing frequency, a lower self-efficacy regarding toothbrushing and higher dental caries experience. The latter three however did not remain significant after adjustment for confounders. No associations between overprotective parenting and skipping toothbrushing were found. Future research on this subject should focus on studies with a longitudinal design. The influence of overprotective parenting on children's oral health outcomes highlights the need to address parenting factors in upcoming interventions and support programs for parents and dental professionals to improve children's oral health outcomes.

Author contributions

E.G., M.d.J.L. and D.D. conceived the ideas; E.G., M.d.J.L. and D.D. contributed to the study design; E.G. collected the data; E.G and D.D. analysed the data; E.G. wrote the first draft of the manuscript; E.G., M.d.J.L. and D.D. provided feedback on the manuscript and approved the final version of the manuscript.

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