

Predicting oral health-related behaviour in the parents of preschool children: An application of the Theory of Planned Behaviour

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Abstract

Objective: This study aimed to test the predictive validity of the Theory of Planned Behaviour (TPB) when applied to the oral health-related behaviours of parents towards their preschool children in a cross-sectional and prospective design over a 5-year interval.

Methods: Data for this study were obtained from parents of 1,057 children born between October 2003 and July 2004 in two regions in Flanders, Belgium. Three behaviours related to oral health (dietary habits, oral hygiene habits, dental attendance) as well as their psychological determinants based on the TPB (attitude, subjective norms, perceived behavioural control (PBC), intention) were measured using validated self-report questionnaires when the children were 0 (2003–2004), 3 (February–June 2007) and 5 years old (March–June 2009).

Results: Multiple linear regression analyses indicated cross-sectionally that the contribution of attitudes, subjective norms and PBC towards intention, and of intention and PBC towards the frequency of consumption of sugared snacks and drinks, tooth brushing and dental attendance was significant ($p < .001$). The combined determinants explained 27%–37% of the variance in intentions and 7%–39% of the variance in the behaviours. Across time, only parental PBC as measured at birth could significantly predict dietary and oral hygiene behaviours at children's ages 3 and 5 years.

Conclusion: This study supports the validity of the TPB to predict intentions and oral health-related behaviours of parents of preschool children. Interventions should aim to improve parental attitudes towards diet and dental attendance, and their PBC towards tooth brushing.

Keywords

Behaviour change, Belgium, oral health, oral hygiene, parents, preschool children

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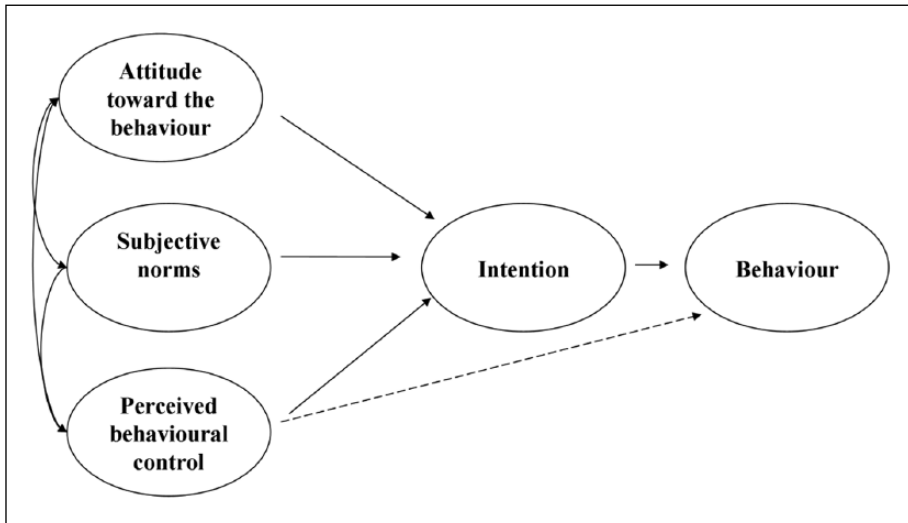


Figure 1. Theory of Planned Behaviour (Ajzen, 1991).

Introduction

Although the prevalence of dental caries has declined markedly in Western countries in recent decades, caries epidemiology remains a significant problem in dental public health (Marthaler, 2004; Petersen, 2003). Oral ill health is highly related to lifestyle factors such as diet and oral hygiene. To maintain optimal oral health, it is therefore generally recommended to brush one's teeth twice daily, to restrict consuming sugared snacks and drinks between meals and to visit the dentist on a regular basis (Harris et al., 2004; Karjalainen et al., 2001; Scottish Intercollegiate Guidelines Network (SIGN), 2005; Wendt et al., 1996). Most of these oral health-related habits are established very early in life, and their development is mediated at least in part through parental behaviours (Johnsen, 1995; Mohebbi et al., 2008). As these recommendations generally require a behaviour change by the parents, health behaviour theories can be informative in identifying and influencing the determinants of oral health-related behaviours.

One of the theories that is most often used to that effect is the Theory of Planned Behaviour (TPB; Ajzen, 1991). According to this theory, behaviour is a function of intentions towards the behaviour, modified by the perceived behavioural control (PBC). Intention, which is considered the immediate antecedent of behaviour, is, in turn, based on attitudes towards the behaviour, subjective norms and PBC (Figure 1). Attitudes can be defined as the positive or negative evaluations of the expected outcome of the behaviour. Subjective norms refer to the perception of social normative pressures to engage in a behaviour. These norms are based on beliefs about the perceived judgement of significant others (e.g. friends, family, dentist) regarding that behaviour. The extent to which these norms influence behaviours depends on the motivation to comply with the norms. PBC refers to the degree to which the individual believes the behaviour is under his/her control. It is determined by control beliefs, which are beliefs about the presence of factors that may facilitate or impede the performance of the behaviour, and by the perceived power of these factors. As such, PBC, like attitudes and subjective norms, has an influence on intentions but can also influence behaviour directly, to the extent that the perception of control accurately reflects actual control (Figure 1).

The predictive validity of the TPB has been demonstrated in meta-analytic reviews covering a wide range of behaviours, including oral health (Buunk-Werkhoven et al., 2011; Godin and Kok, 1996; Luzzi and Spencer, 2008). However, few studies have investigated the applicability of the TPB to oral health-related behaviour in parents of young children (Astrom and Kiwanuka, 2006; Finlayson et al., 2007). Moreover, most of the existing studies have used a cross-sectional design (Anderson et al., 2013; Dumitrescu et al., 2011; Godin and Kok, 1996), and the rare prospective studies have only used short-term follow-up periods of, for example, 1 month (Masalu and Astrom, 2001). As health benefits are mostly gained through long-term performance and maintenance of healthy behaviours, it is important to investigate the predictive validity of the TPB determinants prospectively. To our knowledge, only a few studies have examined the TPB determinants related to oral health over prolonged periods, mostly in adults (Astrom and Okullo, 2004; Conner et al., 2002; Luzzi and Spencer, 2008). This study aims to test the predictive validity of the TPB regarding oral health-related behaviours in parents of preschool children during the first 5 years of life.

Method

Data for this study were obtained from the parents of 1,057 children, born between October 2003 and July 2004 in two distinct regions in Flanders, Belgium. In each region, at least 500 newborn children were included in the study, following their parents' consent. Exclusion criteria were serious medical problems with impact on oral health and insufficient language skills to complete a questionnaire in Dutch. All children participated as controls in the 'Smile for Life' study, an intervention study aiming to improve oral health in preschool children (Van den Branden et al., 2013a).

Questionnaires were constructed and validated using a concept validation approach (Clark and Watson, 1995), the details of which have been published elsewhere (Van den Branden et al., 2013b). Questionnaire data were collected from one of the parents (mostly the mother) shortly after birth (2003–2004), when the children were 3 (February–June 2007) and 5 years old (March–June 2009).

At age 3 and 5 years, data on dietary habits, which here refer to restricting the child's consumption of sugared in-between snacks and drinks on a daily base, were measured with two questions: the frequency of (1) 'consumption of sugared drinks in-between meals' and (2) 'consumption of in-between snacks'. Answers were reported on a 5-point Likert scale ranging from 'never' to 'more than once per day'. Two items measured oral hygiene behaviour looking at the 'frequency of brushing' (with answers on a 4-point scale ranging from 'never' to 'twice per day or more') and at the 'frequency of helping with brushing' (with answers on a 4-point scale ranging from 'never' to 'every day'). Dental attendance was measured by asking when the child was last seen by the dentist, with answers on a 4-point scale ranging from 'never' to '6 months ago or less'.

In addition, all three questionnaires (0, 3 and 5 years) included statements to measure parental beliefs about dietary habits, oral hygiene habits and dental attendance, based on the TPB, to be rated on 5-point Likert scales (1 = strongly disagree, 2 = disagree, 3 = no opinion, 4 = agree, 5 = strongly agree). For dietary habits, the questionnaire comprised 18 questions, representing four scales: attitude (5 questions), norms of partner (3 questions), norms of others (5 questions), PBC (4 questions) and intention (1 question). Oral hygiene habits were measured through 17 items, also representing four scales, each composed of 4 items: PBC, norms of family and friends, norms of partner and experts and attitude. Intention was measured with 1 item. Finally, dental attendance was measured with 16 questions, representing four scales, namely, PBC (4 questions), beliefs about immediate outcomes (4 questions), beliefs about long-term outcomes (2 questions), subjective norms (5 questions) and intention (1 question). At birth, the questionnaires were distributed to the parents by the nurses of the well-baby clinics, at age 3 and 5 by the kindergarten teachers. This

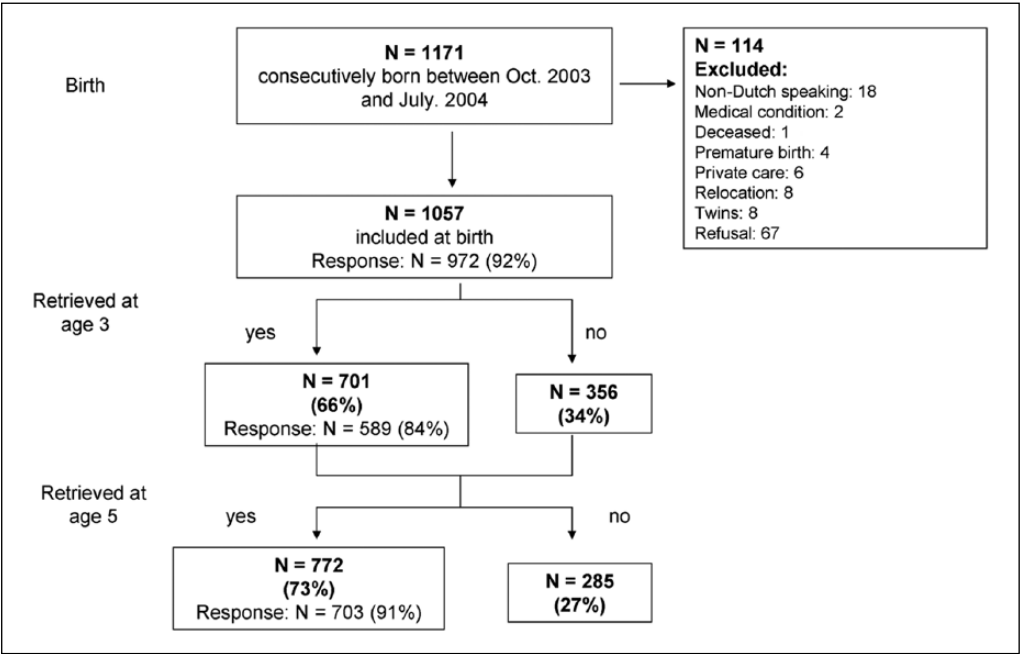


Figure 2. Number of children included and excluded in the study, retrieval rates at ages 3 and 5 years and response rates of the retrieved children.

study protocol received ethical approval from the Medical Ethics Committee at the Catholic University Leuven, Belgium.

Data exploration and statistical analyses were performed with SPSS Statistics version 17. The data were first explored for missing values, outliers and influential data. Cook's D was calculated with a cut-off of $4/n$. All cases exceeding this cut-off might be influential points. The residuals were examined on normality, heteroscedasticity and independence. Negatively phrased items were recoded. Linearity between the predictors and the outcome variable was investigated as well as collinearity between the predictors. At ages 2 and 5, multiple regression analyses were applied to evaluate whether the scales measuring attitude, subjective norms and PBC could predict intention, and whether intention and PBC could predict behaviour, as presumed by the TPB. In addition, multiple regression analyses were performed to investigate whether parental intention and PBC at birth could predict behaviours at ages 3 and 5. R^2 was calculated as an indicator of explained variance. F -tests, t -tests and accompanying p -values were calculated, a significance level of $\alpha < .05$ was adopted.

Results

Out of all participating families ($N = 1,057$), 589 questionnaires were completed at the children's age of 3 and 703 at the age of 5 years. Missing data at age 3 amounted to 34% of the original cohort and at age 5 to 27%. The major reason for missing data at both ages was the lack of identification of the kindergarten which the child attended or refusal of the school to collaborate. Of all children who were retrieved, 84% of parents completed the questionnaire at the age of 3 and 91% at the age of 5. This means that most of the missing data could be categorised as missing at random. An overview of the retrieval rates is provided in Figure 2.

Sugared snacks and drinks in-between meals were provided daily to the majority of children at age 3 years (77% and 61% for snacks and drinks, respectively) and at age 5 years (85% and 58%, respectively). For 89% of the 3-year-olds and 94% of the 5-year-olds, the teeth were brushed on a daily basis. However, 62% of children had never visited the dentist at age 3 years. At age 5 years, most children had been to the dentist for a preventive visit, but still 21% had not.

The mean scores for attitudes, subjective norms and PBC were situated around response category 3 (no opinion) and 4 (agree). Pearson correlations with intention were significant for all factors (Table 1). There were no significant deviations from normality.

Cross-sectional analyses

For dietary habits, 32% (at age 3) and 30% (at age 5) of the variance in the intention to restrict sugared snacks and drinks could be attributed to attitude, norms of partner and PBC (Table 1). Norms of others were not a significant predictor of intentions. With regard to oral hygiene habits, respectively, 37% and 32% of the variance in intention to brush the teeth of the child daily was accounted for by three of the four predictors in the TPB. Intention was best predicted by PBC, followed by attitude and norm of expert and partner. Norms of family and friends did not predict intentions. Finally, the analysis for dental attendance revealed that 27%–29% of the variance in the intention to take the child to the dentist for a check-up twice a year could be explained by attitudes, PBC and subjective norms, although the latter was no significant predictor at age 5 years (Table 1).

The child's consumption of in-between meals and drinks was predicted both by PBC and intention, although the proportion of variance explained by the model is quite low, ranging between 7% and 10%. PBC was also a significant predictor of brushing frequency at both ages, whereas intention was only significant at age 3. The proportion of explained variance was 37% and 39% at age 3 and 5 years, respectively. Dental attendance was predicted both by intention and PBC with the explained variance ranging from 16% to 25% (Table 2).

Prospective analyses

PBC as reported by the parent at birth was a significant predictor of the consumption of in-between meals and drinks by the child and brushing frequency at ages 3 and 5. The proportion of variance explained by the model was however low, ranging between 3 and 8%. PBC at birth could not predict dental attendance at both ages nor could intentions at birth predict oral health-related behaviours later in childhood, except for visiting the dentist at age 5 (Table 3).

Discussion

The aim of this study was to test the predictive validity of the TPB for oral health-related behaviours of parents towards their preschool children at age 3 and 5 years both cross-sectionally and prospectively. Cross-sectionally, multiple linear regression analyses indicated that the contribution of the determinants identified by the TPB (attitude, subjective norms and PBC) towards intention and of intention and PBC towards the consumption of sugar-containing snacks and drinks, brushing frequency and dental attendance was significant. The combined determinants explained 27% to 37% of the variance in intentions of parents of preschool children, which is in line with the percentage reported by [Armitage and Conner \(2001\)](#). The proportion of explained variance for the behaviours ranged from 7% to 39%, whereby lower predictive values were seen for dietary habits and higher values for oral hygiene habits. Lower predictive values related to dietary habits were observed earlier in relation to sugar snacking in preschool children ([Astrom and Kiwanuka, 2006](#)).

Table 1. Internal consistencies, mean scores and standard deviations, Pearson correlation (*r*) and regression analyses predicting intention of parents' oral health-related behaviour towards their 3- and 5-year-old child.

Scale	N items	Cronbach's alpha	Age 3 years			Age 5 years				
			Mean (SD)	r int	R ²	β	Mean (SD)	r int	R ²	β
<i>Restricting in-between sugared snacks and drinks</i>										
1. Attitude	5	.71	4.17 (0.56)	.49***	.32	.39***	4.18 (0.55)	.48***	.30	.37***
2. Norm of partner	3	.74	3.95 (0.67)	.41***		.22***	3.89 (0.67)	.42***		.24***
3. Norm of others	5	.63	3.38 (0.64)	.13**		.03	3.13 (0.77)	.08*		.03
4. PBC	4	.55	3.60 (0.87)	.24***		.17***	3.61 (0.87)	.17***		.11**
<i>Brush the children's teeth daily</i>										
1. Attitude	4	.52	4.35 (0.53)	.37***	.37	.21***	4.40 (0.52)	.40***	.32	.26***
2. Norm of family/friends	4	.69	2.90 (0.65)	.12**		.01	2.94 (0.60)	.08*		-.01
3. Norm of expert/partner	4	.69	3.75 (0.58)	.24***		.10**	3.88 (0.55)	.28***		.13***
4. PBC	4	.75	4.00 (0.68)	.56***		.48***	4.07 (0.70)	.48***		.38***
<i>Visit the dentist for a preventive check-up</i>										
1. Attitude – beliefs immediate	4	.70	3.89 (0.66)	.42***	.27	.21***	4.11 (0.62)	.44***	.29	.19***
2. Attitude – beliefs long-term	2	.80	4.14 (0.64)	.37***		.17***	4.22 (0.62)	.43***		.21***
3. Norm	5	.74	2.97 (0.59)	.42***		.11**	2.98 (0.60)	.13**		.06
4. PBC	4	.78	4.39 (0.60)	.15***		.23***	4.49 (0.61)	.46***		.23***

PBC: perceived behavioural control.
 β = standardized coefficient; *r* = Pearson correlation coefficient; *R*² = proportion of explained variance; SD: standard deviation.
 p* < .05; *p* < .01; ****p* < .001.

Table 2. Number of participants included in analyses, Pearson correlation and multiple regression predicting behaviour of parents at children's age 3 and 5 years.

Oral health-related behaviour	Age 3 years				Age 5 years			
	N	r	R ²	β	N	r	R ²	β
<i>Restricting in-between sugared snacks</i>	581		.07		692		.09	
Intention		.17***		.12**		.21***		.17***
PBC		.23***		.21***		.26***		.22***
<i>Restricting in-between sugared drinks</i>	582		.10		693		.09	
Intention		.24***		.19***		.25***		.22***
PBC		.26***		.21***		.22***		.18***
<i>Brush the children's teeth daily</i>	578		.37		693		.39	
Intention		.41***		.10*		.25***		-.06
PBC		.60***		.55***		.63***		.65***
<i>Visit the dentist</i>	574		.16		692		.25	
Intention		.33***		.23***		.46***		.36***
PBC		.35***		.25***		.39***		.22***

PBC: perceived behavioural control.

β = standardized coefficient; r = Pearson correlation coefficient; R² = proportion of explained variance.

p < .01; *p < .001.

Table 3. Number of participants included in analyses, Pearson correlation and multiple regression predicting future behaviour of parents at children's age 3 and 5 years based on intention and PBC at birth.

Oral health-related behaviour	Age 3 years				Age 5 years			
	N	r	R ²	β	N	r	R ²	β
<i>Restricting in-between sugared snacks</i>	543		.03		650		.04	
Intention at birth		.12***		.08		.06		-.01
PBC at birth		.14**		.11*		.19***		.19***
<i>Restricting in-between sugared drinks</i>	543		.03		650		.03	
Intention at birth		.02		-.04		.11**		.07
PBC at birth		.16***		.17***		.16***		.14**
<i>Brush the children's teeth daily</i>	540		.08		644		.05	
Intention at birth		.18***		.04		.13***		.01
PBC at birth		.29***		.27***		.21***		.20***
<i>Visit the dentist</i>	540		.01		646		.04	
Intention at birth		.04		.09		.18***		.16**
PBC at birth		.08		-.01		.13**		.04

PBC: perceived behavioural control.

β = standardized coefficient; r = Pearson correlation coefficient; R² = proportion of explained variance.

p < .01; *p < .001.

Environmental determinants or other cognitive factors could account for another portion of the variance in these behaviours.

Prospective analyses showed no predictive value of parental intentions at birth towards healthy oral health-related behaviours 3 and 5 years later. On the other hand, PBC scores at birth could significantly predict dietary and oral hygiene behaviours in toddlerhood, although explanatory

power was low. Other studies have shown intentions to be significant predictors of healthy eating behaviour in adults, after a period of 6 years (Conner et al., 2002) and in adolescents at 3-month follow-up (Astrom and Okullo, 2004). However, Ajzen argued that intentions must remain reasonably stable over time until the behaviour is performed, in order to obtain an accurate prediction of behaviour (Ajzen, 1996). Intentions that are measured prior to performance of a behaviour may change as a result of new information or unforeseen obstacles and therefore result in reduced predictive power (Conner et al., 2002). It seems likely to assume that parents may have received a lot of new information during the first 3 years after childbirth through the preventive health services, the school and media campaigns. Previous research by our group has indicated a decrease in intention scores in these first 3 years for all oral health-related behaviours, which was attributed to barriers in daily life that conflicted with the good intentions reported at birth (Van den Branden et al., 2012). This could explain why intentions at birth did not predict behaviours in toddlerhood.

Attitude related to diet, tooth brushing and dental attendance emerged as a very important predictor of intentions towards each of these three behaviours, whereas PBC was the largest predictor of intentions towards brushing behaviours. This is in line with Finlayson et al. (2007), who observed that maternal self-efficacy, which is similar to the concept of PBC, was a strong predictor of preschool children's brushing frequency. The fact that not all three factors contribute significantly to the prediction of intentions does not imply a lack of support for the TPB. Depending on the stage in the process of behaviour change, the three components may have a differential impact on intention (Prochaska and Diclemente, 1992). For example, it has been reported that the importance of attitudes as a determinant of health-related behaviour strongly increases when one becomes aware of the importance of performing a certain behaviour (i.e. in the contemplation phase), whereas PBC is more important when reaching the preparation phase (De Vries et al., 1998). It seems plausible that the parents have to establish new behaviours towards their growing children and therefore have not reached preparation phase yet for all behaviours.

It must be mentioned that only 66% of children could be retrieved at age 3, which caused a substantial amount of missing data. However, in our opinion, the effect of non-responders on the outcomes remains small, as most of the data were missing due to a lack of identification of the kindergarten the children attended, which can be considered as missing at random. Of all children retrieved, 84% completed the questionnaire at age 3, and 91% at age 5, which can be considered a high response rate.

It should also be noted that parametric methods were applied for the statistical analyses, although the data were originally derived from Likert-scales, for which non-parametric methods would be more appropriate. There is, however, a consensus that ordinal data can be treated as interval-level data when the data are normally distributed and there are large numbers of participants. As our data met these conditions, linear regression analyses could be applied and interpreted meaningfully. Additionally, no individual Likert scores were used, but rather mean scores derived from multiple items that measure the same underlying factor. This method has been applied earlier in research applying the TPB (Astrom and Okullo, 2004; Francis et al., 2004; Luzzi and Spencer, 2008).

Conclusion

In conclusion, this study supports the validity of the TPB to predict intentions and oral health-related behaviours in parents of preschool children. The relative importance of the different components of the TPB in predicting behavioural intentions and behaviour suggests that interventions should aim to improve parental attitudes towards a healthy diet and dental attendance, as well as their PBC towards oral hygiene habits. It would be interesting to check whether these conclusions can be confirmed with regard to other health-related behaviours.

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