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Examining intention to control preschool children's sugar snacking: a study of carers in Uganda

A. N. ÅSTRØM[1,2] & S. N. KIWANUKA[1,3]

[1]*Centre for International Health, University of Bergen,* [2]*Institute of Odontology – Community Dentistry, University of Bergen, Bergen, Norway and* [3]*Department of Dentistry, Makerere University, Kampala, Uganda*

Summary. *Aim.* The aims of this study were to investigate parents' intention to control their children's sugar consumption and whether that behaviour is reported to occur in 3–5-year-old preschool children according to sociodemographics and attitudinal factors derived from the Theory of Planned Behaviour (TPB).

Design. Some 589 children aged 3–5 years (51% boys, response rate = 85%) attending nursery schools in Kampala Central (urban) and Nakawa (suburban), Uganda, were examined clinically for dental caries. A questionnaire to assess sociodemographic factors, sugar intake and the constructs of the TPB was completed by their parents'/caregivers in face-to-face interviews.

Results. Analyses of variance revealed more positive attitudes and stronger intention to control children's intake of sugared snacks in highly as compared to less highly educated parents. Independent of educational level, parents having children with caries perceived themselves to have less control over their child' intake of sugared snacks and perceived them to be more susceptible to tooth decay compared to parents of children without caries. In multiple linear regression, the TPB provided a significant prediction of intention with attitude ($b = 0{\cdot}16$, $P < 0{\cdot}001$), subjective norms ($b = 0{\cdot}18$, $P < 0{\cdot}001$) and perceived barriers ($b = 0{\cdot}11$, $P = 0{\cdot}01$), significant and reported sugar intake with attitudes ($b = -0{\cdot}10$, $P = 0{\cdot}02$), and perceived susceptibility ($b = 16$, $P < 0{\cdot}001$) all significant.

Conclusion. The TPB components predict parental intention to control sugar snacking and whether that behaviour occurs in preschool children. The strengths of parents' attitudes and reported level of child sugar snacking varied between diverse socioeconomic family groups. Implications for oral health education are discussed.

Introduction

Diets high in added sugars have been associated with a range of health problems, including dental caries [1–5]. Although the relationship between sugar consumption and dental health is less strong in the modern age of fluoride exposure, controlling the frequency consumption of added nonmilk extrinsic sugars remains a justifiable part of caries prevention [6]. Sugar snacking between meals has been recognized as a key behaviour in caries risk assessment, explaining the presence of caries in preschool children [1,2].

In socioeconomically developing countries, changing from a traditional to a Western-style diet has lead to an increase in the consumption of commercialized food products which are high in sugar and fat [7,8]. With an average gross domestic product of 6% and an industrial production growth rate of 7%, Uganda has been rated as one of the better-performing economies in sub-Saharan Africa, with sugar as one of its major industrialized products [9]. A previous paper [10] revealed that, respectively, 45%, 59% and 66% of 3-, 4- and 5-year-old Ugandan preschool children showed at least one tooth with untreated caries, approximating the figures obtained during the 1960s in the nonfluoridated communities of the USA [11]. The few previous studies from Uganda, from which data can be extracted for 5–7-year-olds, have reported caries experience in the 7–59% range [10]. Moreover, 53% of all children studied scored above the median on a frequency sum score based on some common types of sugary snacks consumed. In that study, children's caries prevalence on the one hand and their sugar frequency intake on the other varied systematically with the plaque score obtained (i.e. visible plaque on anterior maxillary teeth), suggesting that the oral health of Ugandan preschool

Correspondence: Anne Nordrehaug Åstrøm, Centre for International Health, Armauer Hansen Building, N-5021 Bergen, Norway. E-mail: anne.nordrehaug@cih.uib.no

children is a matter of great concern. Tinanoff and Palmer [12] concluded that counselling for the purpose of reducing caries in children should teach parents the importance of controlling high-frequency exposure to obvious and hidden sugars. So far, there is a paucity of research describing parental influences, such as socioeconomic, modelling and attitudinal factors, of the consumption of sugared snacks in preschool children.

The present study applied the Theory of Planned Behaviour (TPB) to explain parents' intention to control their children's intake of sugary snacks [13,14]. The TPB was developed to address the problem of incomplete volitional control and takes intention (I) as a construct presenting one's motivation towards adopting a particular behaviour. Intention, in turn, is the result of attitudes towards performing the behaviour (Aact), perceived norms with respect to the behaviour (SN) and the perceived control (PBC) over performing the behaviour (B). A model derived from this theory was proposed by Ajzen and Madden [15]. This model can be expressed as:

$$B \cong I = (Aact)_{w1} + (SN)_{w2} + (PBC)_{w3},$$

where w1, w2 and w3 are empirical weights determined through an application of multiple regression. The TPB posits that behavioural intention is a function of attitudes, subjective norms and PBC, each of which are underpinned by sets of beliefs. In the context of the present study, Aact was expressed by parents' positive or negative evaluation of controlling their children's sugar intake; Aact is a function of personal beliefs concerning the perceived advantages and disadvantages of carrying out this behaviour. The second component, SN, reflected the perceived social pressure, determined by the expectations of significant others (e.g. dentists, doctors, family, friends and grandparents). The third component, PBC, was defined [15] as the presence or absence of required resources and opportunities (enabling factors), and anticipated obstacles and impediments (barriers). An impediment to controlling children's sugar intake might be restricted time for mothers who are expected to undertake these extra tasks, women who may already be overworked because of multiple roles which include looking after the home, fetching fuel and water, growing foods, and going out to work. Undoubtedly, young children have a preference for sweet tastes and a dislike of bitter tastes. A liking for sweetness has been related to high levels of sugar intake and caries [16]. Thus, the mother might have difficulties in finding suitable, inexpensive and attractive alternatives to sweets snacks. This provides an interesting context in which to assess the TPB because restricting the frequency of preschool children's sugar intake might be largely an unconsidered behaviour and one that is unlikely to be entirely within parents' volitional control.

The TPB has been successfully applied to a range of health behaviours including food choice behaviours [17–20]; however, it has not previously been used with regard to parents' control of children's food consumption generally and sugar intake in particular. Little research has been conducted outside North America and Europe, and uncertainties remain as to the applicability of the TPB to food choice intentions in non-Western cultures [20–22]. This study addressed the following research questions:

1 Do parents' attitudes towards sugar control, as defined by the TPB, vary according to reported family socioeconomic status?

2 Using the TPB as a framework, what are the attitudinal factors influencing parents' sugar control intentions and the extent to which intake of sugared snacks occur in preschool children?

3 What are the beliefs underlying parents' intention to control their children's intake of sugared snacks?

Subjects and methods

Study population and sampling method

The study area was Kampala (0·3 mg fluoride/L), the capital city of Uganda, which covers an area of 197 km^2. Kampala has a population of 1·2 million people (49% male, 18% below 5 years of age) who are considered to be urban residents [23]. The city has five divisions of which two, Kampala Central (area = 14·7 km^2) and Nakawa (suburban) (area = 40·7 km^2), were purposively selected for this study [23]. The study population consisted of 3–5-year-old children attending nursery schools in Kampala Central and Nakawa, and their respective carers. To obtain a group of participants of mixed socioeconomic background, and because sugar consumption was assumed to differ in children from urban and rural areas, a total of 52 and 64 primary schools were listed in Kampala Central and Nakawa, respectively. Using an estimated sample size of 600 preschool children, allowing for a design effect of 2 and a standard error of 5%, and assuming a prevalence of dental caries of 25%, four schools in Kampala Central and five

schools in Nakawa were selected by systematic random sampling. The estimated sample size was also satisfactory for two-sided tests, assuming sugar intake proportions to be 0·60 and 0·50 among children with parents who had high and low intakes, a significance level of 5% and a power of 80%. Using this proportionate stratified one-stage cluster sampling procedure, with school as the primary sampling unit, all children aged 3–5 years attending the selected schools during the period of data collection and their respective parents/caregivers were invited to participate in the study. A total of 618 children were eligible for participation and a final number of 589 child–mother/caregiver pairs participated in the study (participation rate = 85%). For a detailed description of the methodology, including the sampling procedure, see the report by Kiwanuka *et al.* [10].

Ethical considerations

Ethical clearance was obtained from the ethical research committees in Norway and Uganda. Written permission to conduct the study was obtained from the Ministries of Health and Education in Uganda, local administration authorities, and the school authorities. Written and verbal informed consent was obtained from the caregivers before clinical examination of their children.

Clinical examination

The clinical examinations were carried out by one dentist (S.N.K.), who was facilitated by the preschool teachers. A trained assistant recorded the observations. Caries was recorded in terms of dmft, using the World Health Organization's recommendations for oral health surveys [24]. Calibration exercises were carried out at the Institute for Paediatric Dentistry, Faculty of Dentistry, University of Bergen, Bergen, Norway, prior to the onset of data collection and according to the guidelines published by British Association of the Study of Community Dentistry [25]. For full description of the clinical examination, see the report by Kiwanuka *et al.* [10].

Survey instrument

A structured questionnaire was administered by three trained research assistants and completed by the caregivers in face-to-face interviews. For the majority of the respondents, the questionnaire was conducted in English (the official language in Uganda), but translation (and back translation) into Luganda, the main local language, was necessary for a few number of the participants. The survey instrument was reviewed by oral health professionals for semantic, experiential and conceptual equivalence. Sensitivity to culture and the selection of appropriate words were considered. The interview schedule was piloted and adjusted accordingly before being used in the field. Each interview was conducted in a private and quiet place, with both interviewer and interviewee seated facing a horizontal work surface. The age of the child was recorded as the age at her or his last birthday. The mother's highest level of educational attainment was assessed on five-point scales and categorized into (0) lower education (no formal education, primary and secondary school) and (1) higher education (college or university, or higher learning institutions). Caregivers were classified according to their offspring's caries status (i.e. dmft > 0, dmft = 0) and educational level. A group variable of parental deprivation was constructed with four levels in terms of: (1) mother's low educational level and child's dmft > 0; (2) mother's low educational level and child's dmft = 0; (3) mother's high educational level and child's dmft > 0; and (4) mother's high educational level and child's dmft = 0. For use as an explorative variable in linear regression analysis, the sum variable was dichotomized, based on a median split, into a dummy variable yielding (0) high deprivation (including the original categories 1 and 2) and (1) low deprivation (including the original categories 3 and 4). The frequency intake of sugared snacks was assessed by a sum score of two items (confectionery and cakes/biscuits), measured on a scale from (1) 'not every day' to (5) 'more than three times a day'. A dummy variable was constructed based on a median split yielding (1) low frequency snacking and (2) high frequency snacking. The perceived susceptibility of children with tooth decay was assessed by a sum score of two items, using a scale ranging from (1) 'strongly disagree' to (5) 'strongly agree' (for the wording of items, see Table 1). The questionnaire incorporated 10 belief statements (for the wording of items, see Table 1) corresponding to each component of the TPB. They were developed in accordance with the recommendations provided by Ajzen and Fishbein [13], and assessed using a five-point Likert scale ranging from (1) 'strongly disagree' to (5) 'strongly agree'. Parents were requested to agree/disagree

Table 1. Item content of perceived risk of child having tooth decay, intention, perceived behavioural control, attitudes and subjective norms.

Perceived risk of child having tooth decay
The chances that our child gets tooth decay are great
As a family, we worry a lot that our child will have tooth decay
Intention
As a family, we intend to control our child's intake of sugared snacks
As a family, we would like to control our child's intake of sugared snacks
Perceived behavioural control
If time allows, we as a family will be able to control our child's intake of sugared snacks
If clean water was available, we would be able to control our child's intake of sugared snacks
Attitudes
Controlling a child's intake of sugared snacks prevents tooth decay
Controlling a child's intake of sugared snacks makes them behave less well
Controlling a child's intake of sugared snacks is unwise
Subjective norms
The people in our family approve of controlling our child's intake of sugared snacks
The people in our family control our children's intake of sugared snacks
People we know well approve of our controlling our child's intake of sugared snacks

with attitudinal beliefs concerning: (1) the advantages and disadvantages of controlling the intake of sugared snacks; (2) people/groups who would approve/disapprove of controlling the intake of sugared snacks; and (3) beliefs about factors which facilitate/inhibit one's ability to carry out control of sugared snacks. Intention was assessed by summing two items. A dummy variable was constructed based on a median split yielding (1) low intention and (2) high intention.

Statistical analysis

Data were analysed using the Statistical Package for Social Sciences, Version 11·5. Analyses of data were performed using chi-square statistics, analysis of covariance (ANCOVA), the Wilcoxon signed-rank test, principle component analysis and a multiple linear regression. Internal consistency and test–retest reliability was assessed using Cronbach's alpha and Cohen's kappa and the intra-class correlation coefficient (ICC). Multivariate analyses were performed using multiple ANCOVA (MANCOVA). To control for potential cluster effect, the present data were reanalysed using the Stata svy command. This revealed no essential changes to the initial unadjusted results.

Test–retest reliability

Approximately 10% ($n = 56$) of the participating parents/caregivers were re-interviewed after 4 weeks to test for the consistency of their responses to the questionnaire. Their respective children were re-examined to test for intraexaminer reliability. The agreement for the clinical examination was found to be good (Cohen's kappa = 0·84) [26]. There was no evidence of systematic error in the recording of dental caries, as tested by the Wilcoxon signed-rank test ($P = 0·16$). Cohen's kappa for the core self-report variables ranged from 0·66 regarding parents' education to 0·85 regarding household assets. The sugar frequency sum score on both occasions correlated moderately (ICC = 0·49, 95% confidence interval = 0·11–0·70), but is of comparable reliability to those described by other investigators regarding various food items [27].

Results

Study participants

The caregivers responding on behalf of the child were either the mothers (64%), fathers (26%) or others (i.e. grandparents, siblings or relatives) (10%), and the mean age of the sample was 32·5 years (SD = 7·8 years, range = 16–74 years). A total of 38% and 60% ($P < 0·001$) of the respondents were below 31 years of age, and 77% versus 26% of the mothers had higher education in Kampala Central and Nakawa, respectively. There was no statistically significant difference in the age and gender distribution with respect to children from the two study areas (Table 2). Table 2 shows the frequency distribution of the participants by sociodemographic factors.

Theory of Planned Behaviour components

To reduce the number of correlated beliefs (see Table 1) into a new set of TPB components to be used as independent variables in later regression analysis, a factor analysis (extraction method: principle component analysis) was conducted. The three variables supposed to address attitudes and subjective norms revealed rotated (varimax) unifactorial solutions with eigenvalues greater than one, meaning that one factor or dimension was needed to pro-

Table 2. Frequency distribution (%) of study participants according to socio-economic and behavioural variables in Kampala Central and Nakawa ($n = 589$). The number of cases in different categories does not add up to 304 and 285 because of missing cases.

	Kampala Central (total $n = 304$)		Nakawa (total $n = 285$)		Total (total $n = 589$)	
Variable	Number	Percentage	Number	Percentage	Number	Percentage
Age of child (years):						
3	43	14	24	8	67	11
4	126	42	113	40	239	41
5	134	44	145	52	279	48
Gender of child:						
male	162	53	140	49	302	51
female	141	47	145	51	286	49
Mother's level of education:						
low	70	23	205	74	275	48
high	231	77	71	26*	302	52
Sugar snacking (high)	158	52	138	49	309	51
Intention to control snacking (yes)	246	77	224	76	470	76
dmft > 0	171	56	183	64**	354	60

*$P < 0{\cdot}001$; **$P = 0{\cdot}03$.

Table 3. Descriptive statistics and percentage variance explained for the attitudinal factors related to controlling children's intake of sugared snacks. Theoretical range: the higher the score on each construct, the higher the attitudinal value.

Construct†	Mean (SD)	Range (low–high)	Cronbach's α/ Pearson's *r*	Percentage variance explained
Attitudes (three items)	14·7 (2·3)	5–20	$\alpha = 0{\cdot}45$	40%
Subjective norms (three items)	10·5 (2·1)	5–15	$\alpha = 0{\cdot}53$	52%
Perceived barriers/control (two items)	7·2 (1·6)	2–10	$r = 0{\cdot}47$*	–
Perceived risk of tooth decay (two items)	6·4 (2·0)	2–10	$r = 0{\cdot}62$*	–
Intention (two items)	7·7 (1·4)	2–10	$r = 0{\cdot}40$*	–
Sugared snacks (two items)	6·0 (1·9)	2–10	$r = 0{\cdot}40$*	–

*$P < 0{\cdot}001$.
†For details of which items were included in each construct, see Table 1.

vide a description of the three beliefs under attitudes and subjective norms, respectively. Thus, three behavioural beliefs, explaining 40% of the variance among the variables, defined one factor denoting attitudes towards controlling child's sugar snacking, whereas three normative beliefs, explaining 52% of the variance among the variables, defined a factor denoting subjective norms. Table 3 depicts the mean scores of respondents' TPB components and perceived risk. On average, the respondents demonstrated moderately favourable attitudes, perceived a moderate social pressure and felt less difficulty in controlling children's sugar intake (high level of control). The caregivers' intention to control sugar intake was strong, but on average, they reported a high-frequency intake on the part of their children. Comparatively, they perceived their child to be at high risk of suffering dental caries. Item analysis for attitudes and subjective norms showed moderate internal reliability coefficients of Cronbach's alpha of 0·45 and 0·53, respectively. Pearson's correlation for the constructs consisting of two items (for the wording of the items see Table 1) varied from $r = 0{\cdot}40$ (sugar score and intention) to $r = 0{\cdot}62$ (perceived risk) (Table 3).

Parental group differences by the Theory of Planned Behaviour components, perceived risk and sugar frequency score

A series of ANCOVA's were conducted with family deprivation group as an independent variable and the attitudinal factors as dependent variables, whilst controlling for potential confounding sociodemographics. Tests of between group effects were statistically significant for all dependent variables involved except subjective norms. The results of a *post hoc* pairwise Bonferonni test to describe the sources of the subgroup differences are summarized in Table 4. The groups with higher education had a significantly

Table 4. Mean attitudinal scores, mean sugar score and 95% confidence interval (CI) by parental deprivation group. Generalized linear models analysis of variance and Bonferroni *post hoc* test. Groups: (1) caries and low level of education; (2) caries-free and level of education; (3) caries and high level of education; and (4) caries-free and high level of education. Analysis controlled for place of school, children's age and gender. Theoretical range: the higher the score on each construct, the higher the attitudinal value.

	Mean score (95% CI)				
Variable	Group 1 (n = 179)	Group 2 (n = 96)	Group 3 (n = 168)	Group 4 (n = 134)	*Post hoc* test
Attitude	15·6 (14·0–17·2)	15·5 (13·0–17·1)	16·5 (14·9–18·1)	16·5 (14·9–18·0)	1 vs 3,* 1 vs 4,* 2 vs 3,* 2 vs 4*
Norms	10·7 (10·4–11·1)	10·4 (9·9–10·9)	10·4 (10·1–10·7)	10·7 (10·3–11·1)	NS†
Control	7·8 (6·7–8·9)	7·8 (6·7–8·9)	7·4 (6·3–8·5)	8·0 (6·8–9·0)	1 vs 3,* 2 vs 3,* 3 vs 4*
Perceived risk	6·9 (5·6–8·2)	6·3 (5·0–7·7)	6·4 (5·0–7·6)	5·4 (4·1–6·7)	1 vs 3,* 1 vs 4,* 2 vs 4,* 3 vs 4*
Intention	7·4 (7·2–7·6)	7·4 (7·0–7·6)	7·9 (7·7–8·2)	8·1 (7·8–8·3)	1 vs 3,* 1 vs 4,* 2 vs 3,* 2 vs 4*
Sugary snacks	6·5 (6·1–6·7)	6·2 (5·7–6·5)	5·7 (5·4–6·1)	5·7 (5·4–6·0)	1 vs 3,* 1 vs 4*

*P = 0·05.
†Not significant.

Table 5. Intention to control children's intake of sugared snacks and drinks regressed upon attitudinal factors. Unstandardized regression coefficients, b- and P-values. Analysis controlled for age, gender and place of school: (NS) not significant.

Variable	b-value	P-value
Parental deprivation	0·18*	0·000
Attitudes	0·16*	0·000
Subjective norms	0·18*	0·000
Perceived barriers	0·11*	0·008
Perceived risk	0·02†	0·02†

*P < 0·001.
†Not significant.

more favourable attitude and stronger intention to control their children's intake of sugared snacks compared to those with lower education. Among the better-educated subjects, those who had children with caries were significantly lower in perceived control and perceived higher caries risk than those who had children without caries experience. Less-well-educated mothers who had children with caries reported a higher sugar intake than their better-educated counterparts who had children with or without caries experience.

Parental intention to control their children's intake of sugared snacks as predicted by the Theory of Planned Behaviour

Table 5 depicts the results from multiple linear regression analysis. Age, gender and place of residence of the child, parental deprivation group recoded into a binary dummy variable, and the TPB variables were entered in one step. A total of 13·0% of the total variance in intention was explained by the model, giving an indication of fit (adjusted R^2 = 0·130, F-change = $18{\cdot}1_{(5,566)}$, P < 0·001). Parental deprivation, attitudes, subjective norms and perceived barriers were all independently associated with intention with unstandardized regression coefficients, b, of 0·18, 0·16, 0·18 and 0·11, respectively. A similar regression analysis was conducted with child's frequency of intake of sugared snacks as the outcome variable. Four per cent of the total variance in the sugar frequency scores was accounted for by the model (adjusted R^2 = 0.038, F-change $4{\cdot}231_{(7,558)}$, P < 0·001). In the final model, attitudes (b = −0·10, P = 0·02) and perceived risk (b = 0·18, P < 0·001) were the only constructs statistically significantly associated with the children's sugar frequency score.

Attitudinal beliefs associated with parental intention to control their children's intake of sugared snacks

To identify what kind of TPB beliefs explained differences in a mother's motivation to control her child's sugar intake, a series of MANCOVAS were conducted with the groups of mothers classified as below and above the median of intention into, respectively, weak and strong intentions, whilst controlling for parental deprivation, age, child's age and gender. In the analysis with attitudinal beliefs as outcome variables, 'Controlling sugar prevent tooth decay' (adjusted means: weak intention, 4·1, versus strong intention, 4·3; P < 0·001), and 'Controlling sugar is good' (adjusted means: weak intention, 4·0, versus strong intention, 4·4; P < 0·001) were most strongly related to the mother's intention. In the analysis with normative beliefs as outcome variables, 'People in our family think it's important to control sugar intake' (weak intention, 2·6, versus strong intention, 3·2; P < 0·001) and 'People in our family control intake of sugared snacks' (weak intention, 2·7, versus strong intention, 3·0; P < 0·01) discriminated statistically significantly. 'Low intenders' less fre-

quently than 'high intenders' considered clean water (3·3 vs 3·6, $P < 0·05$) and time (3·5 vs 3·8, $P < 0·05$) to be necessary facilitating or enabling factors.

Discussion

This study identifies sociodemographic and attitudinal factors influencing parents' decision to control their children's intake of sugared snacks and the extent to which that intake occurs in preschool children. It contributes to the literature by assessing the predictive validity of the TPB in the context of Ugandan parents, a theory well tested with industrialized populations, but rarely applied in non-Western settings and never before to the parental management of sugar snacking in preschool children.

As depicted in Table 4, this study indicates that attitude strength and the reported frequency of intake of sugared snacks varied across family groups from different socioeconomic backgrounds. The most deprived families, in terms of the educational level of the parents and the caries status of the children, showed the least positive attitudes, felt more vulnerable with respect to their children's tooth decay and had the weakest motivation for controlling child's sugar snacking. They also reported higher-frequency sugar consumption, suggesting that oral health might not be as positive and important a value among less-well-educated parents who have children suffering dental caries. Similar results have been reported previously, suggesting that children in higher social classes have lower levels of caries [12,28–30]. Evidently, the parents' educational level seems to be an important social background factor regarding preschool children's oral health [10,31,32]. The finding that the parents in the socioeconomically disadvantaged group are the least motivated to adopt those aspects of snacking which are favourable to the oral health of their preschool children points to the continuing need to target oral health intervention efforts towards parents in the manual classes.

The present results might have been biased by under- and over-reporting because of a desire to supply socially desirable answers and poor recall effects. Nevertheless, this study included a measure for criterion validation in terms of children's caries status that was assessed independently. Irrespective of maternal education, perceived parental control of their children's intake of sugared snacks was strongest and perceived susceptibility weakest among parents who had children without caries experience.

Turning to consider the performance of the TPB in predicting the children's controlled sugar intake, this may seem disappointing. Although the TPB contributed significantly to the prediction of behavioural intention, the 13% explained variance obtained was not commensurate with the average of 39% reported in recent meta-analytical reviews based on Western studies [17,18]. Given that the TPB has predicted intentions very well in studies of various health-related behaviours [17–22], the comparatively low explanatory power observed warrants some explanation. One point to consider is whether there was sufficient variance in the attitudinal components to permit more substantial relationships. The variances reported in Table 2 all comfortably exceeded 1·00, and given the fact that all measures were taken on five-point Likert scales, it seems unlikely that the relatively low correlation coefficients among the TPB components should be accounted for in terms of restricted variance [33]. Rather, the low explanatory power of the model appears to be a result of the nature of the target behaviour itself. Restricting children's sugar intake might not be recognized by Ugandan mothers as a means of preventing tooth decay, and probably runs counter to social norms prescribing confectionery as traditional rewards, gifts, token of affection and as a symbol of being in line with modern life. Anecdotal evidence suggests that parents and their preschool children will find themselves in social environments where consumption of sugared snacks is considered acceptable and even desirable. Evidently, there is a high preference for sweet tastes among preschool and primary school children, particularly in urban areas where the exposure to sugary snacks has become high [1,8,34–36]. However, the present prevalence (33% and 47%) of Ugandan children taking confectionery and cakes at least several times a week are below those reported for similar age groups in Jordan [1], but correspond with figures obtained in neighbouring Tanzania [34]. It seems unlikely that many of the parents taking part in this study would have given much consideration to children's sugar control prior to their participation. Thus, controlling children's sugar intake hardly merits the labels 'planned behaviour' or 'reasoned action'. It is suggested that, when asked to state their intention, they only provide a probability estimate of future snacking control without formulating conscious plans about whether or not to carry out this behaviour. From this point of view, it is not

surprising that the TPB accounted for a relatively small amount of the explicable variance in behavioural intention.

Although the World Health Organization [37–39] has stressed the importance of initiating and maintaining oral health intervention programmes, East Africa is without national policies on water fluoridation, or the handling of social and economic aspects of sugar production, promotion and consumption. Despite a low predictive power, subjective norms, attitudes and perceived behavioural control, in that order of declining importance (Table 5), remained statistically significant predictors of intended sugar control. Moreover, the TPB offers the possibility of a closer examination of the belief structure underlying behavioural intention [13–15]. This points to the potential usefulness of the TPB for applied intervention purposes. Examination of the belief structure makes it possible to gain insight into the specific motivational structures which might be crucial if one intends to improve parental control of children's sugar snacking. According to the results presented, Ugandan parents seem to be more likely to make a decision for sugar control not only if they expect it to be associated with advantageous outcomes, but also if they perceive a strong social pressure and have feelings of control. Family seems to be an important referent for parents when it comes to controlling their children's intake of sugared snacks, a finding that adds support to the common understanding that African cultures embrace the concept of adherence and social values [40]. The influence of the broader family might be important since the extended family provide a home environment for younger parents of preschool children. Thus, the extended family seem to play a key role in parents' food choices for their preschool children and should be made aware of their potential influences in this respect. The present results also add to the generality of the motivational properties of perceived behavioural control across different cultures. Parents need to be confident in managing sugar control to decide to pursue this endeavour. According to Bandura [41], perceived control can be enhanced through experiences of personal mastery, and by setting and achieving sub-goals; for instance, in terms of providing and choosing sugar-free snack alternatives for their children. The accessibility of clean water and time seem to be important factors facilitating parents' decisions in this regard. Engineering interventions should focus on external control factors to make sugared snacks less available for children at nursery school as well as at home. Finally, but not least important, are efforts to create favourable attitudes in terms of reinforcing parents' positive beliefs and in terms of introducing new positive beliefs by emphasizing the link between good taste and healthy teeth.

In conclusion, this study indicates that attitudes, as defined by the TPB, predict parental intention to control intake of sugared snacks and whether that behaviour is reported to occur in their children. Moreover, the strengths of parents' attitudes and reported level of child sugar consumption varied between diverse socioeconomic family groups. Preventive programmes should pay attention to the whole family setting, its socioeconomic status and parents' attitudes towards sugar restriction. Further studies are needed to illustrate how the predictors identified can be applied effectively in oral health intervention programmes.

What this paper adds

- This paper adds new information about the attitudinal factors that influence parents' motivation to control sugar intake in their children.
- It assesses for the first time the validity of the behavioural theory of TPB in the context of parental control of their children's sugar snacking in Uganda.

Why this paper is important for paediatric dentists

- The paper provides important information for preventing dental caries through modification of children's sugar snacking – an important topic for paediatrics globally.

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