



PARENTAL THOUGHT ABOUT CHILDREN'S ORAL HEALTH BEHAVIOUR USING RANK RANGE FREQUENCY THEORY (RFT): RELATIVE OR ABSOLUTE?

Dentistry

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ABSTRACT

Aim: To assess the parental thought about their children's oral health behaviour using rank range frequency theory among the parents of children aged 3-6 year. **Materials And Methods:** An experimental study was done with a convenience sample of 146 parents of young children (3-6 years old) in KLE Society's School Rajajinagar, Bangalore. After obtaining informed consent from the subjects, parents were allocated to one of the four experimental groups by simple random sampling method. Participants completed a pen – and – paper exercise in the school. Questionnaire consisted of pre exercise, in which demographic details were collected, in post exercise; the parents were asked to rate their child's brushing frequency. In main exercise, parents were showed tables, how many times nine other parents brushed their child's teeth in a normal week and asked to rate each of the nine brushing routines on an 11-point scale. The main exercise was different for all the groups. In group 1 and 2, the distribution of brushing frequencies was manipulated to test the rank principle of Rft, whereas group 3 and 4, the distribution of brushing frequencies was manipulated to test the range principle of Rft. **Results:** Parents' ratings of other tooth brushing frequencies were predicted by the range and rank principle of Range-frequency Theory. A comparison between Group 1 and Group 2 showed that parents' ratings of similar brushing frequencies were affected by their relative rank among other brushing frequencies presented. A comparison between Group 3 and Group 4 showed that parents in a group who were presented with a very high brushing frequency (21 times a week) rated all other brushing frequencies as relatively less healthy than the comparison group. **Conclusion:** The principles of Range-frequency Theory predicted parents' judgement about children's oral health behaviour – specifically tooth brushing frequency. These findings provide a theoretical framework on which to develop future oral health education and interventions aimed at promoting twice-daily tooth brushing to the parents of young children.

KEYWORDS

Family; Health Behaviour; Oral Health; Oral Hygiene; Parents; Rank-Range Frequency Theory; Tooth brushing.

INTRODUCTION

Achieving and maintaining good oral health, as well as the prevention of oral disease is critically dependent upon an individual's behaviour. Tooth brushing is a specific, demonstrable behaviour that should begin early and occur often. Programmes to help parents create a habit of brushing their young children's teeth show it is a behaviour that is also amenable to change¹.

Behaviour-change interventions targeted at parents and caregivers therefore represent an opportunity for reducing the prevalence of tooth decay in young children. Previous efforts to change oral health behaviours have, however, been largely unsuccessful and criticized by researchers for lacking a theoretical underpinning or for relying on 'now dated attempts to use social cognition models to predict behaviour'².

Conceptual models emphasise the importance of parents and family in influencing children's oral health behaviour. However, there is still only a limited understanding of the psycho-social factors that may influence parents' decisions about their child's oral health. Despite the complex aetiology of childhood dental caries, there is general agreement that the disease is largely preventable by individual behavioural factors. In addition to the control of dietary sugar, there is good evidence that the regular use of fluoride toothpaste can significantly reduce the incidence and severity of childhood caries³.

The Theory

The range-frequency theory treats category judgment as a compromise between two principles: One principle is concerned with how the judge divides the stimulus range, the other with how frequently he uses different categories.

The Range Principle

The first principle asserts that the judge uses the categories to subdivide the psychological range, the difference between the two extreme values of the stimuli that form the psychological context for judgment. As a simple example, suppose there were just two categories, "large" and "small," which the subject used for stimuli in the upper and lower halves of his range. According to the range principle, a change in the stimulus frequencies would not affect his judgments of any of the stimuli unless it also changed his psychological range. Each category would always correspond to half the range. Although dependent upon the physical range, the psychological range cannot be directly inferred from it. Thus, a subject may believe that the stimulus he is judging is the smallest that has been presented, even though it has been preceded by even smaller stimuli. His psychological range must be inferred from his judgments.

The Frequency Principle

The second principle asserts that the judge uses each category for a fixed proportion of his judgments. These proportions may vary for different sets of categories, but we can often assume equal proportions. This will be done for the present tests of the theory. The frequency proportions are fixed in the sense that they are independent of the stimulus conditions, as with the relative sizes of the subranges. But unlike the range principle, the frequency principle implies that the judgments are affected by the stimulus frequencies. Suppose that in the example in which "large" and "small" corresponded to equal subranges, the larger stimuli were presented more frequently than the smaller ones. "Large" would then be used more frequently. To conform to the frequency principle, "large" would have to correspond to a narrower subrange. In this case, the range and frequency principles would encounter. The two principles encounter when stimuli from different parts of the range are presented with unequal frequencies. The theory postulates that the actual judgments reflect a compromise

between the two principles. The nature of the compromise will now be specified in a model which yields quantitative predictions of the judgments⁴.

Despite a growing acknowledgement of the important role that parents and carers play in determining their children's oral health behaviour, theoretical explanations for the way in which parents make decisions in this area are still lacking². Therefore, the present study aims to test the magnitude of parental judgment about their children's oral health behavior using rank range frequency theory among parents or caregivers of children aged 3-6 years.

MATERIAL AND METHODS

An Experimental research was carried out among the parents of children aged 3-6 years old attending a private school in Bangalore city. Convenience sampling technique was used for selection of study subjects.

Ethical clearance was obtained by the Institutional ethics committee of KLE Society's Institute of Dental Sciences, Bangalore. The present study was conducted between Oct 2017 to Dec 2017.

Parents of children aged 3-6 years old only attending private school in Bangalore, who were present on the day of examination were included in the study. A total of 146 individuals were selected. Before the data collection the rapport was established by explaining about the study objectives and importance of the present study.

Participants were randomly allocated to one of the four experimental groups. The first participant to carry out exam was allocated to group 1, second participant to group 2 and so on.

The participants were interviewed for the data collection by handing out a proforma to each parent, which included:

- a) Demographic details
- b) Main manipulation
- c) Post manipulation questions

Demographic details constituted of parents name, age, gender and SES was collected using Kuppaswamy's SES scale.

Questionnaire:

The demographic details part of the questionnaire administered asked the parents for their child's age, gender, SES and then to indicate how often they brushed their child's teeth at home each week. Following which parents were presented with a table showing how many times other parents brushed their child's teeth in a week and was told that the data belonged to a previous similar study.

For the main manipulation parents were asked to rate each of nine brushing routines on a 11 point scale ranging from 1 (very unhealthy) to 11 (very healthy).

Post manipulation questionnaire asked the parents to use same 11 point scale to indicate how healthy they believed their own child's brushing routine was and to estimate how often they thought an average child in their son's or daughter's school class might have their teeth brushed at home each week.

All groups answered same pre and post manipulation questions. The main manipulation was the set of nine brushing frequencies that was answered by each parent. The parents were shown one of the four different sets of numbers depending on group allocation. Group 1 and 2 the brushing frequencies was manipulated to test 'rank principle' whereas group 3 and 4 distributions were manipulated to test 'range principle'.

Rank principle:

The participants of group 1 and 2 were presented with a chart of brushing frequencies whose distribution is depicted in the table 1. They were told that the numbers represent the frequency of brushing of child's teeth reported by various parents in a normal week which was shown in randomized order.

The frequencies that were common in both the groups were highlighted in red for illustrative purpose. All frequencies were presented to participants for black text.

The range (12) i.e., the difference between the max value (14) and

minimum value (2) were same for both the groups and also the sum of brushing frequencies (72).

The highlighted values (5, 8 and 11 times per week) were used as reference points and were common to both the groups. The three reference points were of equal proximity to the min, max and mean value of each group.

The reference points in both the groups differed in their rank position which was the only difference between groups. In group 1 '5 times per week' was ranked at 8th out of 9 which was the second lowest value in the group whereas in group 2 it was ranked at 6th position which was fourth lowest value. '11 times per week' was ranked at 2nd position which was second highest value in group 1 whereas it was ranked at 4th position which was fourth highest value in the group 2. In both the groups '8 times per week' was ranked in the middle (rank 5) of the table.

Due to their proximity to the range and distance from mean was same, any difference in the way that 2 groups rated '5 times per week' and '11 times per week' frequencies could only be allocated for by the fact that these values differed in their rank position. This allowed for a direct test of the rank principle.

Range principle:

The participants of group 3 and 4 were presented with another distribution of brushing frequencies. Again they were told that the numbers represent the frequency of brushing child's teeth reported by various parents each week, which was generated randomly for each participant.

The sum of brushing frequency (95) and the range (16) was equal for both the groups, despite the different distributions.

However, the only difference that was seen between the groups was that in group 3, majority of the values were close to the top of the range (negatively skewed distribution), while in group 4, majority of the values were closer to the bottom of the range (positively skewed distribution).

This directly tested the range principle. In theory, as the average frequency was same for both the groups, the average rating given to the brushing frequencies should be equal between the 2 groups.

Any significant difference in the sum of subjective health ratings between 2 groups could therefore only be accounted for the proximity of the frequency to the min and max values in each group.

Statistical Methods:

All the data collected was then subjected to statistical analysis using SPSS v 19.0 statistical package. Data was subjected to descriptive and inferential statistical analysis. Results on continuous measurements are presented as Mean SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

To test the rank principle, a two-factor mixed factorial ANOVA was done, where group 1 and group 2 were considered as between subject factor and brushing frequency as within subject factor. This analysis tested for main effects of brushing frequency and group, and for an interaction between the two factors. Effect sizes for significant findings are reported using the eta squared statistic (η^2) (Cohen, 1973).

To test the mean difference between 2 groups in terms of parents' ratings of their own child's brushing frequency and estimated 'norm' for weekly brushing frequency, One-way ANOVA was used. Effect sizes for significant findings were reported using the Cohen's d statistic (Cohen, 1992).

One-way ANOVA was used to test the range principle which would test mean differences in the average scores allocated to all nine brushing frequencies, with group as between subject factor, further one-way ANOVA was used to look at the mean healthiness score that each group assigned to the '14 times per week' frequency, which was found common to both groups and ranked the same (3rd out of 9) in both groups.

RESULTS

There were no significant differences found between the groups in terms of the frequency with which parents reported brushing their

child's teeth or by the child's age analysed by one way ANOVA.

Chi square analysis was carried out to find difference in the distribution of socio economic status between the groups which was non-significant. It was also found that there was no significant difference in children's gender between the groups.

Rank principle:

The mean healthiness rating across the two groups was mainly affected by the brushing frequency, whereby the frequency of brushing was rated and was seen that "11times per week" was generally rated as healthier than "8times per week" which was in turn rated as generally healthier than "5times per week".

No overall difference was found in healthiness rating when averaging the ratings assigned to 5, 8 and 11 times per week between the groups. However, a significant interaction effect between group membership and brushing frequency was found.

The results were congruent with the prediction done by the rank principle of RfT. Group 1 participants rated "5times per week" as less healthy than the group 2 participants. The only way that the "5 times per week" frequency differed between the groups was the fact that among the other brushing frequencies, it was ranked lower in group 1 (8th of 9) compared to group 2 (6th of 9). Conversely "11times per week" brushing frequency was rated as more healthy by group 1 participants than those in group 2; again, the reason being the item differed in rank position between the 2 groups, group 1 (2nd of 9) which was ranked higher compared to group 2 (4th of 9). "8times per week" frequency had same rank in both the groups and did not present any difference in health ratings. This significant interaction effect therefore suggests the compliance in judgements of tooth brushing frequencies with the rank principle of RfT.

If absolute judgements were made about healthiness of different brushing frequencies, no difference would have been seen in the ratings assigned to "5times/week" and "11times/week" frequencies between the groups.

Range principle:

A significant main effect of group on average healthiness rating of all items was observed, whereby group 3 participants rated 9 brushing frequency as significantly more healthy on an average than those in group 4.

The mean and sum value of nine brushing frequencies were same which were shown to the 2 groups. If absolute judgement about the healthiness of brushing frequencies were to be made, then the average ratings assigned to the 9 items would have no difference. This significant difference between the 2 groups is therefore consistent with the range principle of RfT: the only difference between the groups was the distribution was positively skewed in group 4 with a max value of 21 times per week, hence the frequencies seen by the participants were generally further away from the top of the range, whereas the distribution was negatively skewed in group 3, with a maximum value of 16 times a week, hence the frequencies seen by the participants were generally quite close to the top of the range.

Group 4 participants rated their own child's brushing routine as significantly less healthy than group 3 participants, despite no difference in reported brushing frequencies of their child's teeth by the parents in two groups.

There was also no statistically significant difference in the "norm" of higher weekly brushing frequency estimated by group 4 participants than those in group 3.

DISCUSSION

With 60–90% of children worldwide reportedly experiencing dental caries, poor oral health in the younger years is a major public health issue (WHO, 2012). As parents play a key role in children's oral hygiene practices, the aim of the current study was to assess the parental judgment about their children's oral health behaviour using rank range frequency theory among parents or caregivers of children aged 3–6 year.

In a cross-sectional study in southern Taiwan, caregivers' tooth brushing was a significant indicator for the tooth brushing behaviour of the children. In the study by Mohebbi et al., the frequency of oral

cleaning for the child was directly related to the mother's tooth brushing frequency. The brushing habits were mainly introduced by mothers. Hence, mothers should not only obtain oral health knowledge but also be aware of their role-modelling responsibility to children. Health promotional activities seem necessary for maternal to enhance oral health behaviour of their children.⁵

The results of the study showed that parents' judgements about the healthiness of various weekly tooth brushing frequencies adhered to the rank and range principles of Range Frequency Theory. Parents tended to rate tooth brushing frequencies as more healthy when they were ranked relatively high among the other frequencies shown to them, and they ranked brushing frequencies as more healthy when they were closer to the maximum brushing frequency presented.

These findings add to a growing research base showing that the two principles of Range Frequency Theory can accurately predict people's relative judgements in areas such as alcohol risk perception, body image, happiness and satisfaction with salary (Wedell et al., 2005, Brown et al., 2008, Boyce et al., 2010a, Wood et al., 2011, Wood et al., 2012b). This is, however, the first study to show that the rank and range principles can be used to understand people's judgements about what represents a healthy oral hygiene routine.²

The results also demonstrated that showing parents different types of information about what others do, affected how healthy they rated their own child's brushing routine.

Parents in Group 4, who were shown an example of a parent who brushed their child 21 times a week (or 3 times a day), subsequently rated their own child's brushing frequency as significantly less healthy than those in Group 3. This difference existed despite parents from the two groups reporting similar frequencies for brushing their child's teeth at the beginning of the experiment.

This effect of showing people different information about what others do has been shown to influence people's subsequent judgements in other areas as well. Wood and colleagues, for instance, demonstrated that participants expressed less gratitude for being loaned a fixed amount of money or given certain duration of help when they had previously been shown examples of people who had received more money or help (Wood et al., 2011). However, this is the first study to demonstrate that presenting different types of information about what other people do can influence people's view on the health of their own (or in this case, their child's) tooth brushing frequency.

Previous research has suggested a possible link between parents' oral health knowledge or literacy and their child's oral health behaviour. In the current study, the overwhelming majority of parents were aware of – and often mentioned without prompting – the 'twice a day' tooth brushing norm, suggesting that this traditional oral health message was well understood among this group.

Parents' behaviour, however, appeared to be related to their perception of how often other parents actually brushed their child's teeth – what is commonly referred to as a 'descriptive norm', rather than the twice-a-day 'prescriptive norm'. In many instances, parents assumed that their own behaviour (whether they brushed their child's teeth frequently or infrequently) was similar to that of most other parents.

Recent research has suggested that adolescents tend to overestimate how often their peers consume alcohol and sweet drinks and that the degree of overestimation is typically related to their own level of consumption. The findings of the current study suggest that parents may exhibit similar biases in their estimation of tooth brushing norms. Peer group comparisons also appeared to exert some influence on how satisfied parents were with the frequency with which they brushed their child's teeth: some parents who brushed their child's teeth infrequently were nonetheless satisfied with their behaviour, due to their belief that most other parents acted similarly. These findings are consistent with research suggesting that satisfaction with a wide range of outcomes, such as personal income and body image, is heavily influenced by social comparisons.

The stability of day-to-day home routines, the perceived immediacy of the benefits of tooth brushing, and perceptions of how often other parents brush their children's teeth all appear to be important factors for parents from socio-economically deprived backgrounds when thinking about brushing their children's teeth at home.

LIMITATIONS

1. Convenience sample of parents or caregivers of children aged 3-6 year attending the KLE International School Rajajinagar, Bangalore that may influence its interpretation and generalizability. So results cannot be assumed to apply to the general population.
2. Lack 'ecological validity' – they may not be a realistic approximation of the way in which participants would make decisions in a similar 'real-world' situation.

CONCLUSION

- The current study suggests that decisions about tooth brushing are influenced by the same cognitive processes (the rank and range principles) that predict people's judgements in other aspects of life.
- The findings reported here suggest that Range-frequency Theory may offer one framework for designing oral health education messages or behaviour-change interventions aimed at parents of young children.

TABLES**Table No.1: Distribution Of The Study Subjects According To Age**

Groups	N	Minimum	Maximum	Mean	Std. Deviation
G 1	37	4.00	6.00	4.89	0.77
G 2	37	3.00	6.00	5.89	1.59
G 3	38	4.00	6.00	5.05	0.86
G 4	38	4.00	6.00	4.68	0.90

P=0.073

Table No. 2: Distribution Of The Study Subjects According To Gender

Child's gender	Group	Male (n)	Female (n)	P value
	Group 1	18	19	0.208
	Group 2	24	13	
	Group 3	16	22	
	Group 4	22	16	
	Overall	80	70	

Table No. 3: Distribution Of Study Subjects According To Frequency Of Brushing

Groups	N	Minimum	Maximum	Mean	SD
G 1	37	6.00	18.00	10.78	3.06
G 2	37	7.00	14.00	10.75	2.83
G 3	38	5.00	24.00	10.16	4.66
G 4	38	5.00	14.00	10.86	2.49

P=0.149

Table No. 4: Comparison Of Health Ratings Assigned To Different Brushing Frequencies, By Group (group 1 V Group 2) (table - 7)

Weekly brushing frequency	Group 1					Group 2				
	N	Mean	Standard deviation	Min value	Max value	N	Mean	Standard deviation	Min value	Max value
2	37	1.22	.417	1	2	37	1.08	.277	1	2
3						37	1.76	.495	1	3
4						37	2.46	.836	1	4
5	37	2.24	.760	1	5	37	3.84	.986	2	6
6	37	3.19	.908	2	6					
7	37	4.19	1.221	2	8					
8	37	5.41	1.301	3	9	37	5.43	1.094	2	7
9	37	6.43	1.345	4	9					
10	37	7.73	1.194	5	10					
11	37	8.76	1.321	5	11	37	6.54	1.043	3	8
12						37	7.73	1.387	3	10
13						37	9.00	1.509	4	11
14	37	9.89	1.329	6	11	37	10.05	1.201	5	11

Comparison Of Health Ratings Assigned To Different Brushing Frequencies, By Group (group 3 V Group 4) (table - 5)

Weekly brushing frequency	Group 3					Group 4				
	N	Mean	Standard deviation	Min value	Max value	N	Mean	Standard deviation	Min value	Max value
0	38	1.08	.273	1	2					
5						38	3.21	1.255	1	5

6	38	2.71	1.183	1	6	38	4.03	.944	2	6
7	38	3.74	1.389	1	7	38	5.03	.788	4	7
8						38	6.00	.805	4	7
9						38	6.82	.865	5	8
10						38	7.71	.927	6	9
11	38	5.37	1.792	1	8					
12	38	6.55	1.639	2	9					
13	38	7.47	1.589	3	9					
14	38	8.58	1.328	6	11	38	8.63	1.025	6	11
15	38	9.53	.979	6	11	38	9.53	.893	7	11
16	38	10.66	.627	8	11					
21						38	10.47	.762	8	11

Testing The Rank Principle Of Range-frequency Theory, By Group (group 1 V Group 2) Two Way Mixed Factorial Anova (table - 6)

			F value	P value	Partial Eta Squared
Multivariate Tests	Brushingfrequency * Groupcode	Pillai's Trace	2.597	.082	.068
	Brushingfrequency	Pillai's Trace	797.807	.000	.957

	F value	P value	Partial Eta Squared
Tests of Between-Subjects Effects	.125	.724	.002

Testing The Range Principle Of Range-frequency Theory, By Group (group 3 V Group 4) One Way Anova (table - 7)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.389	1	1.389	.156	.699
Within Groups	142.889	16	8.931		
Total	144.278	17			

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