Promoting Dental Care to Children Using Traditional and Interactive Media Following Threat Appeals

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1 Abstract

In a 2x3 between subjects factorial design with control group, this study investigates the impact of a low versus high threat appeal and the medium type by means of which subsequent health information is conveyed (game, information brochure, narrative story) on the adaptive behavior of 7-9 year old children. The results show that a strong perceived threat concerning the risks of bad dental hygiene has a more positive effect on children's adaptive behavior (choosing fruit instead of sweets) than a weak threat appeal. When afterwards, additional information concerning oral care is provided, the effectiveness of the threat message appears to depend on the medium used to communicate this health information. Results show that the attention children devote to the task (reading, playing, listening) interferences with the effectiveness of the preceding threat message. As a result, the positive effect of threat appeals on adaptive behavior only seems apparent when children are exposed to a subsequent narrative health-related story.

2 Introduction

In recent years, computer games have become an important part of children's lives. Gaming is not only one of their favorite pastime activities, but games are also increasingly used by marketers in an attempt to influence children's purchase behavior. Today, almost every food and beverage brand targeting children has an advergame on its website. Advergames are *"computer games specifically created to function as advertisements to promote brands"*, con-

taining brand identifiers such as logos and brand characters (Kretchmer, 2005, p.7). Games can also be powerful learning tools. Several authors (e.g., Gee, 2003; Prensky, 2001) argue that computer games can be more enjoyable, more interesting and thus more effective than traditional learning modes to increase children's knowledge. Empirical studies that evaluated the impact of the use of games within disciplines such as mathematics, science, language, geography and computer science show positive outcomes in terms of learning effectiveness in relation to curricular objectives (e.g. Rosas et al., 2003; Papastergiou, 2009). However, these authors mainly focus on the learning ability of games rather than their persuasive impact for social marketing purposes. In the area of health education, playing computer games has often been seen with skepticism (e.g. Bale, 1994; Funk and Buchman, 1995).

Previous research shows that playing advergames can indeed affect children's food preferences and eating patterns (e.g. Mallinckrodt and Mizerski, 2007). However, the advergames in these studies generally market products of low nutritional value (Moore, 2006). An exception is the study by Pempek and Calvert (2009), showing that playing games which promote the consumption of healthy food has a positive influence on the selection of higher-quality snacks among children. Therefore, the question in the present study is whether computer games can also be useful to promote other health related behavior, for example concerning dental hygiene. Until now, social marketing campaigns mainly targeted children using traditional media (like information brochures and narrative stories told by parents, teachers, ..). However, little is known about the effectiveness of computer games in increasing health related knowledge and, as a consequence, desirable health behavior with children between 7 and 9 years old.

Within the domain of social marketing, a common persuasive strategy is the use of threat appeals. However, threat appeals have mainly been investigated in traditional advertising media (print & TV), neglecting their impact in an interactive environment. In ad-

dition, there is little research concerning the effect of threat appeals on 7 to 9 year old children.

Besides warning them about the dangers of undesired behavior, it is also important to provide children with additional health related information. Children need to learn why it is important to keep their teeth clean and healthy, since more and more primary school children experience tooth decay caused by bad diet and bad dental hygiene. To date, health information was mainly communicated to children through traditional media. The question arises whether computer games may also be used to increase health related knowledge, and whether this medium is more effective than others for this purpose. Therefore, the impact of interactive games as medium to transfer health related knowledge should be compared to the impact of other media types, such as a traditional information brochure and a narrative story (for instance, told by parents or in a classroom).

The present study investigates the effect of high and low threat messages concerning the importance of dental hygiene on children's behavioral outcome (healthy/unhealthy snack choice). Further, we investigate how these effects are moderated by the type of medium used to communicate dental health information after this threat appeal. The main contribution of the present study is to investigate which medium used to convey this additional information following a message evoking either a low or a high level of threat leads to the best adaptive behavioral results.

3 Conceptual Framework and Hypothesis Development

2.1 Threat appeals

Threat appeals are *"persuasive messages designed to scare people by describing the terrible things that can happen to them if they do not do what the message recommends."* (Witte, 1992, p.329). One of the most comprehensive frameworks on how these threat appeals work is the Extended Parallel Processing Model

(EPPM; Witte, 1992). According to the EPPM, threat appeals may evoke a danger or a fear control process, depending on perceived threat and perceived efficacy (the perception that the threat is reduced when the recommended behavior is adopted). When the threat is not perceived as severe, individuals will not be motivated to process the threat appeal. When the threat is perceived as severe in combination with a high level of perceived efficacy, the threat appeal leads to a danger control process, which motivates individuals to process the message, and is likely to lead to message acceptance and adaptive behavior. When the perceived threat is high but the perceived efficacy is low, individuals are not motivated to process the threat appeal and try to reduce the unpleasant fear experience by maladaptive responses (such as avoidance, denial and counter argumentation). This process is called fear control (Rippetoe and Rogers, 1987).

In other words, only a combination of a perceived threat that is high enough and a high perceived efficacy will motivate people to adapt their behavior following the recommendation in the message (Blumberg, 2000). The fact that, given a sufficiently high level of efficacy perception, a higher level of threat leads to significantly higher intention to adopt the recommendation in the message and to more adaptive behavior, is well-established (Cauberghe et al., 2009), as is the fact that children are very susceptible to threat-related information (e.g., Field and Lawson, 2003). This leads to the hypothesis that children's consumption of healthy (vs. unhealthy) food can be influenced by manipulating their feeling of perceived threat, when perceived efficacy is sufficiently high. In this study, children are either exposed to a high or a low threat message warning them about the dangers of unhealthy teeth. Since children may have difficulty to understand the relationship between consuming low-quality food and ugly, unhealthy teeth (which is portrayed as one of the undesirable consequences in the high threat condition), perceived efficacy is controlled for. All the children are told that they can avoid this threat by brushing their

teeth regularly and eating healthy food. Effects are measured on children's behavior, making them choose between a healthy and an unhealthy snack. Hence, we expect:

> *H1:When the perceived threat is high, there will be significantly more children who adapt their behavior (choosing a healthy snack) than in the low threat condition*

2.2 Threat appeals in a traditional and an interactive context

Before we investigate whether the traditional theoretical insights with respect to threat appeals can also be effective in combination with an interactive, digital media context, it is important to take a look at the characteristics of each medium type studied. Contrary to traditional media (like brochures), computer games are digital, interactive and highly vivid (visually and auditory stimulating) (Prensky, 2001). Games do not only give players a sense of active control over what is happening in the game, they also provide challenge and competition. Due to the embedded interactivity, games can also induce an experience of fun and escapism (Refiana et al., 2005). As a result, games can encompass and capture a player's full attention, as if the player were actually part of the game environment. This has to do with the *immersion* effect of games (Ryan et al., 2006). Immersion is a feeling of being absorbed by the environment. Therefore, we can expect that attention devoted to the game will be high.

Similarly, reading a textual brochure is a complex process for 7-9 year olds (Shepardson and Pizzini, 1991). According to Maibodi (2008, p.42) *"reading requires the reader to focus attention on the reading materials and integrate previously acquired knowledge and skills to comprehend what someone else has written."* Consequently, both playing a computer game and reading a brochure allows self-pacing, which can enhance the attention devoted to this activity.

Listening to a narrative story, on the contrary, is an activity that children cannot do at their own speed or pace. Also, previous research found that listening to stories requires less active processing and a smaller set of cognitive demands, compared to reading (Berl et al., 2010). Although narrative stories have proven to be valuable learning tools (e.g. in a classroom), we expect that they require less focused attention to process:

> *H2: Children devote more attention to a game and an information brochure than to a narrative story*

When a threat message is followed by additional information, conveyed through a medium to which children devote a great deal of attention, this can lead to interference with the preceding threat information. This interference effect, defined as *"the process by which our ability to recollect information is hindered by our exposure to some other information"* (Kumar, 2000, p.155) can decrease the effectiveness of the strong threat appeal preceding the additional health information. In other words, when children devote a great amount of attention to the medium following the threat appeal, they may 'forget' about the threatening message Therefore, the effect of the strong threat message on children's adaptive behavior will be stronger after hearing the narrative story than after playing the game or reading the brochure:

> *H3: Contrary to children who played a game or read a brochure, children who were exposed to a narrative story show more adaptive behavior (chose more healthy snacks) after previous exposure to a strong than to a weak threat appeal.*

3 Materials and Method

A 2 (low threat vs. high threat) x 3 (medium to convey extra health information: computer game – information brochure - narrative story) between subjects factorial design was used to test the hypotheses. For the interactive game condition, we used an existing computer game that was developed to teach children the importance of regular teeth brushing, eating healthy food and going to the dentist through interactive game play. The information brochure and narrative story were developed in such a way that both contained the same information as the computer game, only presented in a different way. In all three media, a beaver named Ben was introduced to explain the importance of dental hygiene, eating healthy food and going to the dentist to the children. In the computer games, the children were challenged to, for example, brush teeth using the mouse and distinguish healthy from unhealthy food, receiving bonus points when succeeding. The same information was incorporated in the story, but this time it was told in a more narrative, descriptive way (*"once there was a beaver named Ben"* etc.). For the brochure, the same format was followed as in a traditional classroom textbook.

The respondents were all third grade pupils, recruited from 10 different primary schools across Flanders (Belgium). The schools were selected across the five Flemish provinces, using quota reflecting the population of the provinces. Children of the age seven to nine were chosen because at this age children are capable to read information brochures and they also have the skills to play the computer game properly. In total, 190 children participated (50% male, average age of 8.13 years). The children were randomly exposed to one of the six conditions. After receiving some basic information about the study, the children were either exposed to a weak or a strong threat message. In the high threat condition, children were informed about the consequences of untended teeth, stressing the related dangers and risks. To stress the manipulation, children also saw a picture of affected teeth with caries (see figure

1). In the low threat condition, the consequences were described as less severe. In this condition, children saw a picture of healthy teeth (see figure 2).

Figure 1: strong threat stimulus

Figure 2: weak threat stimulus

All children were told that they could avoid these negative consequences by brushing their teeth regularly and eating healthy food in the same way in all experimental conditions, hereby controlling for perceived efficacy. Following the threat message, the respondents were randomly assigned to one of the three media, i.e. they played the computer game, read the brochure or listened to the narrative story. Also, a control group was included in which children were not exposed to any stimuli. Afterwards, each participant was asked to fill in a standardized questionnaire and to choose a snack as a reward for participating. By making them choose between a piece of fruit (0) or a candy (1), (non) adaptive behavior was measured. The snack choices were the same foods that were used as an example in the computer game, the brochure and the story. Children from the control group received a shorter version of the survey, after which they could also choose between the two snacks. Following previous research (e.g., Pempek and Calvert, 2009) and given the young age and limited reading skills of the target audience, we adjusted existing scales, simplifying them into one item, 4 point Likert scales. Self-reported attention (Hart and Staveland, 1988), perceived threat and perceived efficacy (Witte, 1992) were measured.

To assess the success of our manipulation, a pretest was conducted. 18 children (50% male, mean age 8.11 years) were either exposed to the high or the low threat message and picture, after which they were asked to indicate the level of perceived threat on a 4-point Likert scale. Results confirm that the level of threat experienced by the low threat group was significantly lower than the threat experienced by the high threat group ($M_{\_low\ threat}$= 1.5 vs. $M_{\_high\ threat}$= 2.4, $t(16)$= 2.155, p= .047). As expected, perceived efficacy was high and did not differ between the low (M= 3.86) and the high threat group (M= 3.80, $t(139)$=.770, p= .443). Finally, the time necessary to play the game and read the brochure was examined, as well as the duration of the narrative story. Results show no significant differences between the three exposure times (M_{game}=339sec, $M_{brochure}$=377sec, $M_{narrative\ story}$=360sec, $F(152)$= 2.403, p= .094).

4 Results

The results of the manipulation check in the main study confirm that the perceived threat was significantly higher in the high threat condition than in the low threat condition ($M_{\_low\ threat}$ = 1.88; $M_{\_high\ threat}$ = 3.22, $t(139)$= 10.481, p< .001).

The results show a main effect of the level of threat on choice behaviour. After receiving the high threat message, significantly more children chose a healthy snack (59%) than the children from the low threat condition (41%; Chi^2= 5.487, p= .019). This supports H1. Also, compared to the children from the control group, children who were exposed to a high threat message chose significantly more healthy snacks (Chi^2= 7,687; p= .006). The difference between the children from the control group and the low threat condition, however, did not appear significant (Chi^2= .792; p= .373, see figure 3).

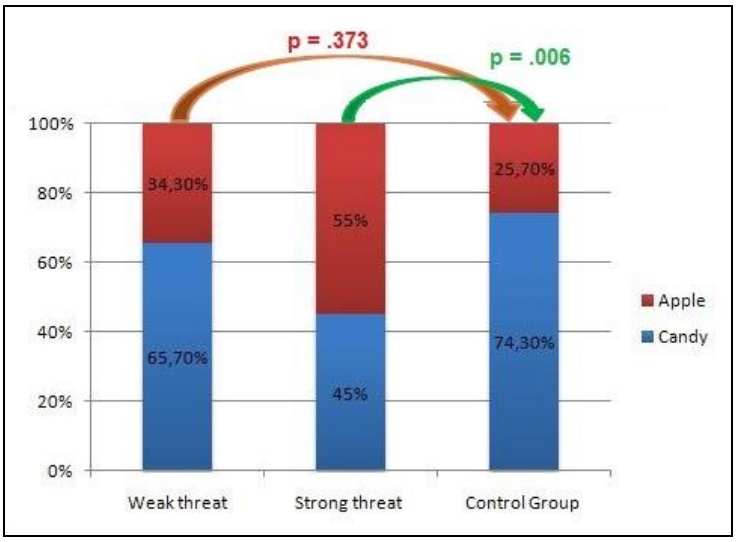

Figure 3: Children's healthy versus unhealthy snack choice

The main effect of medium type on self-reported attention was analyzed using ANOVA. The main effect of medium type on self-reported attention is significant ($F(152)= 4.890$, $p=.009$). As expected, the children paid significantly more attention to the game (M= 3.57) than the narrative story (M= 3.23, $t(103)= 2.643$, $p= .009$). The same can be said for the brochure (M= 3.56, $t(99)= 2.461$, $p= .016$). H2 is supported.

The effect of the medium used to convey extra information on snack choice was tested by means of Chi² analyses. The main effect of medium type on choice behavior was not significant (Chi²= 3.324, p= .190). However, the interaction effect of threat appeal and medium type on choice behavior was. When looking at the snack choice after using the different media, Chi² tests show that the children who played the computer game and read the brochure showed no significant difference in snack choice after being exposed to either the low or the high threat condition. After playing the computer game, 24% of the children choose a healthy snack in the low threat condition versus 46% of the children from the high

threat condition. (Fisher's exact test p=.330). After reading the brochure, 52% of the children choose a healthy snack in low threat condition versus 57% in the high threat condition (Fisher's exact test p=.782). However, after being exposed to the narrative story, 19% of the children in the low threat condition choose a healthy snack, while in the high threat condition 67% preferred the healthy snack over the candy (Fisher's exact test p=.006). These results support H3. Figure 4 shows the share of healthy snacks chosen by the children in both the weak and the strong threat condition, relative to the total amount of children in both conditions.

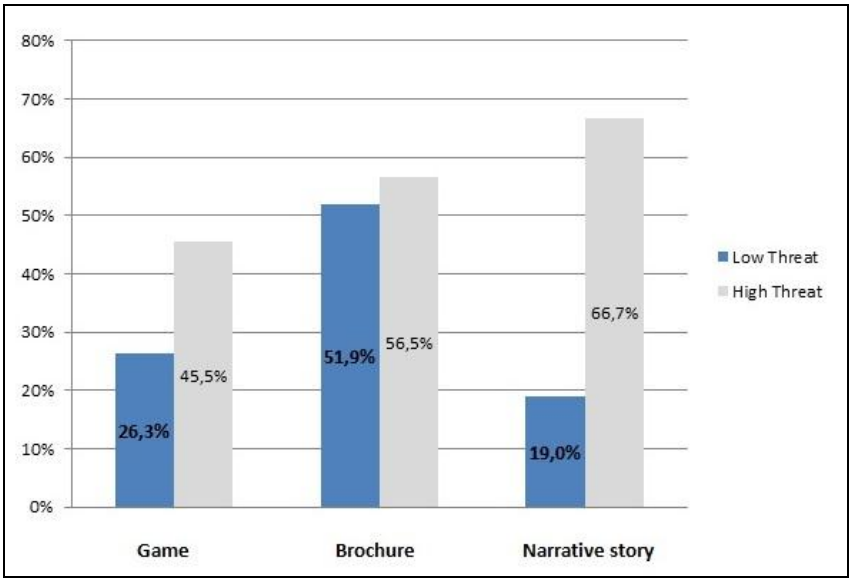

Figure 4: Percent of healthy snacks chosen by children

5 Discussion, Conclusion and further research

The results of the present study show that the effect of threat appeals on adaptive behavior of 7 to 9 year old children is not different from their effect on adults. Under high levels of efficacy, a high threat appeals leads to more adaptive behavior than a low

threat appeal. However, when children are provided with additional health-related information after the threat message, the effectiveness of this threat message appears to depend on the medium used to communicate this extra health information. The results only show a positive effect of a stronger threat appeal on adaptive behavior when the children listened to a story. For children who played the game or read the brochure, the level of perceived threat had no effect on their snack choice. This can be explained by the attention demanding task of playing a game and reading a brochure. Games are immersive and interactive, and children devote a lot of attention to them. Reading a brochure also requires the reader to focus attention on the reading material, certainly for children within the age category 7-9 years. Indeed, the results show that active reading or game playing leads to high focused attention. This interference with the preceding threat message weakens its effect. Listening to a story, however, is a rather passive activity which requires less attention, therefore allowing the threat appeal to 'stay in' better. In sum, when a threat message is followed by additional health information, the medium through which this information is presented influences the effectiveness of the preceding threat message. This study implicates that for children who are afraid for dental caries, the combination of a strong threat appeal and a supplementary narrative story is the best communication strategy amongst the ones tested. Games, pleasant and attention-getting as they may be, are not the most effective medium to reinforce a strong threat appeal.

The limitations of the current study suggest directions for further research. First, only one social topic, namely dental hygiene and the related importance of healthy food was examined. Future research should compare the effect of threat appeals for different topics in the domain of social marketing. In addition, the computer game, the brochure and the narrative story were only played, read or heard once. It would be interesting to investigate the effect of these media after repeated exposure to the stimuli. Also, we meas-

ured attention allocation with self-reported measures. Although this might give a good indication, further research could use, for example, eye-tracking or recall methods to measure attention allocation more validly. Finally, the effects of threat messages were only tested on 7-9 year olds. Further research should incorporate additional age categories.

6 References

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