

Article

The Effect of Message Framing on Preschoolers' Attitudes and Behavioral Intentions: Influences of Age, Issue Involvement, and Delivery Method

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Abstract: Many previous studies have revealed that people's decision-making may differ depending on message framing—whether the same content is presented with an emphasis on gain or loss. However, almost nothing is known about preschooler responses according to message framing. This study aimed to identify the characteristics of the message framing effect in preschoolers and to examine the influence of age, issue involvement, and delivery method on this effect. A total of 180 participants ranging from 3–5 years of age were randomly assigned to one of four conditions with different combinations of frame types and delivery methods. The attitudes and behavioral intentions of the children toward the messages were measured via questionnaire. The results showed that the effect of persuasive messages increased with age ($p < 0.001$, $\eta_p^2 = 0.14$) and was higher when the messages were more relevant to children ($p < 0.001$, $\eta_p^2 = 0.15$). Furthermore, loss-framed messages were more effective than gain-framed messages for issues delivered verbally with pictures, while the opposite was true for issues delivered only verbally ($p < 0.001$, $\eta_p^2 = 0.06$). These results enable developmental and theoretical discussions of the framing effect in children and provide practical data for improving the persuasion efficacy of message delivery in children.

Keywords: message framing for preschoolers; issue involvement; delivery method; attitudes and behavioral intentions



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1. Introduction

Early childhood education promotes children's holistic development, including physical, socio-emotional, and cognitive aspects, while instructing children in basic habits regarding health and safety. It includes topics such as personal hygiene, diet, and coping with accidents and emergencies. Such education can serve as a foundation for preschoolers' development and tends to be strongly persuasive in its ability to induce desirable attitudes and behaviors. When conveying persuasive messages such as "you should always brush your teeth after eating" or "you should wash your hands after outdoor activities," it is important to give children reasons for doing so in order to affect their attitudes and behaviors in the long term. Therefore, it is necessary to research and discuss strategies adults can use to more effectively and persuasively deliver educational messages to children. However, it is difficult to find in-depth research regarding this topic.

The most widespread current behavioral economic theory is prospect theory [1,2], which considers that people value loss more than gain (of equal value). It posits that people tend towards risk aversion when gains are anticipated and towards risk-seeking when losses are anticipated, taking risks for even the smallest of gains. This theory has led to

countless studies on message framing in the fields of health communications [3–5], public service campaigns [6,7], and marketing [8,9], among others.

Message framing refers to a communication strategy that aims to motivate human behavior using a persuasive message that highlights either gain or loss [10]. Gain-framed messages emphasize the expected gain from behaving a certain way, while loss-framed messages emphasize the expected loss from not behaving a certain way. Early studies on this topic found that loss framing was more effective at motivating people, which was interpreted in the context of prospect theory's loss aversion [11]. However, later studies have failed to produce consistent results; researchers have explained the mixed results by referring to moderating variables.

Perceived risk is one of the most actively discussed moderating variables. Based on the certainty effect of prospect theory [1], researchers have suggested that presenting a loss-framed message is more effective for behaviors with high perceived risk (e.g., early detection of cancer), while a gain-framed message is more effective for behaviors with low perceived risk not accompanied by special risks (e.g., use of disease prevention products) [5,12–14]. In addition, it has been determined that individual differences in perceived risks are related to certain behaviors that influence the framing effect [15,16]. Another moderating variable of the framing effect that has been suggested in many studies is issue involvement. Researchers have confirmed that if the message recipient has a close connection to the issue or if the message is processed in depth, a loss-framed message is more persuasive than a gain-framed message, and vice versa [4,8,17,18]. These results were mainly interpreted through the Elaboration Likelihood Model [19]. Finally, another moderating variable that has recently attracted attention is the method of message delivery. Researchers have suggested that conveying messages with visual aids allows for more thorough encoding of information and induces more specific and in-depth cognitive processing than verbal messaging alone [20,21].

As such, a number of diverse studies regarding message framing have been conducted, but the study participants have been almost entirely limited to adults. Even though persuasive messages for young children are frequently delivered in daily life and may have great educational and developmental meaning, children's responses to these persuasive messages and the framing effects in children have not been studied in depth. Early childhood is a crucial period, in which children's cognitive, linguistic, and socio-moral development appears rapidly [22–30]. Thus, their responses to persuasive messages and framing effects may differ from those of adults as well as according to age group. In this context, the purpose of this study is thus to examine the influence of preschoolers' age, issue involvement, and delivery method on message framing in light of the established research and new experimental data in the course of discussing the best persuasion strategies to adopt in early childhood education.

1.1. The Effect of Age on Message Framing

During early childhood, cognitive, linguistic, and socio-moral development are abruptly brought up. First, in terms of cognitive development, children concentrate their attention by themselves and their ability to control attention voluntarily as their age increases to 2.5 years, 3.5 years, and 4.5 years [31,32]. As short-term memory capacity increases during these years, children can catch the changes of objects up to two or three items for 3- or 4-year-olds, and up to three or four items for 5- or 7-year-olds [29]. Furthermore, the performance of complex inhibition tasks that require suppressing the dominant response and executing the opposite response is possible from the age of two and greatly improves between the ages of 3 and 5 [23,24].

Children are constantly stimulated by language after birth and show great overall improvement in language skills in the process of remembering and imitating the language of others around them. Grammatical morphemes appear in children's language after 30 months, and syntax-like structures appear when overlapping sentences are used.

Moreover, as the vocabulary for use increases exponentially, language comprehension and expression skills increase significantly after the age of 2.5 years [22,25].

Children's socio-moral development appears during these years as well. The theory of mind that is needed in order for children to recognize and understand other people's beliefs, desires, intentions, and emotions develops greatly between the first and second half of the age of 4, and the higher-order mind theory develops greatly between the first and second halves of the age of 5 [33,34]. It has been revealed that the self-regulating ability to generate and control motivation to achieve individual wishes and emotional execution functions that delay satisfaction and resist temptation for immediate beneficial results also develop significantly in early childhood [35,36]. The emergence of independent behavioral self-regulation begins between 12 and 36 months, and develops further within a supportive context in which parental guidance and scaffoldings are provided [37,38]. By the age of 3 or 4, children who have been exposed to parental guidance (that models appropriate behavior, encourages, and demands appropriate behavior) begin to internalize social norms and expectations [26,30,37].

According to Kohlberg [39,40], most children before the age of 9 are at the level of pre-conventional morality. At this level, moral judgment is given externally, and is judged according to the rules of the authority that provide punishment or compensation. Within this level, children go through Stage 1 (obedience and punishment) and reach Stage 2 (individual needs and exchange). He mentions that social interactions are important for children's moral development. As parents encourage children to take others' perspectives and provide more opportunities to engage in conversations about issues that have values, they can promote the progress of moral thinking in children [27,28,41].

As such, the cognitive development that occurs between the ages of 3 and 5 facilitates language understanding, situational judgment, causal understanding, and future prediction [42–45], and the development of executive function and social moral development leads children to follow adult rules and regulate their behavior in order to interact naturally with others [33–35,39,40]. These various developments in early childhood suggest that framing effects may differ according to the age of children. For example, if children become more sensitive to risk and have a higher risk perception as their age increases due to cognitive development and social experiences, it can be postulated that loss-framed messages might be more persuasive than gain-framed messages to older children.

However, the results of previous studies are not sufficient to prove this hypothesis. Kim and Kim [46] delivered public service announcements about water conservation and preservation using gain- and loss-framed messages, and showed that the latter were more effective with students in both lower and upper elementary grades. Meanwhile, a study by Improgo and colleagues [47] gave audiovisual presentations to first-graders about the necessity of hand-washing and found that only gain-framed messages increased children's hand-washing knowledge and beliefs. Bannon and Schwartz's [48] study presented gain- and loss-framed messages about the importance of healthy nutrition to kindergarten children, then compared their responses when selecting apples as a snack. Both the gain- and loss-framed message groups showed improved behavior compared to the control group, but there was no significant difference between them. As such, previous studies have not shown consistent results or patterns by age; in particular, few studies have specifically examined the impact of children's age on the framing effect with age as a variable. Therefore, this study aimed to confirm whether children's age moderates the framing effect and if the expected results would be found. Moreover, if the level of cognitive processing and message interpretation differs by children's ages, interactions would be possible between age and other variables (issue involvement, delivery method) in children's response to the messages. Thus, this study additionally aimed to investigate these interactions and discuss the results.

1.2. The Effect of Issue Involvement on Message Framing

Issue involvement is another variable that may influence children's understanding and acceptance of persuasive messages. Issues that are highly relevant to children can elicit better understanding of messages, fostering a positive attitude and willingness to accept the messages. On the other hand, children may not feel interested in or able to fully understand issues that are not relevant to them, causing a decline in attitudes and willingness to follow the persuasive messages. As such, issue involvement may have a major influence on children's attitudes and behavioral intentions regardless of framing type, although few studies have empirically investigated this impact. Therefore, this study examines and discusses the main effect of issue involvement on persuasive message delivery.

On the other hand, many studies of adults have found that issue involvement can moderate the message framing effect [4,18,49,50]. Researchers have confirmed that if the message recipient has a close connection to the issue, loss-framed messages are more persuasive than gain-framed messages, and vice versa if the connection is more distant. These results were mainly interpreted through the Elaboration Likelihood Model [19], which posits that persuasive messages are delivered through either a central or peripheral route depending on the level of cognitive processing. In other words, it is argued that information considered important by the recipient is subject to more in-depth cognitive processing (central route), while information not considered important is subject to shallower cognitive processing (peripheral route). Based on this model, many studies have found that in high-involvement situations, loss-framed information increases people's attention and induces deeper cognitive processing (central route), thereby producing a greater persuasive effect than gain-framed information. In contrast, in low-involvement situations gain-framed information is processed superficially (peripheral route), thereby having a higher persuasiveness than loss-framed information.

A study by Donovan and Jalleh [4] introduced women to a new children's vaccine that included side effects by presenting gain- and loss-framed messages; the gain-framed message was more effective among women who were not closely involved with child care. Maheswaran and Meyers-Levy's [18] study used framed messages to inform college students about the need to lower cholesterol levels and take diagnostic blood tests. In this study, the loss-framed message was more effective in the group that perceived high relevance in the delivered content, while the gain-framed message was more effective in the group that perceived low relevance in the content. Moreover, Moorman and van den Putte [49] found that the persuasive effect of messages about smoking cessation was greater for loss-framed messages in participants with high issue involvement and for gain-framed messages in participants with low issue involvement. Thus, several studies of adults have gathered results supporting existing theoretical models. However, little has been done to verify whether these results can be confirmed in children. A study by Kim and Kim [46] selected two issues, water conservation (personal effort) and water preservation (public effort), and examined the framing effects; loss-framed messages were more effective for both issues. However, issue involvement may not have varied much between these issues because they fell into a similar category, that of environmental protection. The present study aimed to address the limitations of previous studies and more clearly verify whether issue involvement moderates framing effect in children.

1.3. The Effect of Delivery Method on Message Framing

Message delivery method has been proposed as another variable that influences the framing effect. First, presenting visual aids when delivering a message has been revealed to be effective in message recipients' understanding of messages and for improving memory. For example, researchers have shown that the visual elements that accompany linguistic information enables the recipients to understand risks more precisely and reduce errors in information delivery by using anecdotal narratives [20,51,52]. Furthermore, it has been found that visual images can improve message recipients' recall of information [53].

Many previous studies have suggested that presenting visual images can be an important factor in increasing the effectiveness of persuasion. Garcia-Retamero and Cokely [20] confirmed that visual aids could increase the persuasive effect of messages about sexual health in adults. Other studies have found that graphic warning labels on cigarette packages are more effective than text-only warning labels in increasing willingness to quit or reducing smoking among adolescents and adults [53,54]. Furthermore, researchers have suggested that the effects of such visual images are closely related to various factors, such as induced attention [55,56], deep cognitive processing [21,56], and strong emotions [53,55]. Hence, we hypothesized that the verbal delivery of messages with visual images could be very favorable for children, who have lower attention spans, linguistic understanding, and cognitive processing ability compared to adults.

On the other hand, presenting visual images has been clearly shown to be effective, mainly with loss-framed messages. Many studies mentioned above suggest the effect of visual images presented loss-framed messages in their study scenarios [52,53,55,56]. Moreover, a study by Seo and colleagues [57] using both gain- and loss-framed messages found improvements in persuasive effect with visual images only with the latter, and no effect of images or the opposite effect (persuasive effect with verbal only) with gain-framed messages depending on the issue. However, other studies argue that visual elements can be effective regardless of framing type. Garcia-Retamero and Cokely [20] found that visual aids were effective in improving adults' sexual health behavior for both gain- and loss-framed messages, and suggested that these results could be shown in individuals who had high cognitive processing abilities. In other words, visual aids enable more thorough encoding of both potential gains and losses, meaning that individuals who have higher cognitive processing skills can easily process the information without other conditions to facilitate information processing in each (deep or shallow) route. [20,58].

Taking these previous results together, the effect of visual image presentation in children might be stronger and more pronounced with loss-framed messages. In addition, considering that the level of cognitive processing increases as children age, this pattern may vary depending on the age of children. This study examined these hypotheses by analyzing the effect of delivery method on children's responses to messages.

1.4. Purpose of the Study

The purpose of this study was to investigate the attitudes and behavioral intentions of children in response to persuasive messages by age, issue involvement, delivery method, and frame type by analyzing children's responses (main effect and interaction effects among variables) in order to examine the effective strategies of message delivery. The research questions in this study are as follows.

How do age, issue involvement, delivery method, and types of message framing affect children's attitudes and behavioral intentions towards persuasive messages?

1. Are there main effects of each variable on the children's attitudes and behavioral intentions toward persuasive messages?
2. Are there interaction effects between variables for children's attitudes and behavioral intentions toward persuasive messages?

2. Materials and Methods

2.1. Participants

A total of 180 Korean children aged 3, 4, and 5 years old (60 per age group) participated in the study. These children were recruited from kindergartens in a middle-class area of Gyeonggi-do province. Two of the authors explained the purpose, content, and methods of this study to the children's parents in detail and obtained their written consent for their children to participate in the research. The average age of the participants was 43.5 months ($SD = 2.3$) for the 3-year-olds (31 male, 29 female), 55.1 months ($SD = 2.8$) for the 4-year-olds (32 male, 28 female), and 67.0 months ($SD = 2.5$) for the 5-year-olds (29 male, 31 female).

Data from a total of 173 participants were used in the analysis, excluding data from seven participants due to insincere responses.

2.2. Materials

2.2.1. Persuasive Messages

In this study, we selected a safety issue as the high-involvement issue and an environmental issue as the low-involvement issue based on previous studies [59]. When constituting reason messages on each issue, we emphasized personal benefits to create high issue involvement and collective/global benefits to create low issue involvement.

When crafting the details of the messages, we considered the possibility that children's responses could be influenced by an educational effect if children frequently heard the message in daily life. Hence, we selected messages that children might not frequently encounter, which was confirmed in a preliminary study. The main message for the safety issue was "You should wear safety gear when you are doing outdoor sports," while for the environmental issue, the message was "You should use no more soap and shampoo than necessary when bathing."

These persuasive messages were set within gain- and loss-framed messages, and consisted of both central and reason messages. The central messages, given above, convey the proper behavior the child should adopt, while the reason messages explain why. The same central messages were presented in both frames, with different reason messages for each frame. The gain-framed message described the benefits of doing the action, while the loss-framed message described the disadvantages of not doing so. The persuasive messages constructed in this study are shown in Table 1.

Table 1. Persuasive messages according to issue and framing.

Issue	Message	Gain-Framed	Loss-Framed
Safety	Delivery	You should wear protective gear when riding a bike or kick scooter outside.	
	Reason	Because this protects the precious parts of your body, and you do not get hurt a lot even if you fall or hit something.	Because not wearing protective gear may hurt you a lot if you fall or hit something. Then you will bleed and it will hurt a lot, and you will have to go to the hospital.
Environment	Delivery	We should use only the right amount of soap and shampoo when bathing.	
	Reason	Because if we do so, the soap and shampoo will be naturally gone in the river (dissolved), so fish can live in clean water.	Because if we use a lot of soap or shampoo, it stays in the river (not dissolved). This pollutes the river and kills all the fish living in the river.

The persuasive messages were verified by two early childhood education professors and two preschool teachers. We asked these experts to assess whether the messages were structured appropriately for each frame type and whether the language used was age-appropriate for the participating children, and asked them to comment critically on unsuitable parts. Based on the opinions of these experts, we removed redundant sections and modified the messages to make them clearer and easier to understand. The experts reassessed the new messages in the same way, and after one more revision, the messages underwent a final review by the experts.

2.2.2. Picture Cards

In this study, picture cards that visually depicted the persuasive messages were created. These cards consisted of two pictures that vividly and concretely described the content of the persuasive message; one showed the child's action and the other showed the outcome. The gain-framed cards contained pictures of a child performing the action promoted by the persuasive message, with the positive outcome of the action, and the loss-framed cards contained pictures of the child not performing the action, with the negative outcome. A total of eight picture cards were produced, four cards for each topic (two gain-framed and two loss-framed cards). Moreover, separate sets of picture cards were made for boys and

girls in order to help them identify with the characters in the pictures. These picture cards (14 × 10 cm) were illustrated in color to deliver vivid visuals. They were created by a university student majoring in art and participating in early childhood art education. The validity of the pictures was confirmed by the two early childhood education professors and two preschool teachers.

2.2.3. Attitudes and Behavioral Intention Questionnaire

A questionnaire was developed in order to measure the degree to which a child was persuaded by the given messages. Previous studies have measured the persuasive effects of messages in a variety of ways, including agreement with the message, attitudes, behavioral intention, and behavioral change [60]. Attitudes and behaviors have been used primarily as indicators of the degree of persuasive effect. Several studies have directly measured the behavior or behavioral changes of message recipients [48,55], while others have measured behavioral intentions instead of behaviors [10,53], as the recipient's willingness to behave could be the most proximal predictor of their actual behavior [61]. We considered both the previous studies' methods and the possibility of extraneous influencing factors that may appear in children's actual behavior, such as individual differences in the opportunity to ride a bicycle or scooter, that of possessing equipment, or guidance of a parent or teacher. Thus, we decided to set the attitude and behavioral intention of children as dependent variables reflecting the persuasive effect.

A questionnaire on the children's attitudes and behavioral intentions was created with reference to a previous study examining the effect of message framing on elementary school students [46]. It consisted of a total of three items, two measuring attitude and one measuring behavioral intention. The first item was "How important do you think this story is?" This item was intended to measure the importance and value of the message that children perceive. The second item was "How much do you want to tell this story to a younger sibling or a friend?" This was intended to measure children's interest and trust in this story. The third item was "How much more do you want to do OOO (the target behavior) after hearing the story?" This item aimed to measure children's willingness to engage in the target behavior. Each item was measured on a 7-point Likert-type scale, modified in this study to be more understandable and easier to use for the children, consisting of seven black circles arranged from smallest to biggest under numbers from 1 through 7. The score range for each item was 1–7, and higher scores represented a stronger perception of the importance of the message, more interest in the message, and higher willingness to follow the message by engaging in the behavior. This questionnaire was validated by the two early childhood education professors and two preschool teachers. These experts confirmed that the items in the questionnaire were appropriate for measuring the attitudes and behavioral intentions of children towards the message of each issue.

2.3. Procedure

2.3.1. Preliminary Study

We conducted a preliminary survey to confirm the adequacy of the persuasive messages, picture cards, questionnaires, and general process of the survey. Twelve children (four of each group aged 3, 4, and 5 years) participated, but did not subsequently participate in the main study. We surveyed each child individually in a quiet space in the kindergarten, delivering messages either only verbally or verbally with picture cards and confirming that the child could fully understand the content. We also asked questions from the attitudes and behavioral intention questionnaire and confirmed whether the child could understand each item well and properly utilize the Likert-type scale to respond.

The preliminary findings showed that the persuasive messages and picture cards were appropriate for the level of the children and that the items in the questionnaire were well-understood. However, a few expressions used in the persuasive messages that the children may have had difficulty understanding were modified for the main study. The survey took about 20 min per child, a suitable length for young children.

2.3.2. Main Study

This study was approved by the Seoul National University Institutional Review Board (Approval No. IRB No. 1603/001-008) and the parents of all study participants provided written informed consent. The main survey was conducted with 180 children aged 3, 4, and 5 years (total of 60 per age group), who were randomly assigned to one of four conditions (1—gain, verbal only; 2—gain, verbal + picture; 3—loss, verbal only; 4—loss, verbal + picture) and received persuasive messages on two issues for each condition (a total of fifteen children per age group per condition). As such, this study used a mixed design, including age, delivery method, and frame type (as between factors) and issue involvement (as within factors). We were concerned that individual differences between groups would be excessively reflected in the results if there were too many experimental groups, excluding a potential design with eight experimental groups; thus, only four experimental groups were used. In order to avoid having one child receive two conditional messages on an issue, issue involvement was set as a within factor. This setting was expected to minimize memory effects in the survey.

The survey was conducted in a quiet space in the kindergarten. We first introduced each child to the quiet space and had a brief conversation to build rapport with the child. We then delivered the persuasive message to the child following the experimental settings of that child's group. The two messages were delivered in random order to avoid order effects. To the group presented with picture cards, a set of cards was presented in accordance with the child's sex. Immediately after delivering the prepared persuasive message, we asked the children three questions from the attitudes and behavioral intention questionnaire and allowed the children to respond by pointing to the circles on the seven-point Likert scale using their fingers. We recorded the children's responses on the record sheet. The survey took about 20 min per child.

2.4. Data Analysis

The collected data were analyzed using SPSS 22.0. First, a basic statistical analysis was conducted to investigate the means and standard deviations of the children's attitude and behavioral intention scores in terms of each variable. Next, to examine the effects of the respective variables on the attitudes and behavioral intentions of the children, a repeated-measures ANOVA analysis was conducted. The main effects of each variable and interaction effects between variables were identified; when the latter were statistically significant, a simple main effect analysis was performed to analyze the effects more specifically.

3. Results

The results of the basic statistical analysis for each condition, checking the trend in attitudes and behavioral intentions in children by age, issue involvement, delivery method, and frame type, are shown in Table 2. Table 2 shows the trend in children's responses to the messages in each condition.

Table 2. Attitudes and behavioral intentions of children by age, issue involvement, delivery method, and frame type.

Title 1		3 Years Old (n = 58)				4 Years Old (n = 58)				5 Years Old (n = 57)			
Attitudes and Behavioral Intentions in Gain/Loss Condition		High inv.		Low inv.		High inv.		Low inv.		High inv.		Low inv.	
		Verb. M (SD)	Verb. + Pic. M (SD)	Verb. M (SD)	Verb. + Pic. M (SD)	Verb. M(SD)	Verb. + Pic. M (SD)	Verb. M (SD)	Verb. + Pic. M (SD)	Verb. M (SD)	Verb. + Pic. M (SD)	Verb. M (SD)	Verb. + Pic. M (SD)
Perception of importance (attitude)	Gain	4.27 (2.17)	3.64 (2.17)	4.53 (1.60)	4.64 (2.10)	5.27 (1.87)	4.40 (2.29)	5.40 (2.03)	4.33 (2.26)	5.29 (2.20)	5.67 (0.90)	5.43 (1.79)	5.53 (1.81)
	Loss	3.97 (2.69)	4.13 (2.26)	2.50 (1.65)	3.80 (2.46)	4.53 (2.07)	6.00 (1.41)	4.27 (2.15)	5.31 (2.10)	5.77 (1.59)	5.67 (1.84)	5.92 (1.50)	5.80 (2.08)
		3.97 (2.44)		3.17 (2.17)		5.21 (1.91)		4.75 (2.15)		5.71 (1.70)		5.86 (1.80)	
Tendency to share the message (attitude)	Gain	4.07 (2.12)	4.86 (2.14)	5.00 (2.07)	4.57 (2.28)	5.27 (2.05)	3.80 (2.54)	4.00 (2.10)	4.07 (2.46)	3.93 (2.53)	4.87 (1.73)	5.29 (1.86)	5.60 (1.64)
	Loss	3.71 (2.40)	4.47 (2.13)	4.43 (2.34)	3.87 (2.23)	4.27 (2.37)	6.31 (1.11)	4.73 (2.22)	4.69 (2.36)	3.77 (2.31)	5.87 (1.51)	4.31 (2.25)	6.00 (1.51)
		4.10 (2.26)		4.14 (2.26)		5.21 (2.13)		4.71 (2.24)		4.89 (2.17)		5.21 (2.04)	
Behavioral intention	Gain	4.47 (2.26)	4.07 (2.30)	3.60 (2.26)	3.14 (2.41)	5.73 (2.46)	4.47 (2.59)	3.13 (2.00)	2.80 (2.11)	6.14 (1.83)	5.87 (1.51)	3.93 (2.40)	3.67 (2.02)
	Loss	3.43 (2.50)	4.87 (2.56)	2.29 (2.09)	3.20 (2.43)	5.33 (2.32)	6.38 (0.96)	2.73 (1.94)	2.92 (2.25)	5.54 (1.71)	6.40 (1.59)	1.92 (0.95)	3.53 (2.53)
		4.17 (2.59)		2.76 (2.28)		5.82 (1.87)		2.82 (2.06)		6.00 (1.68)		2.79 (2.10)	

High inv.: High involvement, Low inv.: Low involvement, Verb.: Verbal only, Verb. + Pic.: Verbal + Picture.

3.1. Effects of Age, Issue Involvement, Delivery Method, and Frame Type on Children's Perception of Importance of Messages (Attitude)

A repeated-measures ANOVA analysis, 3 (age) \times 2 (issue involvement) \times 2 (delivery method) \times 2 (frame type), on children's perception of importance was conducted. The results are shown in Table 3. The main effect of age ($F = 18.10$, $p < 0.001$, $\eta_p^2 = 0.18$) and the interaction effect between delivery method and frame type ($F = 4.37$, $p < 0.05$, $\eta_p^2 = 0.03$) were significant.

Table 3. Children's perception of importance of messages by age, issue involvement, delivery method, and frame type.

	SS	Df	MS	F	η_p^2
Age (A)	172.21	2	86.11	18.10 ***	0.18
Issue involvement (B)	0.54	1	0.54	0.17	
Delivery method (C)	2.32	1	2.32	0.49	
Frame type (D)	0.50	1	0.50	0.11	
A * B	1.27	2	0.63	0.20	
A * C	0.70	2	0.35	0.07	
A * D	17.99	2	9.00	1.89	
B * C	0.35	1	0.35	0.11	
B * D	7.91	1	7.91	2.45	
C * D	20.79	1	20.79	4.37 *	0.03
A * B * C	5.65	2	2.82	0.87	
A * B * D	9.07	2	4.54	1.40	
A * C * D	23.85	2	11.93	2.51	
B * C * D	0.04	1	0.04	0.01	
A * B * C * D	0.26	2	0.13	0.04	
Error (B)	520.18	161	3.23		
Error (between variables)	766.12	161	4.76		

* $p < 0.05$. *** $p < 0.001$.

First, children's perception of importance increased as their age increased. The average score for perception of importance was 3.92 ($SD = 1.54$) for the 3-year-olds, 4.91 ($SD = 1.76$) for the 4-year-olds, and 5.63 ($SD = 1.36$) for the 5-year-olds. Statistically significant differences were observed between all age groups.

Next, there was an interaction effect between delivery method and frame type. Specifically, children's perception of importance was higher in the loss-framed condition ($M = 5.09$, $SD = 1.68$) than in the gain-framed condition ($M = 4.72$, $SD = 1.73$) when messages were delivered verbally with pictures, whereas when the messages were delivered only verbally, the gain-framed condition ($M = 5.02$, $SD = 1.56$) showed higher perception of importance than the loss-framed condition ($M = 4.43$, $SD = 1.82$). This shows that delivery method can modulate the framing effect in children.

3.2. Effects of Age, Issue Involvement, Delivery Method, and Frame Type on Children's Tendency to Share Messages (Attitude)

The results of the repeated-measures ANOVA analysis of 3 (age) \times 2 (issue involvement) \times 2 (delivery method) \times 2 (frame type) on children's tendency to share messages are shown in Table 4. The main effect of delivery method ($F = 4.27$, $p < 0.05$, $\eta_p^2 = 0.03$) was significant. Moreover, the interaction effects between age and issue involvement ($F = 3.01$, $p = 0.052$, $\eta_p^2 = 0.04$) as well as between delivery method and frame type ($F = 3.70$, $p = 0.056$, $\eta_p^2 = 0.02$) were closely significant.

Table 4. Children's tendency to share messages by age, issue involvement, delivery method, and frame type.

	SS	df	MS	F	η_p^2
Age (A)	19.43	2	9.72	1.80	
Issue involvement (B)	1.13	1	1.13	0.31	
Delivery method (C)	22.98	1	22.98	4.27 *	0.03
Frame type (D)	0.74	1	0.74	0.14	
A * B	21.86	2	10.93	3.01 ($p = 0.052$)	0.04
A * C	23.75	2	11.87	2.20	
A * D	21.61	2	10.80	2.01	
B * C	10.12	1	10.12	2.79	
B * D	2.64	1	2.64	0.73	
C * D	19.91	1	19.91	3.70 ($p = 0.056$)	0.02
A * B * C	3.87	2	1.94	0.53	
A * B * D	1.52	2	0.76	0.21	
A * C * D	12.55	2	6.28	1.17	
B * C * D	7.30	1	7.30	2.01	
A * B * C * D	16.31	2	8.16	2.25	
Error (B)	584.02	161	3.63		
Error (between variables)	867.41	161	5.39		

* $p < 0.05$.

First, by examining the interaction effect between age and issue involvement, it is observed that children's tendency to share the messages with their peers showed different patterns for each issue by age. When children encountered the high-involvement issue, the tendency to share messages did not vary by age. However, when children heard the low-involvement issue, the 5-year-olds ($M = 5.33$, $SD = 1.87$) showed a greater tendency to share messages than the 3-year-olds ($M = 4.47$, $SD = 2.21$) and 4-year-olds ($M = 4.36$, $SD = 2.25$) ($F = 3.63$, $p < 0.05$, $\eta_p^2 = 0.04$).

The main effect of delivery method was found in the children's tendency to share messages. Children wanted to talk more about messages when they were delivered verbally with pictures ($M = 4.90$, $SD = 1.72$) than only verbally ($M = 4.41$, $SD = 1.64$). Recognition of the vivid colored images might have elicited children's interest in the message and improved their memory, motivating them to share the message with other people.

Last, the interaction effect between delivery method and frame type was significant in the children's tendency to share messages. When the messages were delivered verbally with pictures, a higher score was shown in the loss-framed condition ($M = 5.19$, $SD = 1.62$) than in the gain-framed condition ($M = 4.63$, $SD = 1.79$), while when the messages were delivered only verbally, the tendency score in the gain-framed condition ($M = 4.59$, $SD = 1.49$) was higher than that in the loss-framed condition ($M = 4.21$, $SD = 1.78$).

3.3. Effects of Age, Issue Involvement, Delivery Method, and Frame Type on Children's Behavioral Intention

The results of the repeated-measures ANOVA analysis of 3 (age) \times 2 (issue involvement) \times 2 (delivery method) \times 2 (frame type) on children's behavioral intention are shown in Table 5. The main effects of age ($F = 5.58$, $p < 0.01$, $\eta_p^2 = 0.07$) and issue involvement ($F = 97.84$, $p < 0.001$, $\eta_p^2 = 0.38$) and the interaction effect between age and issue involvement ($F = 5.34$, $p < 0.01$, $\eta_p^2 = 0.06$) were significant. Moreover, the interaction effect between issue involvement and frame type ($F = 3.49$, $p = 0.064$, $\eta_p^2 = 0.02$) was closely significant and the interaction effect between delivery method and frame type ($F = 9.65$, $p < 0.01$, $\eta_p^2 = 0.06$) was significant.

Table 5. Children’s behavioral intention by age, issue involvement, delivery method, and frame type.

	SS	df	MS	F	η_p^2
Age (A)	56.79	2	28.40	5.58 **	0.07
Issue involvement (B)	399.59	1	399.59	97.84 ***	0.38
Delivery method (C)	5.66	1	5.66	1.11	
Frame type (D)	3.65	1	3.65	0.72	
A * B	43.65	2	21.83	5.34 **	0.06
A * C	5.33	2	2.67	0.52	
A * D	11.94	2	5.97	1.17	
B * C	0.04	1	0.04	0.01	
B * D	14.25	1	14.25	3.49 ($p = 0.064$)	0.02
C * D	49.12	1	49.12	9.65 **	0.06
A * B * C	1.63	2	0.82	0.20	
A * B * D	1.08	2	0.54	0.13	
A * C * D	0.12	2	0.06	0.01	
B * C * D	1.39	1	1.39	0.34	
A * B * C * D	5.73	2	2.87	0.70	
Error (B)	657.52	161	4.08		
Error (between variables)	819.14	161	5.09		

** $p < 0.01$. *** $p < 0.001$.

First, we should note that the children’s behavioral intention significantly increased as their age increased. The behavioral intention score of the 3-year-olds was 3.65 ($SD = 1.59$), that of the 4-year-olds was 4.17 ($SD = 1.73$), and that of the 5-year-olds was 4.65 ($SD = 1.54$). A significant difference was observed between the 3- and 5-year-olds. These results seem closely related to the results of the children’s perception of the messages’ importance. This supports previous studies which argued that recipients’ attitudes can lead to their willingness to engage in a behavior [57], and indicates that behaviors might be more motivated as children age, as they can more deeply process and interpret the messages and fully perceive their value.

However, it is worth noting that these age effects varied by issue involvement. When hearing about the high-involvement issue, children’s behavioral intention increased as age increased: 3-year-olds: 4.22, 4-year-olds: 5.45, 5-year-olds: 6.00 ($F = 10.45$, $p < 0.001$, $\eta_p^2 = 0.11$). However, there were no significant differences in children’s behavioral intention by age after hearing about the low-involvement issue: 3-year-olds: 3.07, 4-year-olds: 2.90, 5-year-olds: 3.30. As seen in Figure 1, these results show that the phenomenon in which perception of importance in children encourages their behavioral intention can be specified by issue involvement.

The main effect of issue involvement was confirmed as well. Children’s behavioral intention was 5.22 ($SD = 2.25$) for high issue involvement and 3.09 ($SD = 2.16$) for low-involvement. These differences can be seen in Figure 1.

Next, there was an interaction effect between issue involvement and frame type. When the children encountered the high-involvement issue, behavioral intention was higher in the loss-framed condition ($M = 5.32$, $SD = 2.23$) than in the gain-framed condition ($M = 5.13$, $SD = 2.28$). However, when they heard the low-involvement issue, their behavioral intention was higher in the gain-framed condition ($M = 3.38$, $SD = 2.17$) than the loss-framed condition ($M = 2.79$, $SD = 2.12$).

Finally, the interaction effect between delivery method and frame type was found with respect to children’s behavioral intention, which was higher in the loss-framed condition ($M = 4.55$, $SD = 1.57$) than in the gain-framed condition ($M = 4.01$, $SD = 1.69$) when the message was delivered verbally with pictures. When messages were delivered only verbally, behavioral intention was higher in the gain-framed condition ($M = 4.49$, $SD = 1.78$) than in the loss-framed condition ($M = 3.55$, $SD = 1.44$). This result follows the same pattern as children’s perception of message importance and tendency to share messages.

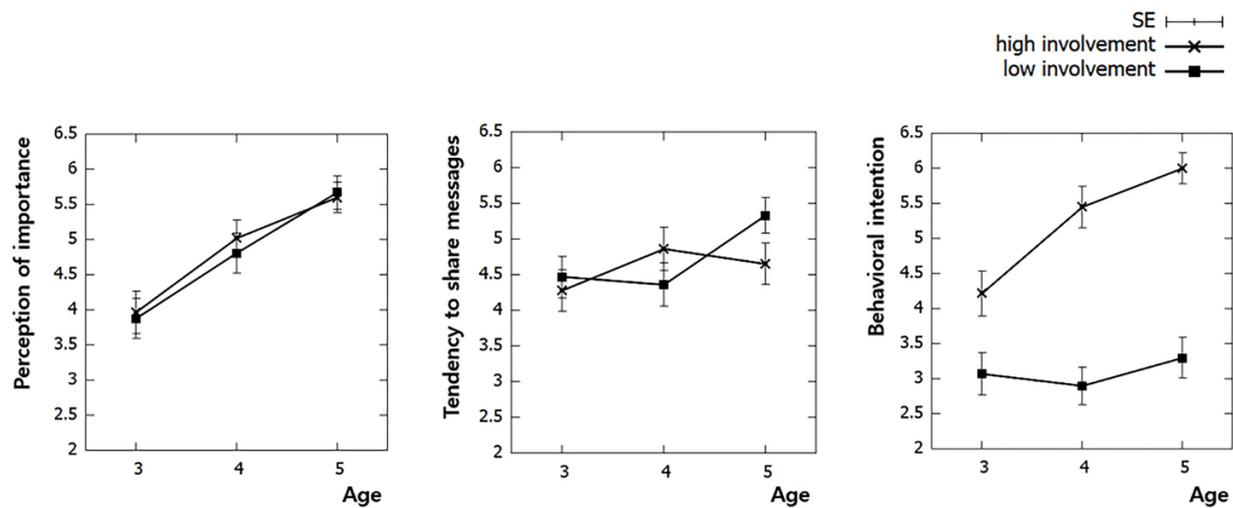


Figure 1. Children’s perception of importance (attitude), tendency to share messages (attitude), and behavioral intention by age and issue involvement. (Error bars represent standard errors.).

3.4. Children’s Attitudes and Behavioral Intentions by Age, Issue Involvement, Delivery Method, and Frame Type

To confirm the children’s overall attitudes and behavioral intentions, repeated-measures ANOVA analysis of 3 (age) \times 2 (issue involvement) \times 2 (delivery method) \times 2 (frame type) was executed. Table 6 shows the results.

Table 6. Children’s attitudes and behavioral intentions by age, issue involvement, delivery method, and frame type.

	SS	df	MS	F	η_p^2
Age (A)	69.61	2	34.803	13.46 ***	0.14
Issue involvement (B)	42.94	1	42.94	28.36 ***	0.15
Delivery method (C)	8.40	1	8.40	3.25	
Frame type (D)	0.34	1	0.34	0.13	
A * B	8.57	2	4.29	2.83 ($p = 0.062$)	
A * C	4.19	2	2.09	0.81	
A * D	12.60	2	6.30	2.44	
B * C	0.64	1	0.64	0.42	
B * D	7.49	1	7.49	4.95 *	0.03
C * D	28.55	1	28.55	11.04 **	0.06
A * B * C	0.08	2	0.04	0.03	
A * B * D	0.25	2	0.12	0.08	
A * C * D	4.29	2	2.15	0.83	
B * C * D	1.51	1	1.51	1.00	
A * B * C * D	5.14	2	2.57	1.70	
Error (B)	243.76	161	1.51		
Error (between variables)	416.42	161	2.59		

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Furthermore, in order to comprehensively examine the persuasive effect by delivery method, we calculated the average overall score for all three dependent variables as the score of children’s attitudes and behavioral intentions and investigated the trends in children’s responses through a graph (Figure 2).

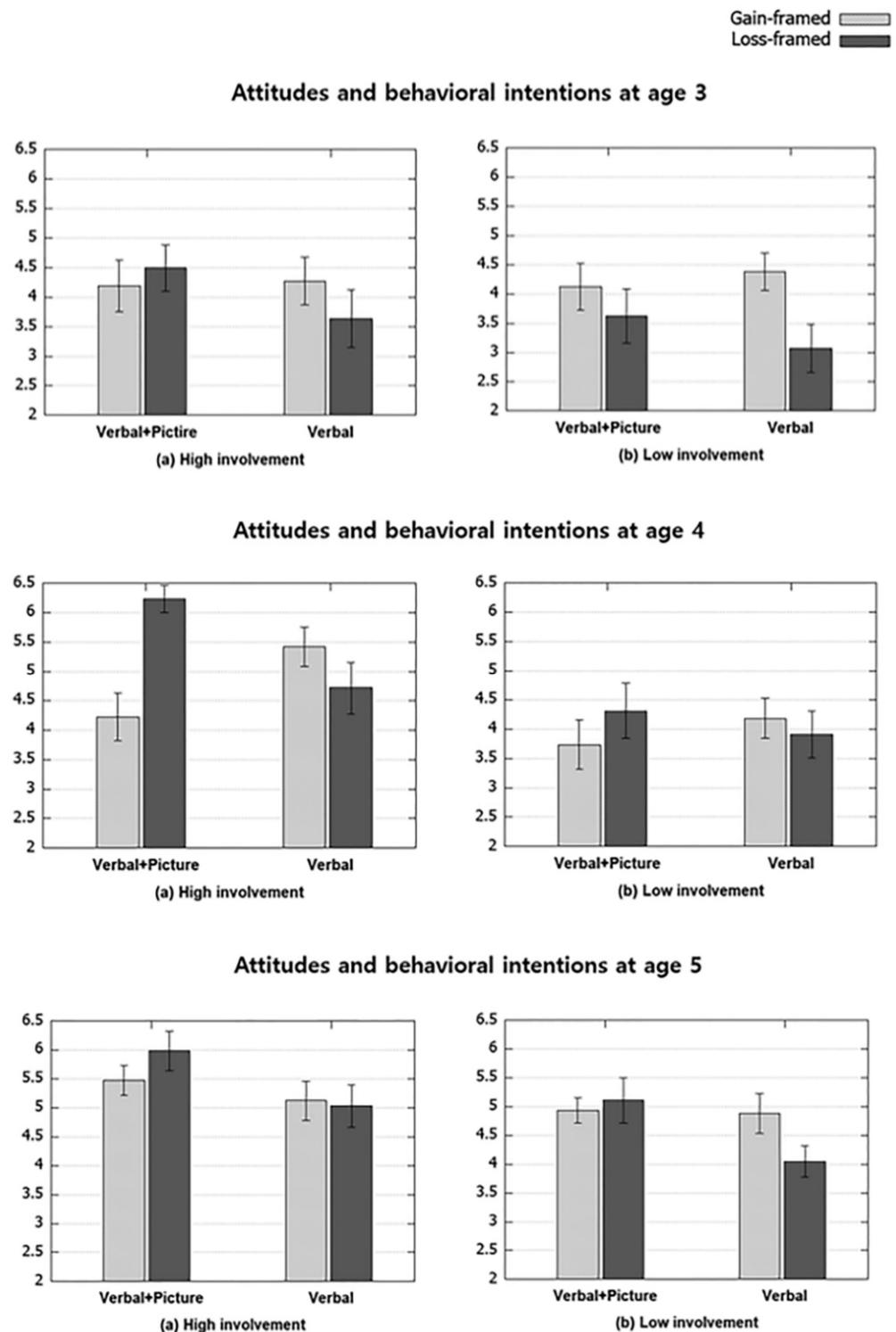


Figure 2. Children’s attitudes and behavioral intentions by age, issue involvement, delivery method, and frame type. (Error bars represent standard errors.).

First, the attitudes and behavioral intentions of the 3-year-olds were low overall compared to those of the older children. Interestingly, the 3-year-olds were generally more persuaded by gain-framed messages than loss-framed ones. In this study, the interaction between age and frame type was not statistically significant, although the trend is visible in the graphs.

In the 4- and 5- year-olds, we confirmed that children's responses were particularly prominent for high issue involvement and that they differed by each variable. Interestingly, the trend suggested in the Elaboration Likelihood Model (loss-framed is more effective than gain-framed when issue involvement is high, and vice versa when issue involvement is low) was clearly seen when messages were delivered verbally with pictures for high issue involvement and only verbally for low issue involvement. As such, the results predicted by the Elaboration Likelihood Model were apparent for specific delivery methods, which can be further discussed in terms of inducing deep or shallow cognitive processing by each delivery method.

Finally, it can be noted that the effect of persuasion in delivering messages verbally with pictures was more pronounced among 5-year-olds, regardless of frame type. This seems to be in line with previous studies suggesting stronger effects of persuasion in individuals who are more cognitively competent when the message is delivered with visual elements, regardless of the frame type [20,58].

4. Discussion

In early childhood education, persuasive messages are frequently delivered to children to help them form basic lifestyle habits and promote their safe and healthy development. Nevertheless, few studies have been conducted on effective strategies to deliver educational messages to children. In this study, a total of 180 children aged 3, 4, and 5 were surveyed to examine how age, issue involvement, delivery method, and frame type influenced their attitudes and behavioral intentions. The main findings are discussed below.

4.1. Effects of Children's Age on Their Attitudes and Behavioral Intentions

We hypothesized that children's age would have a major influence on their response to the messages, and this hypothesis was partially validated. As children's age increased, perception of message importance and behavioral intention increased. These results can be interpreted in line with the children's development of comprehensive thinking abilities and core information processing skills. Between the ages of 3 and 5, a critical period when rapid cognitive development occurs [23,24,35], children's attention, message comprehension, causal inference, and outcome prediction generally develop [42–45,62]. Therefore, children might be able to understand the presented situation more clearly and to better recognize the seriousness of certain issues and the need for suggested behaviors as they grow. This can be discussed in connection with Bandura's [63] social learning theory, which suggests that children's social learning occurs in four stages: attention, memory retention, behavioral reproduction, and motivation [46,47]. That is, in order for children to conduct behaviors by themselves using the information obtained through interaction with their environment, they need to develop skills in attention, retention, carrying out behaviors, and motivation, all of which require a certain level of cognitive ability. Furthermore, our results can be interpreted in regard to children's social development [33,34]. Children's theory of mind develops greatly around 4 and 5 years of age. This allows older children to grasp the intentions of adult researchers' message delivery better and more accurately. In addition, through socialization [26,30,37,39] older children can establish an attitude that messages from adults are important, that they should follow them well, and that they should act that way in the future.

Although social learning theory is particularly focused on information that children can obtain by observing other people's behavior, it acknowledges that a series of cognitive processes are needed in order for children to accept information and translate it into actual behavior. It is interesting that the age effect did not appear in another dependent variable, the tendency to share messages. We hypothesized that the children's willingness to carry the message to peers may reflect their trust in the message as well as their interest. However, the results of this study indicate that this willingness may come from children's interest or curiosity about information rather than from deep cognitive processing. If cognitive

processing had been involved, the age effect would have influenced children's tendency to share messages.

Second, there was an interaction effect between age and issue involvement for children's behavioral intention. While this had not been hypothesized, it may be compared to the results on the children's perception of message importance. As seen in Figure 1, as age increased, children were more aware of the importance and value of both high-involvement and low-involvement issues; however, behavioral intention only increased with age for high issue involvement. Many studies have suggested that the attitudes of recipients can predict behavioral intention or actual behaviors [57]. In contrast, the results of this study suggest that children's attitudes are not always associated with their actual behaviors, and that characteristics of issues, such as their relevance to children, can play a significant role in motivating children's behavior. In contrast to the safety issue, it would be difficult for children to directly feel the impact of the environmental issue used in this study, and it would be challenging to bring out their related behavioral motivation. These messages may need to be repeated and sustained until children can recognize their indirect and ultimate implications. Although this study showed that low-involvement issues are limited in their ability to lead children's actual behavior, subsequent studies need to examine the possibility of further motivating children's behaviors through continuous delivery of issues.

Meanwhile, this study showed an interaction effect between age and issue involvement on children's tendency to share messages. Children's willingness to deliver the messages to peers did not vary by age in the high-involvement condition, while in the low-involvement condition 5-year-olds showed a significantly higher tendency to share messages than 3- and 4-year-olds. These findings suggest that children show a similar degree of interest and curiosity about issues that are closely related to themselves, regardless of their age, while older children are more likely to pay attention and approach and use information even if it is not relevant to their own lives. These results might be interpreted regarding children's socialization experiences and development of social interaction ability depending on their age [26,30,37]. For example, 5-year-olds have learned and internalized various rules and norms more than 3- or 4-year-olds. These rules and norms may be understood to apply to the self and to everyone. Therefore, even though the consequences of an action may be less likely to have an immediate impact, older children may nonetheless think that it is crucial and necessary to inform others. The development of children's social interaction ability can explain these results [64,65], as the intention or motivation to tell their peers what they have heard somewhere is made possible through social skills development that promotes "hanging out," interacting, and talking freely with peers. Thus, 5-year-old children may be more active in sharing what they know with others than 3- or 4-year-olds.

Another age effect investigated in this study was the moderating effect of age on message framing. In the results, although the interaction effect between age and frame type was not statistically significant, 3-year-old children tended to find gain-framed messages more persuasive than loss-framed messages, regardless of other conditions. These findings were partly consistent with the hypothesis of this study, and support Smith's [66] study that suggested listeners with higher education levels (having higher cognitive skills) are more likely to be persuaded by loss-framed messages, which induce deeper and more thorough cognitive processing. In addition, higher levels of education may mean that the level of socialization is higher and that social rules and norms have been further internalized through learning or limitations [26,30,37]. Thus, as children grow from 3 to 4 to 5 years old, they form social and moral attitudes according to adults' instructions or guidance. Older children may have experienced more punishment or loss than reward or benefit through this process. Adults easily apply punishment or loss to children to control their behavior. Therefore, children who have experienced this socialization process may be more sensitive to loss or harm rather than gain or benefit.

Meanwhile, gain-framed messages, which are superficially processed, are more effective for those who do not have a high level of cognitive processing skills. In this study, however, there was no apparent advantage for loss-framed messages in older children. Al-

though they have higher levels of cognitive processing [67], they may be slightly influenced by other variables, such as issue involvement or delivery method in this study. Therefore, subsequent studies would be required to survey the effects of age on framing effects in children in a wider age range (e.g., 2–10 years old) while controlling other conditions such as issue or delivery mode in order to verify the age effects more reliably.

4.2. Effects of Issue Involvement on Children's Attitudes and Behavioral Intentions

This study found that issue involvement with messages influenced children's behavioral intention. Children's behavioral intention was higher when messages relevant to the children themselves, such as those about personal safety, were delivered, and lower when delivering messages less relevant to themselves, such as on environmental issues. These results suggest that issues eliciting high involvement can encourage certain behaviors in children because children can directly feel and experience the outcomes of such issues. Children may be less easily motivated toward behaviors when hearing about low-involvement issues, perhaps because the sensitivity regarding benefit or loss declines and outcomes may sound too abstract. Overall, these results suggest that a message on an issue perceived by children as having great immediacy is more effective for inducing desirable behavior. It is important to note, however, that children's perception of the message importance and their tendency to share were high even for messages with low involvement. Hence, it would be meaningful to educate children using messages about public service or community in order to improve their attitudes, even if the information does not induce behavioral changes.

Moreover, as in many studies examining framing effects, this study found that issue involvement moderated the message framing effect on children—significantly for behavioral intention, and non-significantly (though the same trend was found) for perception of message importance. In other words, loss-framed messages were more effective than gain-framed messages with high-involvement issues (the safety issue), while gain-framed messages were more effective than loss-framed messages with low-involvement issues (the environmental issue). These results are consistent with those of many previous studies showing that loss-framed messages, which induce central path processing, are more effective when issue involvement is high, while gain-framed messages, which induce peripheral path processing, are more advantageous when issue involvement is low [4,17,18,49,50]. This suggests that children can process and accept persuasive messages through mechanisms similar to adults. Furthermore, as proposed by the Elaboration Likelihood Model [19], children can process information through one of two paths, deeper or shallower, depending on the relevance of the information; the persuasiveness then varies by frame type, while its influence varies based on cognitive processing. In addition, it is notable that the distinctive cognitive processing of messages by issue involvement was most pronounced for behavioral intention, which requires the most cognitive processing, and the least pronounced in tendency to share messages, which does not seem closely involved with cognitive processing. This suggests that interaction between issue involvement and frame type may occur when judgment and decisions requiring deep cognitive processing are involved.

4.3. Effects of Delivery Method on Children's Attitudes and Behavioral Intentions

In this study, we first examined whether delivery method was a strong or major influence itself. The main effect of the delivery method appeared in the children's tendency to share messages. Children wanted to talk more about the messages with their peers when the messages were delivered verbally with pictures than when they were delivered only verbally. This shows that vivid and colorful visual information may help children perceive and remember the scene more clearly, as it attracts their attention and interest and induces their curiosity. As was previously discussed, children's tendency to share messages could reflect their interests and curiosities rather than their in-depth cognitive processes. Thus, delivery method may be a major influencing factor on children's tendency to share messages, and is not affected by other factors that control the level of cognitive processing, such as frame type or degree of issue involvement. In other words, the presen-

tation of vivid images when delivering messages or information can increase children's interest and approach to information, enabling them to imprint, retrieve, and deliver the provided scene.

In addition, as we expected, delivery method moderated the message framing effect. This result was found in all of the children's attitudes and behavioral intention: loss-framed messages were more effective when delivered verbally with pictures, while gain-framed messages were more effective when messages were delivered only verbally. Many studies have suggested that presentation of visual images has a strong impact on loss-framed message delivery [53,55–57]. The results of this study point first to the effect of visual images on the level of cognitive processing. Delivering information multimodally, that is, linguistically and visually, could enable dual encoding, which can help foster deeper processing [68,69]. In addition, visual elements can increase salience and induce attention, leading more thought and consideration to be given to the delivered message [21,55,56,70]. Therefore, the pictures presented to children in this study might have played a significant role in promoting cognitive processing. In addition, loss-framed messages presented with visual images can cause strong negative emotions in listeners [53,54]. Negative emotions are an evolutionary product that play an important role in enabling humans to immediately recognize risk and respond to it [53,71]. While induced emotions can directly motivate certain behaviors, they also increase risk scrutiny by motivating deep thinking about risks, which in turn can foster beneficial behaviors [72,73]. Hence, presenting loss-framed messages with vivid visual images may cause strong negative emotions in children, which may promote their processing and acceptance of the message. As such, the results of this study are consistent with those of many previous studies [21,53,55–57].

Meanwhile, this study showed higher effectiveness of gain-framed verbally-delivered messages only, consistent with the results for sunscreen use in the study by Seo and colleagues [57]. When visual images are presented in a gain-framed message, it may enable somewhat deeper cognitive processing; however, it may result in limited processing depth, as the stimulus does not cause a very strong emotion that would make children feel threatened or at risk. Hence, children may more easily accept and be persuaded by information through the peripheral path when the gain-framed message is delivered only verbally, as it is processed superficially. Therefore, this result suggests that presentation of visual elements is more effective for loss-framed messages, while verbal-only delivery is more effective for gain-framed messages.

Another noteworthy aspect of this study regarding delivery method was whether framing effects, which are moderated by delivery methods as mentioned above, depend on the age of children. We predicted that the impact of visual images could be observed in both gain- and loss-framed messages as children's cognitive processing ability developed. Although the results showed no significant interaction effects between age, delivery method, and frame type, we did find non-significant trends (Figure 2). Under the condition of verbal delivery with pictures, the persuasiveness of the gain-framed message was considerably lower than that of the loss-framed message among 4-year-olds, while 5-year-olds showed greatly increased persuasiveness with the gain-framed message; the difference between the two frame types was very small. As suggested in a previous study [20,58], there is a possibility that 5-year-old children's more advanced attention, memory, expectation, and inferential abilities allow them to easily perform deep information processing, enabling acceptance of messages through the central route even with a gain-framed message when they encounter visual images. Hence, delivery of visual elements may be a more effective method across framing types for older children.

4.4. Comprehensive Discussion of Effective Message Delivery for Children

This study found that children's attitudes and behavioral intentions generally appeared high when a loss-framed message on an issue relevant to children was delivered verbally with pictures or when a gain-framed message on an issue not relevant to children was delivered only verbally (Figure 2). This might indicate that the delivery method ad-

ditionally influences the level at which information is processed in each processing path. In other words, messages generated under the high-involvement condition are processed through a specific and in-depth central route; here, visual delivery intensifies the processing level, making the priority of the loss frame more apparent, which is effective in the central route. In contrast, messages under the low-involvement condition are processed through a shallow peripheral route; the verbal delivery method is better suited for the superficial processing of information, thereby strengthening the priority of the gain frame, which is effective in the peripheral route.

In addition, as mentioned above, 3- and 5-year-olds showed distinct response characteristics. In 3-year-old children, gain-framed messages generally showed superior effectiveness in persuasion. The cognitive processing skills of younger children (their ability to attend to and fully understand the core message and to anticipate future situations through inferential thought) are immature and they process information largely superficially, making gain-framed messages more effective regardless of condition. Furthermore, age three is the period when the socialization process is first seriously starting. Thus, three-year-olds may not have experienced more punishment or loss than older children, and their sensitivity to loss may not yet be significantly established. In contrast, the five-year-old children were more persuaded by visual images regardless of frame type, as they can more rapidly recognize content, easily make inferences, and are able to predict causality thanks to developments in their cognitive abilities, allowing them to respond more sensitively to images that assist in deeper processing of information. Therefore, these results provide various implications for effective message delivery to children.

4.5. Limitations and Suggestions for Future Researches

This study has several limitations. First, it measured children's attitudes and behavioral intentions with only three questions; using more items to capture attitudes towards messages and behavioral intention of children would have produced more accurate and reliable results. This measurement limitation relates to the low effect size shown in this study. Although the effect size of the influences of age and involvement was large in the analysis of overall attitudes and behavioral intentions, several influences of independent variables show small effect sizes despite the significance in the analysis of each sub-area (two kinds of attitudes and behavioral intention). The small effect size might result from the large amount of variance of the entire group, even though the average difference among groups appears. This could mean that the distribution of children's responses in each group is scattered. Therefore, it is essential to collect data that are more reliable through more responses that measure children's attitudes and behavioral intentions in future studies. In addition, when children conduct psychological evaluations, it can be difficult for them to use standards of evaluations and answer accordingly. Therefore, if the effect of variables can be confirmed through psychological evaluation and measures of children's behavioral changes, the effect will be more definite.

Second, safety and environmental issues were selected as high- and low-involvement issues, respectively; using a wider range of topics appropriate for each condition could have enhanced the external validity of the results. In addition, the safety and environment issues were chosen in this study because it was possible to construct more personally close or distant hypothetical messages with each issue. Therefore, it is essential to choose the relevant issues, and configure messages depending on the study's hypothesis. Third, there was a limitation in not being able to convey the exact facts in this study. As we tried to create a scenario related to gains and losses, the delivery content seems to have been exaggerated. For example, reducing the use of soap is better for the environment, but over-use of soap will not kill all fish. While we were able to investigate children's responses to these hypothetical messages in this study, providing the exact information to children is very important. Researchers will have to check whether their messages are realistic and error-free in future studies.

Fourth, this study did not control for other influencing factors that could affect the children's response to persuasive messages. In future studies, if factors such as degree of interest, risk sensitivity, and risk avoidance were investigated and controlled in analysis, more accurate results could be derived [10,15,74]. Fifth, this study did not confirm whether the participating children understood the messages correctly. Although we confirmed the messages were appropriate for children of that age through a preliminary study, confirming that the participating children fully understood the messages would have ensured more accurate interpretation of the results.

Sixth, the influences of children's gender or sociodemographic factors on their response to persuasive messages need to be examined in future studies. This study could not find gender differences between boys and girls. However, gender differences can appear depending on the characteristics of messages, for example, messages evoking more empathy and emotion. In addition, even though we focused on children of families with similar socio-demographic characteristics, it is necessary to examine the influences of sociodemographic factors in children's families in subsequent studies, as these variables relate to the cognitive development and socialization experiences of children. Finally, this study did not follow up on the effect of persuasion through the actual behavior of the children; behavioral intention can sometimes, though not always, be used to predict actual behavior [5,57]. Hence, all of these limitations must be considered and addressed in future studies.

5. Conclusions

This study is one of the first to consider the necessity of effective delivery of persuasive messages in early childhood education and to examine framing effects on children and the variables affecting them. This study analyzed several of these by examining in detail the effects of age, issue involvement, delivery method, and frame type on children's attitudes and behavioral intentions.

In this study, children's age was found to significantly affect attitudes and behavioral intentions toward the message, whether on its own or in connection with issue involvement. The study results suggested that children's cognitive processing of persuasive messages might be achieved through the same two processing routes as in adults, namely, central and peripheral, as proposed in the Elaboration Likelihood Model. In addition, this study showed that different delivery methods can promote information processing through the respective routes.

These findings can provide useful information on effective message delivery strategies for children. First, gain-framed messages can be more useful for younger children, with increased persuasiveness for them. Generally, loss-framed messages delivered verbally with pictures are most effective for topics that are relevant to children, while gain-framed messages delivered only verbally, or delivered verbally with pictures regardless of frame type (especially for 5-year-olds), are most effective for less relevant topics. Early childhood educators could achieve better educational effects in children by including these methods as part of their persuasion strategies. However, as mentioned above, there is a possibility that children's behavioral intentions will not lead to real action. Thus, educational support plans (for example, creating a planner) and behavior checks should be considered in order to encourage children to follow through on behaviors when they have a will to act.

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References

- Kahneman, D.; Tversky, A. Prospect theory: An analysis of decision under risk. *Econometrica* **1979**, *47*, 263–292. [[CrossRef](#)]
- Tversky, A.; Kahneman, D. The framing of decisions and the psychology of choice. *Science* **1981**, *211*, 453–458. [[CrossRef](#)]
- Abhyankar, P.; O'Connor, D.B.; Lawton, R. The role of message framing in promoting MMR vaccination: Evidence of a loss-frame advantage. *Psychol. Health Med.* **2008**, *13*, 1–16. [[CrossRef](#)] [[PubMed](#)]
- Donovan, R.J.; Jalleh, G. Positive versus negative framing of a hypothetical infant immunization: The influence of involvement. *Health Educ. Behav.* **2000**, *27*, 82–95. [[CrossRef](#)] [[PubMed](#)]
- Gallagher, K.M.; Updegraff, J.A. Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Ann. Behav. Med.* **2012**, *4*, 101–116. [[CrossRef](#)] [[PubMed](#)]
- Avineri, E.; Waygood, E.O.D. Applying valence framing to enhance the effect of information on transport-related carbon dioxide emissions. *Transp. Res. Part A Policy Pract.* **2013**, *48*, 31–38. [[CrossRef](#)]
- Purewal, S.; van den Akker, O.B.A. A study of the effect of message framing on oocyte donation. *Hum. Reprod.* **2009**, *24*, 3136–3143. [[CrossRef](#)]
- Ganzach, Y.; Karsahi, N. Message framing and buying behavior: A field experiment. *J. Bus. Res.* **1995**, *32*, 11–17. [[CrossRef](#)]
- Keller, P.A.; Limpkus, I.M.; Rimer, B.K. Affect, framing, and persuasion. *J. Mark. Res.* **2003**, *40*, 54–64. [[CrossRef](#)]
- Gerend, M.A.; Sias, T. Message framing and color priming: How subtle threat cues affect persuasion. *J. Exp. Soc. Psychol.* **2009**, *45*, 999–1002. [[CrossRef](#)]
- Meyerowitz, B.E.; Chaiken, S. The effect of message framing on breast self-examination attitudes, intentions, and behavior. *J. Personal. Soc. Psychol.* **1987**, *52*, 500–510. [[CrossRef](#)]
- Cherubini, P.; Rumiat, R.; Rossi, D.; Nigro, F.; Calabrò, A. Improving attitudes toward prostate examinations by loss-framed appeals. *J. Appl. Soc. Psychol.* **2005**, *35*, 732–742. [[CrossRef](#)]
- Detweiler, J.B.; Bedell, B.T.; Salovey, P.; Pronin, E.; Rothman, A.J. Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychol.* **1999**, *18*, 189–196. [[CrossRef](#)] [[PubMed](#)]
- Rothman, A.J.; Salovey, P. Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychol. Bull.* **1997**, *121*, 3–19. [[CrossRef](#)] [[PubMed](#)]
- Hull, S.J. Perceived risk as a moderator of the effectiveness of framed HIV-test promotion messages among women: A randomized controlled trial. *Health Psychol.* **2012**, *31*, 114–121. [[CrossRef](#)] [[PubMed](#)]
- Venkatraman, S.; Aloysius, J.A.; Davis, F.D. Multiple prospect framing and decision behavior: The mediational roles of perceived riskiness and perceived ambiguity. *Organ. Behav. Hum. Decis. Processes* **2006**, *101*, 59–73. [[CrossRef](#)]
- Gerend, M.A.; Shepherd, J.E. Using message framing to promote acceptance of the human papillomavirus vaccine. *Health Psychol.* **2007**, *26*, 745–752. [[CrossRef](#)] [[PubMed](#)]
- Maheswaran, D.; Meyers-Levy, J. The influence of message framing and issue involvement. *J. Mark. Res.* **1990**, *27*, 361–367. [[CrossRef](#)]
- Petty, R.E.; Cacioppo, J.T. The elaboration likelihood model of persuasion. *Adv. Exp. Soc. Psychol.* **1986**, *19*, 123–205.
- Garcia-Retamero, R.; Cokely, E.T. Effective communication of risks to young adults: Using message framing and visual aids to increase condom use and STD screening. *J. Exp. Psychol. Appl.* **2011**, *17*, 270–287. [[CrossRef](#)] [[PubMed](#)]
- White, V.; Webster, B.; Wakefield, M. Do graphic health warning labels have an impact on adolescents' smoking-related beliefs and behaviours? *Addiction* **2008**, *103*, 1562–1571. [[CrossRef](#)] [[PubMed](#)]
- Berko, J. The child's learning of English morphology. *Word* **1958**, *14*, 50–77. [[CrossRef](#)]
- Garon, N.; Bryson, S.E.; Smith, I.M. Executive function in preschoolers: A review using an integrative framework. *Psychol. Bull.* **2008**, *134*, 31–60. [[CrossRef](#)] [[PubMed](#)]
- Guy, J.; Rogers, M.; Cornish, K. Developmental changes in visual and auditory inhibition in early childhood. *Infant Child Dev.* **2012**, *21*, 521–536. [[CrossRef](#)]
- Hwang, M.H. A Longitudinal Study of a Korean Child's Language Development: From 30 to 41 Months. Master's Thesis, Dankook University, Yongin-si, Korea, 2003.
- Kochanska, G.; Coy, K.C.; Murray, K.T. The development of self-regulation in the first four years of life. *Child Dev.* **2001**, *72*, 1091–1111. [[CrossRef](#)] [[PubMed](#)]
- Kurdek, L.A. Perspective taking as the cognitive basis of children's moral development: A review of the literature. *Merrill-Palmer Q. Behav. Dev.* **1978**, *24*, 3–28.
- Selman, R.L. The relation of role taking to the development of moral judgment in children. *Child Dev.* **1971**, *42*, 79–91. [[CrossRef](#)] [[PubMed](#)]
- Simmering, V.R. The development of visual working memory capacity during early childhood. *J. Exp. Child Psychol.* **2012**, *111*, 695–707. [[CrossRef](#)] [[PubMed](#)]

30. Vazsonyi, A.T.; Huang, L. Where self-control comes from: On the development of self-control and its relationship to deviance over time. *Dev. Psychol.* **2010**, *46*, 245. [[CrossRef](#)] [[PubMed](#)]
31. Danis, A.; Pêcheux, M.G.; Lefèvre, C.; Bourdais, C.; Serres-Ruel, J. A continuous performance task in preschool children: Relations between attention and performance. *Eur. J. Dev. Psychol.* **2008**, *5*, 401–418. [[CrossRef](#)]
32. Ruff, H.A. Components of attention during infants' manipulative exploration. *Child Dev.* **1986**, *57*, 105–114. [[CrossRef](#)] [[PubMed](#)]
33. Cheon, C.H. The Influence of Child's Development of Theory of Mind and Social Desirability on Child's Prosocial Behavior. Master's Thesis, Sungkyunkwan University, Seoul, Korea, 2014.
34. Chung, J. A Developmental Lag between Children's Understanding of First-Order and Second-Order Mental States. *Korean J. Dev. Psychol.* **2013**, *26*, 97–118.
35. Hongwanishkul, D.; Happaney, K.R.; Lee, W.S.; Zelazo, P.D. Assessment of hot and cool executive function in young children: Age-related changes and individual differences. *Dev. Neuropsychol.* **2005**, *28*, 617–644. [[CrossRef](#)] [[PubMed](#)]
36. Rothbart, M.K.; Ellis, L.K.; Rosario Rueda, M.; Posner, M.I. Developing mechanisms of temperamental effortful control. *J. Personal.* **2003**, *71*, 1113–1144. [[CrossRef](#)]
37. Bindman, S.W.; Hindman, A.H.; Bowles, R.P.; Morrison, F.J. The contributions of parental management language to executive function in preschool children. *Early Child. Res. Q.* **2013**, *28*, 529–539. [[CrossRef](#)] [[PubMed](#)]
38. Kopp, C.B. Antecedents of self-regulation: A developmental perspective. *Dev. Psychol.* **1982**, *18*, 199. [[CrossRef](#)]
39. Kohlberg, L. Stage and sequence: The cognitive developmental approach to socialization. In *Handbook of Socialization on Theory and Research*; Goslin, D., Ed.; Rand McNally: Chicago, IL, USA, 1969; pp. 347–480.
40. Kohlberg, L. The cognitive-developmental approach to moral education. *Phi Delta Kappan* **1975**, *56*, 670–677.
41. Walker, L.J.; Taylor, J.H. Family interactions and the development of moral reasoning. *Child Dev.* **1991**, *62*, 264–283. [[CrossRef](#)]
42. Seed, A.M.; Dickerson, K.L. Future thinking: Children but not apes consider multiple possibilities. *Curr. Biol.* **2016**, *26*, R525–R527. [[CrossRef](#)] [[PubMed](#)]
43. Seiver, E.; Gopnik, A.; Goodman, N.D. Did she jump because she was the big sister or because the trampoline was safe? Causal inference and the development of social attribution. *Child Dev.* **2013**, *84*, 443–454. [[CrossRef](#)]
44. Tecwyn, E.C.; Thorpe, S.K.S.; Chappell, J. Development of planning in 4- to 10-year-old children: Reducing inhibitory demands does not improve performance. *J. Exp. Child Psychol.* **2013**, *125*, 85–101. [[CrossRef](#)] [[PubMed](#)]
45. Witelson, S.F. Neurobiological aspects of language in children. *Child Dev.* **1987**, *58*, 653–688. [[CrossRef](#)] [[PubMed](#)]
46. Kim, S.P.; Kim, H.J. The impact of message framing and theme type on public campaign advertising: Focused on elementary school student. *J. Public Relat. Res.* **2013**, *17*, 5–39.
47. Impropo, L.V.F.; Inguito, J.S.; Ingusan, D.R.; Ingusan, D.R.; Jalandoni, J.A.J.; Jarabelo, L.E.; Empaynado-Porto, A. Loss versus gain: Integrating technology and message framing in promoting proper hand washing among grade 1 pupils. *Int. J. Public Health Res.* **2011**, *2001*, 103–114.
48. Bannon, K.; Schwartz, M.B. Impact of nutrition messages on children's food choice: Pilot study. *Appetite* **2006**, *46*, 124–129. [[CrossRef](#)] [[PubMed](#)]
49. Moorman, M.; van den Putte, B. The influence of message framing, intention to quit smoking, and nicotine dependence on the persuasiveness of smoking cessation messages. *Addict. Behav.* **2008**, *33*, 1267–1275. [[CrossRef](#)] [[PubMed](#)]
50. Rothman, A.J.; Salovey, P.; Antone, C.; Keough, K.; Martin, C.D. The influence of message framing on intentions to perform health behaviors. *J. Exp. Soc. Psychol.* **1993**, *29*, 408–433. [[CrossRef](#)]
51. Fagerlin, A.; Wang, C.; Ubel, P.A. Reducing the influence of anecdotal reasoning on people's health care decisions: Is a picture worth a thousand statistics? *Med. Decis. Mak.* **2005**, *25*, 398–405. [[CrossRef](#)]
52. Lipkus, I.M. Numeric, verbal, and visual formats of conveying health risks: Suggested best practices and future recommendations. *Med. Decis. Mak.* **2007**, *27*, 696–713. [[CrossRef](#)] [[PubMed](#)]
53. Evans, A.T.; Peters, E.; Strasser, A.A.; Emery, L.F.; Sheerin, K.M.; Romer, D. Graphic warning labels elicit affective and thoughtful responses from smokers: Results of a randomized clinical trial. *PLoS ONE* **2015**, *10*, e0142879. [[CrossRef](#)]
54. O'Hegarty, M.; Pederson, L.L.; Nelson, D.E.; Mowery, P.; Gable, J.M.; Wortley, P. Reactions of young adult smokers to warning labels on cigarette packages. *Am. J. Prev. Med.* **2006**, *30*, 467–473. [[CrossRef](#)] [[PubMed](#)]
55. Hammond, D.; Fong, G.T.; McDonald, P.W.; Brown, K.S.; Cameron, R. Graphic Canadian cigarette warning labels and adverse outcomes: Evidence from Canadian smokers. *Am. J. Public Health* **2004**, *94*, 1442–1445. [[CrossRef](#)] [[PubMed](#)]
56. Hammond, D.; Fong, G.T.; McDonald, P.W.; Cameron, R.; Brown, K.S. Impact of the graphic Canadian warning labels on adult smoking behavior. *Tob. Control* **2003**, *12*, 391–395. [[CrossRef](#)] [[PubMed](#)]
57. Seo, K.; Dillard, J.P.; Shen, F. The effects of message framing and visual image on persuasion. *Commun. Q.* **2013**, *61*, 564–583. [[CrossRef](#)]
58. Cokely, E.T.; Kelley, C.M. Cognitive abilities and superior decision making under risk: A protocol analysis and process model evaluation. *Judgm. Decis. Mak.* **2009**, *4*, 20–33.
59. Cho, Y.-S.; Hwang, J.-S. The effectiveness of PSA (Public Service Advertising) with the types of issues: Influence of the characteristics of messages and audiences on social v. individual issues. *Korean J. Advert. Public Relat.* **2007**, *9*, 71–104.
60. O'Keefe, D.J.; Jensen, J.D. The relative persuasiveness of gain-framed loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *J. Health Commun.* **2007**, *12*, 623–644. [[CrossRef](#)]

61. Pakpour, A.H.; Yekaninejad, M.S.; Sniehotta, F.F.; Updegraff, J.A.; Dombrowski, S.U. The effectiveness of gain- versus loss-framed health messages in improving oral health in Iranian secondary schools: A cluster-randomized controlled trial. *Ann. Behav. Med.* **2014**, *47*, 376–387. [[CrossRef](#)]
62. Ruff, H.A.; Lawson, K.R. Development of sustained, focused attention in young children during free play. *Dev. Psychol.* **1990**, *26*, 85–93. [[CrossRef](#)]
63. Bandura, A. *Social Learning Theory*; Prentice Hall: Englewood Cliffs, NJ, USA, 1977.
64. Ahn, S. The Teacher-Child Interaction and the Child-Peer Interaction in Free Play Time. Master's Thesis, Ewha Womans University, Seoul, Korea, 2000.
65. Lee, Y.-N. Affective Perspective Taking Ability and Peer Interaction: Their Tendency and Relationship in Preschoolers 4–5 Years-Old. Master's Thesis, Ewha Womans University, Seoul, Korea, 2017.
66. Smith, G.E. Framing in advertising and the moderating impact of consumer education. *J. Advert. Res.* **1996**, *36*, 49–64.
67. Rose, S.A.; Feldman, J.F.; Jankowski, J.J.; Van Rossem, R. Information processing from infancy to 11 years: Continuities and prediction of IQ. *Intelligence* **2012**, *40*, 445–457. [[CrossRef](#)] [[PubMed](#)]
68. Mayer, R.E.; Heiser, J.; Lonn, S. Cognitive constraints on multimedia learning: When presenting more material results in less understanding. *J. Educ. Psychol.* **2001**, *93*, 187–198. [[CrossRef](#)]
69. Paivio, A. *Mental Representations: A Dual Coding Approach*; Oxford University Press: New York, NY, USA, 1990.
70. Nelson, D.; Reed, V.; Walling, J. Pictorial superiority effect. *J. Exp. Soc. Psychol. Hum. Learn. Mem.* **1976**, *2*, 523–528. [[CrossRef](#)]
71. Slovic, P.; Finucane, M.; Peters, E.; MacGregor, D.G. Rational actors or rational fools: Implications of the affect heuristic for behavioral economics. *J. Socio-Econ.* **2002**, *31*, 329–342. [[CrossRef](#)]
72. Peters, E. The functions of affect in the construction of preferences. In *The Construction of Preference*; Lichtenstein, S., Slovic, P., Eds.; Cambridge University Press: Cambridge, UK, 2006; pp. 454–463.
73. Peters, E.; Lipkus, I.; Diefenbach, M.A. The functions of affect in health communications and in the construction of health preferences. *J. Commun.* **2006**, *56*, S140–S162. [[CrossRef](#)]
74. Block, L.G.; Keller, P.A. When to accentuate the negative: The effects of perceived efficacy and message framing on intentions to perform a health-related behavior. *J. Mark. Res.* **1995**, *32*, 192–203. [[CrossRef](#)]