The Effects of Children's Goals for Learning on Video Game Performance

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Children's goals for learning on their video game performance and patterns of attention were examined. Before playing a game, second- and fifth-graders were instructed to adopt an evaluative, process, outcome, or no specific goal focus while playing. Children were then interviewed about their game strategies and the game features they paid attention to while playing. Older children and more frequent players showed better performance. Among frequent players, process goal instructions facilitated performance. Younger children's interview references to process goals also were predictive of better performance. Their references to attention strategies, however, were predictive of poorer performance while older children's references to attention strategies were predictive of better performance. These findings highlight the efficacy of process goals for learning among younger and older children.

Descriptions of children's attention during the elementary school years point to younger children's inability to benefit from the attention strategies they use while learning (DeMarie-Dreblow & Miller, 1988; Miller, 1990; Miller & Seier, 1994; Miller & Weiss, 1981). Specifically, children before the age of ten demonstrate less sophisticated selective attention or attention to relevant information than would be expected from their overt strategic behavior. Miller and her colleagues (Miller, 1990; Miller & Seier, 1994) have referred to this lag between strategy use and its manifestation in efficient attention behavior as a utilization deficiency.

The primary task used to assess children's patterns of attention is Miller's door-opening task (Miller & Weiss, 1981). Briefly, this task utilizes pictures drawn from two categories, one of which is designated as relevant and one irrelevant. The pictures are arranged in an array and hidden behind doors. Each door is illustrated with a line drawing that indicates the category whose exemplar is depicted underneath. Children's overt strategies for studying the pictures (i.e., lifting of the doors)

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is then observed and compared to their subsequent recall of the location of relevant items, and irrelevant items. Strategies of attention are inferred from children's patterns of opening the doors (e.g., opening all doors in sequence, opening only relevant doors). Assessments of selective attention are inferred from children's recall of the relevant pictures' locations.

The reasons offered for the utilization deficiency, which is also found in studies of children's memory (Bjorklund & Coyle, 1995; Bjorklund, Coyle, & Gaultney, 1992; Bjorklund, Schneider, Cassel, & Ashley, 1994) include the limit in cognitive capacity available to apply a strategy given the effort involved in its production, the limited knowledge that younger children use in particular learning situations, the inability to link strategy production with other information processing activities or to inhibit the use of an inappropriate strategy, and finally, to the poor metamemory skills of younger children (Miller & Seier, 1994). Another possibility is that developmental differences in children's goals for learning have implications for the ability to benefit from their strategy use. That is, younger children's goals for learning a task may predispose them to a different and perhaps less efficient attentional focus than older children despite comparable abilities to execute efficient attentional strategies in circumscribed learning tasks.

Support for the effects of children's goals for learning on performance can be found in the self-regulation literature, which concerns the processes learners use to negotiate their cognitive abilities, motivation, and performance while striving toward a goal (Schunk, 1996; Schunk & Zimmerman, 1997; Zimmerman, 1998a). According to Zimmerman (1998b), an initial phase of self-regulation involves the establishment of goals for learning a particular task, and has implications for directing attention while learning. Two types of goals that have been examined are process and outcome goals (Schunk & Swartz, 1993; Zimmerman & Kitsantas, 1997): process goals pertain to the execution of those strategies or behaviors that children use to facilitate learning, whereas outcome goals pertain to the product or result of that learning.

The differential effects of process and outcome goals have been demonstrated for motoric behaviors such as dart throwing among high school students (Zimmerman & Kitsantas, 1997) and for writing achievement among elementary school students (Schunk & Swartz, 1993). These studies demonstrated that process goals were more effective than outcome goals alone in facilitating performance. Zimmerman and Kitsantas' findings, in particular, provided compelling evidence for a sequence of goals in which performance is most effective when students shift from a process goal to an outcome goal once a skill has been acquired (in this case, how to throw a dart).

Blumberg (1998) recently found that among second- and fifth-graders, performance on a popular children's video game and self-reported patterns of attention while playing were influenced by differential goals for game play. In that study, children played a video game and then were asked about the game features that they paid attention to while playing, and the game and attention strategies that they would recommend to a novice player. Post-game responses revealed developmental differences in references to game features, strategies, and in orientations or goals for game play. Specifically, younger children focused more on evaluative assessments

of the task ("I like the game") whereas older children focused more on specific goals or standards for game play which could be construed as a process ("I was thinking to try not to get hit by the spikes") or an outcome ("I wanted to win") goal. A focus on either of these two types of goals was predictive of better game performance.

The present study was designed to examine whether manipulations of children's goals for game play would differentially affect second- and fifth-graders' video game performance. The central question concerned the extent to which an evaluative goal focus would impair older children's game performance and either a process- or outcome-based focus would facilitate younger children's performance. To address this question, children were given pre-game instructions to focus on how much they liked the game (evaluative goal focus), what they were doing while playing the game (process goal focus), how well they were playing the game (outcome goal focus), or no specific game focus (control group). A second question concerned the extent to which children would report attention to different aspects of the learning situation based on their pre-game instructions.

Consistent with earlier findings (Blumberg, 1998), children instructed to adopt an evaluative focus were expected to show poorer performance than children in each of the goal conditions and the control group. Children instructed to adopt a process orientation, by comparison, were expected to show the best performance among all conditions. Because outcome goals may be less relevant in the playing of video games, which have several embedded end-points within any given game level or stage, outcome goal instructions were expected to exert less of an influence on performance and patterns of attention than process goal instructions. Children's references to game and attention strategies, and to cues during the post-game interview also were expected to vary by instructed goal emphasis given their differential attentional focus. In particular, children in the process goal condition were expected to show the greatest reference to strategies and to cues during the post-game interview. Consistent with findings from the utilization deficiency literature, reference to strategies and game cues, across all conditions, were expected to be predictive of better performance among the older children than younger children.

Method

Subjects

The participants were 62 second-grade (31 boys and 31 girls, mean age = 7.89) and 65 fifth-graders (35 boys and 30 girls, mean age = 10.72) attending four ethnically diverse public elementary schools in a New York City school district. Participants from each school were distributed proportionally among the conditions.

Materials and Apparatus

A Sega Game Gear color portable video game system was used to present Sega's *Sonic the Hedgehog 2* video game. The primary goal for playing *Sonic the Hedgehog 2* is to complete as many successive levels of the game as possible. To meet this goal, a player is given three "Sonics," or lives, at the start of each game.

Each Sonic insures one round of play. When a player loses a Sonic on a given level, the game reverts to the beginning of that level. A player accumulates Sonics by successfully locating a free Sonic (as represented by a small Sonic the Hedgehog icon), by accumulating 100 rings during a given round of play, or by receiving a free Sonic at the conclusion of a level (awarded on a random basis). A player loses a Sonic through contact with dynamic hazards (e.g., robots that spew rocks) or static hazards (e.g., spikes, lava).

A Panasonic RN-122 microcassette recorder was used to tape-record children's responses to post-game questions.

Procedure

Students first were asked about their prior experience playing the video game used in the study, *Sonic the Hedgehog 2* for *Game Gear*, and the frequency with which they played video games. Next, participants played the game for 10 continuous minutes. As part of their pre-game instructions, participants were asked to focus on "how much you like the game" (evaluative goal focus), "how well you are playing the game" (outcome goal focus), or "what you are doing while playing" (process goal focus). The remaining participants received game instructions consistent with those given by Blumberg (1998) in which no game play focus was given (control group).

Each child was seen individually in a testing area provided by the participating school. After the experimenter (one of two Black females or one of two White females) introduced herself and explained that portions of the child's work would be tape-recorded, the child was asked to play a video game on the Game Gear. After 10 minutes of continuous play, children were asked three questions about their experience playing the game: 1) What were you thinking about as you were playing the game? 2) Suppose you were going to tell someone else who has never played the game before how to play it. Are there any special secrets or rules that you would tell them about? and 3) What would you tell them to pay attention to?

Immediately following the last response, the child was thanked and asked to return to their class.

Coding Scheme for the Post-Game Questions

A coding scheme was devised to characterize children's responses to the three post-game questions as indicated on individually prepared transcripts of their tape-recorded comments. All transcripts were verified by an independent reader. Discrepancies were reconciled in a second set of transcripts that were then used to code children's post-game question responses.

Slightly over half the transcripts (N = 64) were coded by two independent raters for references to particular categories of comments. For the most part, these categories were question-specific. Inter-rater reliability, based on Cohen's kappa, ranged from excellent to fair for nearly all categories of response, according to Fliess' (1981) general guidelines. Descriptions of the categories are presented below.

Goal-oriented Comments. This category of comments referred to the subject's perceived goals for playing the game. These comments were further classified as

outcome goal references, which pertained to the subject's mention of overriding or general goals for playing the game (e.g., "I was thinking I wasn't gonna win" or "Just to get to the end"), *process goal references*, which noted specific or personal goals for mastering the game, and to completing a particular level or move within the context of the game (e.g., "I was thinking that I'd really like to beat the third board" or "How good I was gonna be and how far I was gonna get"), and *evaluative goal references*, which reflected personal appraisals of the game (e.g., "It was fun playing" or "I was thinking about how much harder it is than the original Sonic the Hedgehog"). This category was used to code responses to question 1 only.

Strategy-based Comments. Subjects' remarks in this category referred to strategies or approaches that could be used while playing the game. These comments were further classified as *attention strategy references*, which concerned how and what to monitor while playing, and how to avoid distractions (e.g., "Pay attention to the game and not talk to anyone while I'm playing it cause they might lose" or "To keep your eyes on the game and don't look anywhere else"), and *game strategy references*, which described how to enact a move or the consequences of an action or inaction (e.g., "There's one where you have to jump on the thing and you have to push the backwards button and you go up and you have a little machine and then get the box that has the small coins"). This category was used to code responses to questions 2 and 3 only.

Game-oriented Comments. This category of comments referred to specific aspects of the game. These comments were further classified into two types of references: *game mechanics references*, which concerned the operation of the game such as the controls or the codes that could be used to set the game parameters, such as the number of "lives" allotted per game (e.g., "When you like press the button to move forward, try not to press too hard because if you do, you die" or "I would tell them the secret of the code to go to the last master") and *game cue references*, which referred to specific aspects or features of the game (e.g., "The spikes are on top of the ceiling; there's red ones that fall down"). This category also was used to code responses to questions 2 and 3.

Uninformative/Definitive Comments. This category pertained to responses that provided little or no information about children's thoughts on a given question. These comments were classified as *non-committal/non-focused* references which took the form of an "I don't know" or irrelevant response and *definitive* references which took the form of a "yes" or "no" response. This category was used to code responses to questions 1, 2, and 3.

Results

Characterization of Dependent Variables

Children's performance while playing was characterized by four performance indicators previously used by Blumberg (1998): highest level reached, number of levels completed, number of Sonics lost, and number of games initiated. The first two variables are best characterized as indicators of "good" performance whereas

Table 1. Factor Loadings for the Game Performance Variables

Variable	*Factor Loading*
Highest level reached	0.89
Total levels completed	0.89
Sonics lost	−0.75
Games started	−0.83

the latter two are indicators of "poor" performance. A principal components analysis yielded one factor that accounted for 71% of the variance. This factor, referred to as "game performance," was normalized to have mean 0 and standard deviation 1, and was used in subsequent analyses of performance. The factor loadings for each of the four dependent variables are shown in Table 1.

Characterization of Children's Overall Game Experience

Prior to their game play, all children were asked how often (or frequently) they played video games, using a four point scale where 4 indicated "every day" and 1 indicated "hardly ever or not at all." Children also were asked whether they had played *Sonic the Hedgehog 2* for *Game Gear* and how often, using a three point scale where 3 indicated "many times" and 1 indicated "only a few times." Children's responses to this question indicated that 64% of the children (39 second-graders and 42 fifth-graders) played video games at least one day a week. These children were characterized as frequent players in subsequent analyses, the remainder as infrequent players. Two chi-square analyses were performed to examine the distribution of players representing the four levels of frequency of play across grade and the two newly formed levels of frequency of play across grade. Both analyses yielded insignificant findings. An additional two-way analysis of variance of game performance with frequency of play (frequent or infrequent) and goal condition as between subject variables indicated a main effect of frequency of play only, $F(1, 119) = 8.52$, $p < .004$ ($M_{\text{frequent}} = .20$ vs. $M_{\text{infrequent}} = -.36$). Accordingly, no correction was applied for differential frequency of play across the goal conditions.

A three-way analysis of variance of game performance with frequency of play, grade, and gender as between subject variables yielded significant main effects for frequency of play, $F(1, 119) = 4.59$, $p < .03$ ($M_{\text{frequent}} = .20$ vs. $M_{\text{infrequent}} = -.36$), grade, $F(1, 119) = 14.20$, $p < .01$ ($M_{\text{fifth}} = .28$ vs. $M_{\text{second}} = -.29$), and gender, $F(1, 119) = 12.55$, $p < .001$ ($M_{\text{males}} = .36$ vs. $M_{\text{females}} = -.38$). No significant interactions were found. The finding of gender differences in video game performance is consistent with prior research (Greenfield, 1994; Greenfield, Brannon, & Lohr, 1994; Okagaki & Frensch, 1994). However, as gender was not a primary variable of concern in the present study and did not interact with the primary variable of goal condition, it was excluded from further analyses.

Characterization of Children's Specific Game Experience

Only 35% of the total sample of children (15 second-graders and 30 fifth-graders) had played *Sonic the Hedgehog 2* for *Game Gear* (that is, had specific

game experience) prior to the study. This finding stands in marked contrast to Blumberg's study (1998) in which all but nine children had specific game experience. Of the children who reported previous game experience in the present study, 76% (13 second-graders and 21 fifth-graders) indicated that they had played the game only a few times. The difference in specific game play experience between the two samples may reflect the recency and novelty (and attending popularity) of *Sonic the Hedgehog 2* for *Game Gear* in the children's video game market for participants in Blumberg's study.

A two-way analysis of variance of game performance with specific game experience and goal condition as between subject variables indicated a main effect of specific game experience only, $F(1, 119) = 5.10$, $p < .03$ ($M_{\text{specific game experience}} = .25$ vs. $M_{\text{no specific game experience}} = -.13$). No significant interactions were found. Accordingly, all subsequent analyses were collapsed across specific game experience given that only eleven children had more than limited contact with the game (that is, played the game more than a few times).

Game Performance

A three-way analysis of variance of performance with grade, goal condition, and frequency of video game play as between subject variables indicated a main effect of grade, $F(1, 111) = 13.03$, $p < .001$ ($M_{\text{fifth}} = .28$ vs. $M_{\text{second}} = -.30$) and frequency of play, $F(1, 111) = 11.15$, $p < .001$ ($M_{\text{frequent}} = .20$; vs. $M_{\text{infrequent}} = -.35$). A significant grade by frequency by goal condition interaction was also found, $F(3, 111) = 4.67$, $p < .004$. An examination of the means indicated that frequent players consistently showed better performance across all conditions for both grades than infrequent players, with two notable exceptions: second-graders in the control condition ($M_{\text{frequent}} = -.70$; vs. $M_{\text{infrequent}} = -.23$) and in the evaluation condition ($M_{\text{frequent}} = -.03$; vs. $M_{\text{infrequent}} = .49$). Accordingly, instructions to focus on one's assessment of the task ostensibly facilitated performance among younger children with infrequent exposure to video games and deterred those children with frequent exposure. This finding conforms with Blumberg's results which indicated that an evaluative game focus was associated with poorer performance among frequent players (as nearly all children were self-characterized in that study). The means and standard deviations for these three variables are shown in Table 2.

The analyses of greatest interest concerned children's performance as influenced by their pre-game instructions to adopt a specific learning focus. A series of two-way analyses of variance, with grade and goal condition as between subject variables, compared each of the goal conditions against the control group. However, among the entire sample, only a main effect of grade was found for the comparison between the process goal and control group only, $F(1, 60) = 8.15$; $p < .006$ ($M_{\text{fifth}} = .37$ vs. $M_{\text{second}} = -.37$).

Given that only children who played video games may have been able to respond meaningfully to the instructional manipulation, analyses were done including only those children who reported having played video games at least once a week ($n = 81$). The subsequent two-way analyses of variance, with grade and goal condition as between subjects variables, compared each of the goal conditions against the

Table 2. Game Performance by Grade, Condition, and Frequency

					Condition					
	Grade		*Evaluation*		*Process*		*Outcome*		*Control*	
	Frequency	*N*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Second										
	Freq.	39	−0.03	(0.61)	0.17	(0.79)	0.04	(1.16)	−0.70	(0.88)
	Infreq.	23	−0.49	(0.50)	−1.34	(0.88)	−0.93	(1.04)	−0.23	(1.12)
	Total	62	−0.11	(0.60)	−0.29	(1.06)	−0.37	(1.17)	−0.42	(1.02)
Fifth										
	Freq.	42	0.43	(0.90)	0.77	(0.41)	0.15	(0.69)	0.49	(0.95)
	Infreq.	23	0.04	(1.20)	0.58	(0.84)	0.04	(0.88)	−1.03	(1.30)
	Total	65	0.27	(1.02)	0.71	(0.56)	0.10	(0.75)	0.06	(1.23)

Note: Game performance is normalized to have mean = 0 and standard deviation = 1.

control group. Main effects of grade were found for comparisons between the evaluative goal and control group, $F(1, 40) = 9.06$; $p < .005$ ($M_{\text{fifth}} = .46$ vs. $M_{\text{second}} = -.25$) and the outcome goal and control group, $F(1, 33) = 4.61$; $p < .04$ ($M_{\text{fifth}} = .36$ vs. $M_{\text{second}} = -.30$). The process goal and control group comparison, however, yielded both a significant effect of grade, $F\ (1, 36) = 12.00$; $p < .001$ ($M_{\text{fifth}} = .62$ vs. $M_{\text{second}} = -.21$), and of goal condition, $F\ (1, 36) = 4.37$; $p < .04$ ($M_{\text{process}} = .50$ vs. $M_{\text{control}} = .07$). Accordingly, paying attention to one's behavior while playing facilitated performance among both younger and older frequent players.

Post-game Responses

A series of independent *t*-tests comparing the mean number of post-game responses for each category by grade indicated significant developmental differences for references to attention and game strategies, specific game cues, and uninformative comments about the game. Three categories of comments were excluded from further consideration given their relative infrequency or non-occurrence (Attention strategy comments in response to question 2: five instances; game mechanics comments in response to question 3: six instances; non-committal comments in response to question 2: six responses, and definitive comments in response to question 3: no instances). The proportions of post-game responses by grade and coding category are shown in Table 3.

Unlike Blumberg's earlier findings, there were no significant differences between second- and fifth-grade students in the proportion of evaluative goal response comments made to question 1. In fact, there were no significant differences between younger and older students in references to any of the goal-oriented comment categories. Developmental differences were found, however, in reference to strategy-oriented comments as fifth graders mentioned a higher proportion of game strategies in response to question 2 [$t\ (125) = -2.140$; $p = .034$] and to question 3 [$t\ (125) = .041$]. Fifth-graders also were more inclined to make references to game cues in response to question 2 than were second-graders [$t\ (125) = -4.019$; $p = .001$]. Second graders, however, were more likely to make references to attention

Table 3. Proportions of Post-Game Responses by Grade and Coding Category

Coding Category	*Applicable Questions*	*Grade 2 (N = 62)*	*Grade 5 (N = 65)*	*All subjects (N = 127)*
Goal-oriented				
Evaluative goal	1	0.11	0.03	0.08
Outcome goal	1	0.26	0.31	0.28
Process goal	1	0.35	0.51	0.43
Strategy-oriented				
Attention strategy	3	0.29[a]	0.11[b,**]	0.20
Game strategy	2	0.32[a]	0.51[b,*]	0.42
	3	0.26[a]	0.43[b,*]	0.35
Game-oriented				
Game mechanics	2	0.23	0.18	0.20
Game cues	2	0.34	0.40	0.37
	3	0.39[a]	0.72[b,**]	0.56
Uninformative				
Non-committal	1	0.24	0.14	0.19
	3	0.24[a]	0.05[b,**]	0.14
Definitive	2	0.39	0.31	0.35

[a,b] Cell means with different superscripts are significantly different at either * $p < 0.05$ or ** $p < 0.005$.

strategies in response to question 3 than fifth-graders [t (125) = 2.615; p = .01]. Second graders also were more inclined to make non-committal comments in response to question 3 than fifth graders [t (125) = 3.268; p = .002]. Overall, younger children may have been inclined to focus on ways to maintain attention while learning whereas fifth graders may have been more concerned with the strategies and cues needed to master the game while learning.

An examination of the differences in types of comments made by frequent versus infrequent players yielded no significant findings. However, among frequent players, developmental differences were found for references to game strategies in response to question 2 [t (79) = −2.712; p = .008] and to game cues in response to question 3 [t (79) = −3.390; p = .001]. Specifically, fifth-graders made greater reference to these categories of responses than second-graders. Younger children, however, were more likely to make attention strategy references in response to question 3 than fifth-graders [t (79) = 2.369; p = .02]. These findings are consistent with those found among the larger sample. The proportions of post-game responses by grade and coding category for frequent players are shown in Table 4.

Relationship between post-game responses and game performance. A series of point biserial correlations was computed to examine the relationship between subjects' reported goal orientation and game aspects warranting attention and their game performance.

Reference to process goals in the post-game interview was correlated with better performance only among second graders, (r_{pb} = .26); $p < .04$. This finding was more pronounced among second-graders characterized as frequent players,

Table 4. Proportions of Post-Game Responses by Grade and Coding Category Among Frequent Players

Coding Category	*Applicable Questions*	*Grade 2 (N = 39)*	*Grade 5 (N = 42)*	*All subjects (N = 81)*
Goal-oriented				
Evaluative goal	1	0.07	0.02	0.05
Outcome goal	1	0.23	0.26	0.25
Process goal	1	0.33	0.55	0.44
Strategy-oriented				
Attention strategy	3	0.33[a]	0.12[b,**]	0.22
Game strategy	2	0.28[a]	0.57[b,**]	0.43
	3	0.26	0.45	0.36
Game-oriented				
Game mechanics	2	0.33	0.17	0.25
Game cues	2	0.31	0.40	0.36
	3	0.36[a]	0.71[b,**]	0.54
Uninformative				
Non-committal	1	0.33[a]	0.14[b,*]	0.23
	3	0.23[a]	0.04[b],*	0.14
Definitive	2	0.36	0.36	0.36

[a,b] Cell means with different superscripts are significantly different at either * $p < 0.05$ or ** $p < 0.005$.

($r_{pb} = .40$); $p < .01$. Thus, an emphasis on one's behaviors while involved in a familiar type of task was associated with facilitating effects among the second-graders. In contrast, second-graders' reference to attention strategies in response to question 3 was negatively correlated with game performance, ($r_{pb} = -.34$); $p < .03$, as it was among second-graders characterized as frequent players, ($r_{pb} = -.38$); $p < .02$. Accordingly, a more general attentional focus to the game had an opposite effect on performance among younger children.

Among older children, only reference to attention strategies among frequent players in response to question 2 was predictive of better performance, ($r_{pb} = .32$); $p < .03$. Thus, fifth-graders with video game experience ostensibly considered attention strategies a useful adjunct to their game play.

Discussion

This study was designed to investigate the effects of children's goals for learning on their video game performance and self-reported patterns of attention after having played the game. Reference to process goals during the post-game interview was predictive of better performance among the younger children, particularly those children with frequent game play experience. Thus, focusing on one's behavior while negotiating a familiar learning situation was a useful and facilitative strategy for the younger children. The question remains as to how the younger children used a process goal orientation to direct their attention while playing, as reference to attention strategies, in response to a query about how a novice player should

approach the game, was predictive of poorer performance. In fact, a significantly greater proportion of younger children made references to attention strategies than older children. However, an awareness of the need to apply attention strategies among the younger children was not manifest in better game performance. This finding is consistent with a utilization deficiency account of the developmental delay between early elementary school children's attention strategy use and their performance (Miller, 1990). As a direct assessment of the patterns of attention used by younger children was not possible in the present study, clear conclusions about the lack of coordination between younger children's attention strategies and performance, as observed in utilization deficiencies, cannot be drawn.

Among older children with frequent game experience, reference to attention strategies was predictive of better game performance, implying an ability to use attention strategies to mediate learning in an arguably familiar situation (i.e., playing video games). This inference is supported by finding that older children, in general, also made significantly greater references to game cues and game strategies in response to queries about what novice players should know when playing the game. Older children's references to strategic knowledge, particularly for the frequent players, may reflect greater ability to self-regulate their learning given their prior video game knowledge (see Boekaerts, 1997).

In contrast to Blumberg's earlier findings (1998), second-graders in the present study did not make significantly more evaluative comments than fifth-graders. In fact, only nine children (seven second-graders and two fifth-graders) made evaluative comments. This finding may reflect the relatively small number of children who had played *Sonic the Hedgehog 2* for *Game Gear* as compared with children in the earlier study for whom the game was relatively new and popular. Children's infatuation with and interest in new video games is well documented and exploited by toy manufacturers (Herz, 1997). Thus, the relative novelty of the game for children in the earlier study may have accounted for their greater experience with the game than children in this study.

As Blumberg proposed (1998), younger children may be more inclined than older children to adopt less stringent standards for learning, as characterized by an evaluative emphasis, in situations where they have had direct experience with a task. However, when faced with a similar but not identical task, younger children's goals for learning may mirror those of older children (63% of the second-graders and 65% of the fifth-graders were characterized as frequent video game players). In fact, the greatest proportion of goal references for this study, regardless of assignment to goal condition, were process goal comments (43% as compared to 28% and 7% for outcome and evaluative goal references, respectively) and as noted above, nearly two-thirds of the subjects had no direct experience with the experimental game.

The relationship between task experience and goals for learning, particularly among younger learners, clearly warrants further investigation. As expected, outcome goals were mentioned very infrequently in the post-game interview and, as part of pre-game instructions, did not influence children's performance. As indicated in the introduction, outcome goals may be less relevant in the playing of video games, in which outcomes within a given level of the game (e.g., acquiring all the

rings in a subterranean cave) are equally as important, or even more important, than the outcome of the game as a totality (e.g., beating Dr. Robotnik to rescue a kidnapped friend).

Overall, these findings point to the efficacy of process goals for learning among younger children. The manner in which process goals mediate both younger and older learners' attention and performance warrants further examination and more direct assessment than was possible with a commercial video game. Tasks similar to Miller's door-opening apparatus (Miller & Weiss, 1981), in which separate assessments of children's attention strategies and performance can be readily made, are needed to clearly determine how children's goals for learning and motivation in general mediate their learning and developmental differences in strategy and performance. The challenge remains to devise a task or effectively exploit children's everyday tasks to examine the generalizability of their goals for learning on attention and performance across learning situations, contrived or uncontrived, and to examine the contribution of experience to developmental differences in their patterns of attention.

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