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University of California, San Diego

Triton Psychology Report

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- Provide an opportunity for undergraduates in psychology and related fields to share their research contributions with their peers and the larger scientific community of UCSD.
- Promote students' fundamental understanding of the research process, and foster their ability to effectively communicate findings, while offering hands-on experience preparing a research journal for publication.
- Encourage undergraduate students to take advantage of the research opportunities available to them through UCSD and affiliated institutions.

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Executive Functioning Deficits in Suicide Attempters with Psychiatric Illness

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To explore the link between suicidal behavior and deficits in neuropsychological functioning in individuals with psychiatric illness, 36 suicide attempters diagnosed with severe mental illness were administered a neuropsychological battery focusing on executive functioning. Participants completed a brief survey regarding life circumstances and history of suicidality to allow for comparisons between executive functioning and attempt lethality, presence of psychosis, and substance abuse or dependence. High lethality participants respond significantly slower than low lethality participants on the Delay=Go task $t(33)=-2.46$, $p=.02$, suggesting that processing speed may differ between high lethality and low lethality attempters. No other significant results were observed. Though preliminary, these findings suggest that neuropsychological dysfunction may influence the suicidal behavior of psychiatric patients. Further investigation is needed in an effort to develop early intervention and treatment for individuals at risk for suicide.

Eleven out of every 100,000 Americans commit suicide each year (Kochanek, Murphy, Anderson, & Scott, 2004), and approximately 90% of those individuals have been diagnosed with psychiatric illness (Mann, Waternaux, Haas, & Malone, 1999). In an effort to better understand the association between mental illness and suicidal behavior, current research is examining possible moderating factors, one of which may be impaired cognition.

Psychiatric illness is associated not only with suicide risk, but also with impairment in neurocognitive functioning. Patients with psychotic disorders, bipolar disorder, depression, and borderline personality disorder frequently display such impairment, especially in the domain of executive functioning (Saykin et al., 1991; Bearden, Hoffman, & Cannon, 2001; Marvel & Paradiso, 2004; Lenzenweger, Clarkin, Fertuck, & Kernberg, 2003). Executive functions include (a) problem-solving; (b) planning, strategizing, and organizing behavior; (c) thinking flexibly; (d) monitoring and adjusting one's own performance; and (e) inhibiting inappropriate or impulsive behavior.

Several recent studies suggest that suicide attempters do, in fact, show deficits in executive functioning. For example, Keilp et al. (2001) examined lethality, the likelihood of a suicide attempt resulting in death, and found that depressed, high lethality suicide attempters performed worse than non-patients on several neuropsychological tests, and also performed significantly worse on tests of executive functioning than did low lethality attempters. Another study demonstrated that suicide attempters score significantly lower than healthy controls on a decision making task, proposing that impaired decision making may be a neuropsychological risk factor for suicidal behavior (Jollant et al., 2005). In addition, a study comparing depressed patients with and without suicidal ideation showed that those with suicidal ideation performed significantly worse on some measures of reasoning and flexibility, but not on a test of inhibition (Marzuk et al., 2005). Other studies, however, have not yielded significant differences between suicide attempters and non-attempters. For example, King et al. (2000) found no differences between depressed attempters and non-attempters on a range of neuropsychological tasks. Given such conflicting results over a wide range of diagnoses and methodologies, further research on neurocognitive impairments in suicidal psychiatric patients is warranted.

The present study was designed to investigate the role of executive functioning deficits in the suicidal behavior of individuals with severe mental illness. It is hypothesized that

1) Lower executive functioning scores will predict a higher number of previous suicide attempts.
2) High lethality attempters will show greater deficits on measures of executive functioning than low lethality attempters, but will not differ on other measures.

3) Patients with psychosis will perform worse than non-psychotic patients on all measures (as suggested by prior studies of cognitive impairment in patients with psychosis; Heinrichs & Zakzanis, 1998).
4) Patients with substance abuse or dependence will perform more poorly on measures of executive functioning than patients without substance abuse or dependence, but will not differ on other measures.

Method

Participants

Thirty-six participants (24F, 12M) were recruited from the Maricopa Integrated Health System Psychiatric Inpatient Unit in Phoenix, Arizona. All met the following inclusion criteria: (a) between the ages of 18 and 60, (b) hospitalized for a suicide attempt, (c) have a primary diagnosis of major depressive disorder (MDD), bipolar affective disorder (BAD), borderline personality disorder (BPD) or a primary psychotic disorder (schizophrenia or schizoaffective disorder), and (d) primary language of English. Potential participants were not excluded if they had comorbid substance abuse or dependence. Exclusion criteria included history of epilepsy, dementia, or traumatic brain injury with loss of consciousness greater than 30 minutes.

Procedure

Following confirmation of diagnosis and suicidal behavior, the Inpatient Psychiatric Unit and the research team coordinated the recruitment, and a trained member of the team obtained written informed consent from all participants. Prior to administration of the cognitive battery, patients gave a brief history of their life circumstances and suicidality. The cognitive battery involved approximately one hour of bedside testing. Following assessment, each test was scored according to published norms. The lethality of the current suicide attempt was rated low (did not require medical hospitalization or could not have resulted in serious injury or death, e.g., superficial cutting; overdose of 10 aspirin) or high (required medical hospitalization or could have resulted in serious injury or death, e.g., overdose requiring gastric lavage; attempted hanging with loss of consciousness).

Measures

As a measure of premorbid intellectual ability, the American National Adult Reading Test (ANART; Grober & Sliwinski, 1991) was administered to participants before the neuropsychological battery. The battery included the following measures: The Trail Making Test (Reitan & Wolfson, 1993) assessed processing speed (Part A) and cognitive flexibility (Part B). The Controlled Oral Word Association Test (COWAT; Benton & Hamsher, 1989) was administered as a test of verbal problem-solving ability. The Wisconsin Card Sorting Test (WCST-64; Kongs, Thompson, Iverson, & Heaton) assessed cognitive rigidity and the ability to form abstract concepts, utilize feedback, and to shift and maintain set. The Delay=Go Computer Task (Pluck, personal communication, June 9, 2002) examined sustained attention and inhibitory control. Finally, the Stroop Test (Golden, 1978) measured response inhibition during an interference condition.

Whenever possible, T-scores were corrected for age, gender, education, and ethnicity. All T-scores are scaled such that a score of 50 and a standard deviation of 10 characterize the normal population, where higher scores indicate better performance.

Data Analyses

Correlation and *t* tests were used to analyze the data. Due to a leptokurtic distribution of previous suicide attempts, the non-parametric Spearman rho correlation was used to assess hypotheses regarding the association between performance on the cognitive measures and number of previous suicide attempts. Independent sample *t* tests were used to compare high lethality and low lethality attempters, psychotic and non-psychotic participants, and participants with substance abuse or dependence and those without. Relevant sub-samples were compared on demographic (age, gender, education level, ethnic minority status) and clinical variables (number of previous attempts, presence of alcohol/drugs in attempt) to examine potential confounding factors. Cohen's *d* effect sizes (Cohen, 1988) were calculated to quantify the group differences. Cohen (1988) defined .2 as representing a small effect, .5 a medium effect, and .8 a large effect.

Results

Sample Characteristics

Table 1 shows the clinical and demographic characteristics of the sample. Psychotic and non-psychotic participants did not differ with regard to gender, education, ethnic minority status, and the presence of substance abuse or dependence, though psychotic patients were older than non-psychotic patients (43 vs. 33 years old; $t(35)=2.07$, $p=.05$). No diagnostic or demographic differences were found between high lethality attempters and low lethality attempters, or between participants with substance abuse or dependence and those without.

Means and standard deviations for participants' performance on the neuropsychological tests are

Table 1
Demographic and Clinical Characteristics of Participants

Demographic variables	
Mean age (*SD*)	35.0 (10.8)
Mean years of education (*SD*)	12.3 (2.5)
% Female	66.7
% Minority ethnicity	13.9
Clinical variables	
Mean number of previous attempts (*SD*)	2.7 (3.2)
% Substance abuse or dependence	61.1
% Alcohol involved in attempt	30.6
% Drugs involved in attempt	27.8
Diagnosis:	
Major Depressive Disorder	12
Bipolar Affective Disorder	9
primary psychotic disorder	5
Borderline Personality Disorder	10

shown in Table 2. Mean estimated IQ of the sample was 106.6 (*SD*=8). Participants' mean T-scores were below average on all measures of executive functioning, but they remained within one standard deviation of the mean, with the exception of the Stroop interference condition T-score (*M*=37.6, *SD*=8.9).

Hypothesis 1

The correlations between number of previous suicide attempts and measures of executive functioning ranged from $r_s(34)$=-.27 to $r_s(34)$=.24. None of the correlations reached statistical significance.

Hypothesis 2

Low lethality attempters respond faster than high lethality attempters on the Delay=Go task, $t(33)$=-2.46, p=.02. However, the groups do not differ in terms of total errors. No other significant differences were found between low lethality and high lethality participants, but several medium effect sizes indicate that high lethality attempters performed worse than low lethality attempters on Delay=Go errors, d=-.45, and Stroop, d=-.40.

Table 2
Neuropsychological Performance of the Sample

	Mean	*SD*
ANART Estimated IQ	106.6	8.0
Trails A T-score	45.3	10.3
Trails B T-score	44.5	10.4
Delay=Go total errors	1.1	1.6
Delay=Go total RT (s)	15849.0	6086.0
FAS T-score	41.4	8.8
Animals T-score	42.0	8.1
Stroop T-score	37.6	8.9
WCST perseverative errors T-score	44.1	7.4

Hypothesis 3

Analysis of psychotic participants' performance on all measures as compared to non-psychotic participants yields no statistically significant differences. Nevertheless, participants with psychosis perform worse on almost all neuropsychological measures, with medium effects on Trails A T-score d=-.49; Trails B T-score, d=-0.61; Delay=Go total errors d=-.58; and Stroop T-score, d=-.41.

Hypothesis 4

There are no statistically significant differences between participants with substance abuse or dependence and those without. Those with substance abuse or dependence, however, perform worse on most measures, including Delay=Go reaction time (RT), d=-.48; FAS T-score, d=-.40; and Animals T-score, d=-.63.

Discussion

In the present study, the sole statistically significant finding was that low lethality participants were quicker to respond on the Delay=Go task with no resulting loss of accuracy. If this result were to be replicated, it could be asserted that high lethality suicide attempters have slower processing speed than do low lethality attempters.

The suicide attempters in this sample did not differ statistically on the basis of attempt lethality, psychosis, or substance abuse or dependence. Nor was a significant relationship found between number of prior suicide attempts and performance on executive functioning measures.

Despite the non-significant results, some medium effect sizes were observed between psychotic and non-psychotic participants. Psychotic participants' lower scores on part B of the Trail Making test indicate impairment in cognitive flexibility and switching skills. Inhibitory control may be another area of impairment in individuals with psychosis, as evidenced by lower scores on the Delay=Go Task and Stroop Color-Word Interference Test. These results may help to characterize the broad cognitive dysfunction experienced by individuals with primary psychotic disorders.

In addition, attempters with substance abuse or dependence were found to have higher RT on the Delay=Go task, as well as name fewer words and animals on the COWAT (though these differences were not significant). Taken together, these findings may suggest that individuals who abuse or are dependent on alcohol or substances have slower processing

speed than those without such abuse or dependence.

Given the small sample size in this study, statistical power was limited for comparisons among inpatient suicide attempters. Larger samples are needed to further validate and develop understanding of these potential neurocognitive deficits in the suicidal psychiatric population. Despite such limitations, these preliminary findings suggest that neuropsychological dysfunction may influence the suicidal behavior of psychiatric patients. This study suggests that impairment in the executive functioning domains of processing speed, inhibitory control, and cognitive flexibility are especially evident in suicide attempters. Therefore, in an effort to reduce suicidal behavior in the severely mentally ill, it seems pertinent to develop interventions to target problematic functioning in these domains. If individuals who attempt suicide truly are more cognitively impaired than others with similar diagnoses, specialized assessment to identify such impairment, and appropriate intervention, is essential to decrease the number of deaths by suicide in psychiatric populations.

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Baseline Neuropsychological Status and Cognitive Training Outcomes in Psychosis

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Introduction

Background

- Most individuals with schizophrenia experience impairments in multiple cognitive domains
- Although appropriate medication management can reduce positive symptoms, additional treatments are required to address cognitive impairment, everyday functioning abilities, negative symptoms, social functioning, and quality of life
- Cognitive Training (CT) is a psychosocial intervention that targets cognitive impairment and may have additional effects on functional capacity, negative symptoms, and quality of life
- The CT intervention focuses on compensatory strategies and habit learning
  - Internal strategies
  - External cuing

Objective

- We report initial findings of a 6-month randomized controlled trial of CT with standard pharmacotherapy (SP), compared with SP alone, in outpatients with schizophrenia and related psychoses

Hypothesis

- We expected that better neuropsychological functioning at baseline would predict CT-associated improvement

Introduction (cont.)

CT Intervention

- Manualized treatment
- Group format, with ~5 participants and 2 instructors
- Meets for 2 hours, once per week, for 12 weeks
- Minimal lecturing, with the majority of class time devoted to practicing strategies
- Homework is assigned weekly to encourage strategy practice
- Focuses on compensatory strategies and habit learning within 4 domains:
  - **Prospective memory**
    - Calendar use
    - To do lists
    - Prioritizing and linking tasks
  - **Conversational and task vigilance**
    - Eye contact
    - Paraphrasing and asking questions
    - Self-talk during tasks
  - **Learning and memory**
    - Encoding strategies
    - Retrieval strategies
    - General memory strategies
  - **Problem-solving and cognitive flexibility**
    - 6-step problem-solving method
    - Strategy verbalization (self-talk)
    - Self-monitoring

Method

Participants

- 35 outpatient subjects participated in the study; 23 had complete data at immediate post-treatment (3 months), and 26 had complete data at follow-up (6 months)
- All subjects were 21 years old or older, had a primary psychotic disorder, and had no substance use disorder within the past month
  - The CT and SP groups differed significantly on age and ethnic minority status

Table 1. Subject characteristics within the CT and SP groups

	CT (n=14)	SP (n=21)
Demographic variables		
Mean age (SD)	44.6 (10.3)	51.3 (7.3)
Mean years of education (SD)	13.3 (1.7)	13.2 (1.5)
% male	71%	71%
% Caucasian	86%	52%
Clinical variables		
Diagnosis		
Schizophrenia	4	12
Schizoaffective disorder	8	8
Other primary psychotic d/o	2	1
Mean duration of illness (SD)	19.9 (14.1)	28.4 (10.5)
Antipsychotic regimen		
Atypicals only	12	15
Both atypicals and typicals	1	2
Typicals only	1	1
None	0	3

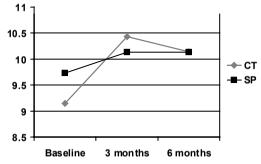
Method (cont.)

Measures

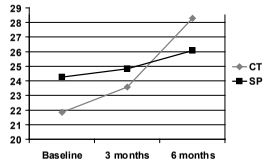
- Administered at baseline, 3 months (immediate post-treatment), and 6 months (follow-up)
- Cognition – mean Z-score
  - Premorbid IQ – ANART Reading
  - Attention – Continuous Performance Test—Identical Pairs (CPT), WMS-III Digit Span Forward, Digit Span Distractibility Test
  - Working Memory – Letter Number Sequencing, WMS-III Digit Span Backward
  - Processing Speed – Trails A, Symbol Search, Digit Symbol
  - Learning – learning trials from Hopkins Verbal Learning Test (HVLT-R), WMS-III Logical Memory I & II, Brief Visual Memory Test
  - Memory – delayed recall percent retained from Hopkins Verbal Learning Test (HVLT-R), WMS-III Logical Memory I & II, Brief Visual Memory Test
  - Prospective Memory – Memory for Intentions Screening Test (MIST)
  - Executive Functioning –Wisconsin Card Sorting Test (WCST-64), Trails B-A, Stroop, FAS
  - Language – Category fluency
- Cognition – Target outcomes
  - Attention – WMS-III Digit Span Forward
  - Learning -- HVLT-R Trials 1-3
  - Memory – HVLT-R percent retained
  - Executive Functioning – WCST-64 total correct
  - Prospective Memory – MIST
- Everyday Functioning Capacity
  - UCSD Performance-Based Skills Assessment (UPSA)
    - Performance-based measure using role-play scenarios to evaluate performance of everyday tasks in 5 areas of functioning: household chores, communication, financial management, transportation planning, and recreation planning

Results: Intervention Outcomes and Predictors of Outcome

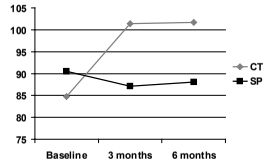
Attention: Forward Digit Span
F=.89, df=2, p=.420



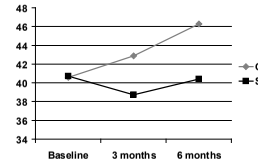
Learning: HVLT Trials 1-3
F=2.16, df=2, p=.128



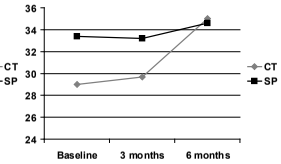
Memory: HVLT Percent Retained
F=6.49, df=2, p=.007



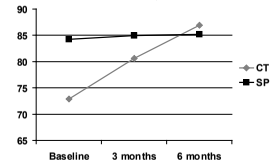
Executive Functioning: WCST-64 total correct
F=1.05, df=2, p=.359



Prospective Memory: MIST total correct
F=1.13, df=2, p=.333



Functional Capacity: UPSA Total
F=6.16, df=2, p=.005



CT Participant Attendance

- CT participants attended 85% of sessions

Baseline Neuropsychological Status as a Predictor of Outcome within CT Participants

- Contrary to expectation, global neuropsychological Z-scores were not associated with baseline-to-6-month change on any selected outcome measure
  - Attention: r = .076, p = .857
  - Learning: r = -.298, p = .474
  - Memory: r = -.094, p = .825
  - Executive Functioning: r = .028, p = .947
  - Prospective Memory: r = -.476, p = .280
  - UPSA: r = .089, p = .834
- Although none of the correlations between global Z-scores and outcomes was significant, some correlations suggested that those with more global neuropsychological impairment at baseline improved more during the CT intervention

Discussion

Summary

- CT led to improvements in verbal delayed memory and everyday functioning capacity
- Improvements in the CT group were not associated with baseline neuropsychological functioning

Conclusion

- Results from this pilot study suggest that compensatory CT has the potential to improve both cognition and functional capacity regardless of initial neuropsychological status

Limitations

- Small sample sizes within the CT and SP groups
- Groups differed significantly on age and ethnic minority status, and we did not correct for these differences in this pilot study

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From Past to Present? The Effect of Presentation Direction on History Learning

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The present study investigated the widely held belief that history should be taught in a forward direction: less recent events taught before more recent events. Despite the prevalence of this belief, the effect of order of presentation on learning in the context of history has not been examined empirically. Participants were presented with narrative passages describing Chinese history in either forward or reverse chronological order, and then tested for immediate recall of the passages. Remarkably, recall performance was equal in both forward and reverse conditions, providing no support for the belief that history should be taught in a forward direction.

Designing curricula to maximize learning is imperative in a world where education and knowledge are highly valued. Successful learning is largely determined by how quickly new information can be stored and later accurately recalled. Speedy and efficient acquisition of knowledge depends on the brain's ability to organize information in a way that facilitates effective recall. The method of presenting to-be-learned information can influence this mental organization and, consequently, impact the amount of learning that will occur (Guthrie et al., 1998).

There are many theories regarding the best way(s) of presenting new material in order to maximize learning. Yet, in one particular academic context, a single method of presentation is almost universally preferred: the chronological presentation of historical events. Every United States History and World History textbook intended for use in grades eight to twelve from the five most popular publishers presents content in chronological order; each book begins with the earliest events covered in the text, proceeds linearly in time as the chapters progress, and ends with discussion of the most recent events. Textbooks of the five most popular educational publishers – McGraw-Hill; Glencoe, Pearson; Prentice Hall; Harcourt, Holt, and Houghton Mifflin; McDougal – are estimated by the American Textbook Council to comprise 80% of all textbooks currently in use (http://www.historytextbooks.org/adoptions.htm).

There is little, if any, research investigating the amount of learning that occurs when historical events, or temporally related events in general, are taught in forward or reverse chronological order. However, there is a large body of work investigating the effects of order of presentation on paired associates (pairs of words, nonsense syllables, or symbols). In these paired associate learning studies, participants learn a list of item pairs (e.g., X-Y). Recall is then tested in either a forward (e.g., X-?) or backward (e.g.,?-Y) direction.

A phenomenon frequently described in paired associate literature is "associative symmetry"—when there is no difference in recall performance due to the direction of probe questions (Asch & Ebenholtz, 1962; Kahana, 2002) Some studies, however, have found a preference for forward recall. Kahana and Caplan (2002), for instance, reported greater accuracy for forward recall when a third target was added to the list of to-be-remembered stimuli (e.g., A-B-?).

A recent study was designed to carefully control the temporal order of stimulus presentation (Jones & Pashler, in press). A sequence of abstract shapes was presented in an order determined by preset probabilities; thus certain shapes were likely to occur in the same order throughout the sequence. Participants were tested to see if they were sensitive to these relationships, and if they were better at identifying the first shape from the second, or vice-versa. The findings revealed no difference between forward and reverse recall.

Studies of relationships between arbitrary items do not necessarily provide insight into the processes that occur when the to-be-learned material is temporally or logically related, and research on paired associates

looks only at the direction of the recall probes—not the direction of material presentation. It is impossible to manipulate the presentation direction of paired associates in a particularly meaningful way because there is no inherent relationship between items.

The present study seeks to address whether forward and backward presentation of learning material differentially influence recall performance. As opposed to the arbitrary composition of paired associates, the learning material will be comprised of passages from history texts.

Method

Participants

Participants were 36 undergraduate students from the University of California, San Diego. The students enrolled for the experiment online, and were awarded class credit for their participation.

Design and Materials

The experiment consisted of a Web application that participants could access from a personal computer. The program was created using PHP, MySQL, Javascript, and HTML technologies.

Study materials were designed for two conditions: forward and reverse. In the forward condition, participants read a historical passage written in chronological order (as is typically seen in historical texts). In the reverse condition, passages were constructed such that the most recent events appeared first and the earliest events appeared last (see Appendix for examples).

Three passages on Chinese history, drawn from Wikipedia, were used to construct the materials (http://en.wikipedia.org/wiki/Chinese_history). This topic was chosen in order to minimize participants' prior familiarity with the material. For the forward condition, the passages were used in their original form. For the reverse condition, each passage was rewritten in reverse chronological order. To reverse the order of the passages, sentences were switched one-for-one (e.g., the last sentence of the passage became the first, and the first sentence became the last). The sentences were then rephrased to maintain coherence within the passage. As few changes as possible were made with respect to word selection and sentence complexity. Finally, ten four-option multiple choice questions were created for each passage.

Procedure

Participants could use any computer with internet access and support for the appropriate programs. Before the experiment, participants were instructed to read each passage carefully, and to begin the question set whenever they felt ready. They were also informed that there would be no reward based on performance. Finally, participants were told that they should not print or copy the passages to refer to during testing.

The computer program randomly assigned each participant to either the forward or reverse condition. Every participant then saw one of the three passages from their condition. The order of passage presentation was also randomly assigned by the program. After reading the first passage, the participant answered the ten multiple choice questions for that passage. The questions were presented one at a time and in a random order. The same multiple choice questions were presented in both conditions. Skipping questions was not allowed. After the participant completed all ten questions for the first passage, the program randomly selected one of the two remaining passages for the participant to read. After answering the ten multiple choice questions for the second passage, the final passage and question set were presented.

After completing the experiment, participants were informed of their recall performance (number of questions correct out of 10) on each passage.

Results

All 36 participants completed the study, 18 in each condition. A two-tailed *t*-test was used to compare recall performance between the two conditions.

Table 1 shows mean recall performance by passage and condition. The mean number of correctly recalled facts for the forward condition was 21.7(*SD*=5.1) out of 30, CI_{95} = ± 2.4. The mean for the reverse condition was 21.2(*SD*=5.8), CI_{95} = ± 2.7. There was no significant difference between recall performance in the two conditions, $t(34)=0.274$, $p>0.7$.

Table 1

Performance means and standard deviations by passage and condition

	Forward	Reverse
Passage 1	7.6 (1.9)	7.4 (2.2)
Passage 2	7.1 (2.5)	6.7 (2.7)
Passage 3	7.0 (2.3)	7.1 (1.9)
Overall	21.7 (5.1)	21.2 (5.8)

Discussion

The current study varied the presentation of a sequence of historical facts to determine if order would affect participants' ability to learn the material. The results were clear: the direction in which historical material is presented has no effect on recall accuracy.

These findings are particularly interesting considering the dominance of forward historical presentation in

both primary and secondary schools. Perhaps deviating from the method of teaching history in chronological order would not adversely affect students' learning.

In the context of the paired associate literature, this study provides additional support for associative symmetry. In a more general sense, this study adds to the evidence that the brain's mechanisms for recall are not directionally sensitive.

It should be noted that the obtained results are only preliminary in that this is the first study to explore the effects of presentation order on history learning. Further investigation is necessary to fully understand how historical events are best learned. For example, future work could study the effects of presentation at longer retention intervals (a more practical measure for generalizing results to history courses). The effects of order on both presentation and testing could also be examined in more detail. Borrowing from typical laboratory paired associate tasks, material presentation and recall probes could be manipulated to test for interactions between the direction of learning and the direction of testing.

In conclusion, the results of the current study suggest that history curricula need not be arranged chronologically for the sake of students' learning. At this time, the full implications of this possibility are unknown, as the convention of teaching in forward temporal progression is so pervasive. If the direction in which material is presented is, in fact, an arbitrary constraint, the structure of historical education could be significantly altered—perhaps fostering a new perspective on history.

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Authors' Note

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Appendix: Example Forward and Reverse Passages

Forward: China suffered two extreme famines exactly twenty years after each opium war in the 1860s and 1880s, and the Qing imperial dynasty was ineffective in helping the population. Socially these events had a profound impact as it challenged the dominative power that the Chinese had enjoyed in Asia for centuries. As a result, the country was in a state of turmoil. A large rebellion, the Taiping Rebellion, involved around a third of China falling under control of the Taiping Tianguo, a quasi-Christian religious movement led by the self-proclaimed mystic "Heavenly King" Hong Xiuquan who was able to gather an extremely large following due to his charisma. Only after fourteen years were the Taipings finally crushed--the Taiping army was destroyed in the Third Battle of Nanking in 1864. In total between twenty million and fifty million lives were lost, making it the second deadliest war in human history.

The Qing officials were slow to adopt modernity and suspicious of social and technological advances that they viewed as a threat to their absolute control over China. As an example, gunpowder had been widely used by the army of the Song and Ming Dynasties, then was forbidden by the Qing rulers after they took over China. Therefore, the dynasty was ill-equipped to handle the Western encroachment. Western powers did intervene militarily to quell domestic chaos, such as the Taiping Rebellion and the anti-imperialist Boxer Rebellion. General Gordon, later killed in the siege of Khartoum, Sudan, was often credited with having saved the Qing dynasty from the Taiping insurrection. By the 1860s, the Qing Dynasty had put down the rebellions at enormous cost and loss of life. This undermined the credibility of the Qing regime and contributed to the rise of warlordism in China.

Reverse: The credibility of the Qing regime was undermined and contributed to the rise of warlordism in China by the 1860s as a result of the Qing Dynasty putting-down various occurring rebellions at enormous cost and loss of life. General Gordon, killed later in the siege of Khartoum, Sudan, is often credited with having saved the Qing dynasty from the Taiping Rebellion. Western powers did intervene militarily to quell domestic chaos and rebellions, such as the Taiping Rebellion and the anti-imperialist Boxer Rebellion.

The Qing dynasty was ill-equipped to handle this Western encroachment because the Qing officials were slow in adopting modernity and were suspicious of social and technological advances they viewed as a threat to their absolute control over China. For example, gunpowder became forbidden after the Qing rulers took over China.

Only after fourteen years were the Taipings finally crushed in the Taiping Rebellion—the Taiping army was destroyed in the Third Battle of Nanking in 1864. In total between twenty million and fifty million lives were lost, making it the second deadliest war in human history. The Taiping Rebellion was a large rebellion which involved around a third of China falling under control of the Taiping Tianguo, a quasi-Christian religious movement led by the self-proclaimed mystic "Heavenly King" Hong Xiuquan who was able to gather an extremely large following due to his charisma. One of the causes of this rebellion was that China was in a state of turmoil.

China suffered two extreme famines exactly twenty years after each opium war in the 1860s and 1880s, and the Qing imperial dynasty was ineffective in helping the population. The dominative power that the Chinese had enjoyed in Asia for centuries was profoundly impacted by being challenged socially due to these events.

The Spacing Effect in Mathematical Problem Solving

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The spacing effect is the tendency for material learned in spaced intervals to be better retained than material learned in one massed block. This effect has been found in a variety of paradigms (e.g., motor skills, declarative memory), but has not been found in others (e.g., implicit memory). The present study assessed participants' performance on a set of mathematical problems after spaced and massed training, with latency to solve problems as the dependent measure. During the training period, participants performed better on problems learned in massed form; but during a later testing period, they performed better on the material learned in spaced intervals. These results provide further evidence of the spacing effect.

One of the foremost questions in the study of training principles concerns the optimal spacing of practice. More specifically, do people learn and retain information better when they practice in spaced intervals or in one massed block? General intuitions might suggest that massed training would be the ideal strategy—practice a skill until it has been mastered, and only then move on to learning a new skill. However, research suggests that people actually perform better at later testing when they have practiced a skill in spaced intervals. This phenomenon is known as the spacing effect.

An intriguing corollary of the spacing effect is that success during training does not necessarily predict success during testing at a later time; although performance during training is reliably better for participants who practice in one massed block of trials, retention (measured by performance during testing) is better for participants who practice in spaced trials (Schmidt & Bjork, 1998).

Research in this area has sought to address why the spacing effect occurs. One general theory is that material is retained better when the process through which it is acquired is more difficult (Schmidt & Bjork, 1992). For instance, when repeating one item over and over with the goal of memorization, one might easily perform well at the end of several trials without ever transferring the information from short-term to long-term memory. However, if one is forced to remember the same information over an intervening time lapse or alternate task, it is not possible to continue actively rehearsing the item—making it necessary to store the information in a more permanent way.

This theory has been supported by a number of studies using a variety of training paradigms. One such experiment contrasted random and blocked schedules of practice in a procedural motor task (Shea & Morgan, 1979). The results showed that after 10 minutes, there was an advantage for retention in the blocked condition, but after 10 days this advantage switched to the spaced condition.

The spacing effect, however, does not appear to be universal; for instance, it has not been demonstrated in certain tasks that measure implicit memory (Greene, 1990). Thus, it is necessary to continue investigating the circumstances in which spaced practice enhances performance.

The present study seeks to further explore the spacing effect by altering a training paradigm implemented in a recent investigation of the shift from algorithm-based problem solving to direct recall (Rickard, 1997). In this paradigm, participants are taught an algorithm for solving pseudo-arithmetic problems, and their latency to solve the problems is measured throughout training. In the current study, half of these arithmetic problems will be learned in spaced intervals and the other half will be learned in massed blocks. Reaction time (RT) during both the training session and a later testing session will be measured to assess performance.

Investigations of the spacing effect have typically operationalized learning as percent accuracy

during testing. The study described here was driven by the hypothesis that the spacing effect will also be observed when RT is used as a measure of learning. By measuring learning in different ways, the process of learning optimization might be better understood, and the generalizability of previous work on the spacing effect might be extended.

Methods

Participants

The participants were 30 undergraduates at the University of California, San Diego, participating for course credit. Of the 41 participants who began the study, 11 were discarded due to interruptions in the task, or failure to attend the second day of testing.

Stimulus Materials

A total of 24 multiplication problems consisting of two numbers—one single digit number, one double-digit number—were presented to participants. These multiplication problems were displayed horizontally on a monitor with an "X" between them to denote multiplication. The problems were designed to be of intermediate difficulty, thus factors believed to be solvable by recall and not calculation (e.g., 5 X 10) were avoided.

Participants spoke into a microphone attached to a voicebox that recorded the time at which they spoke the first syllable of their answer. This device also prompted the correct answer to be displayed on the monitor once the participant's vocalization was recorded. In addition to the microphone and voicebox, materials included a switchboard with three buttons that represented "malfunction", "wrong," and "right."

Design

The experiment used a within-subjects design that consisted of two sessions—a training session and a testing session—separated by one week. During training, each participant was presented with two separate training paradigms: massed and spaced. In the massed paradigm, the multiplication problems were presented in four groups of three. In the spaced paradigm, the problems were presented in one group of 12. In the massed trials, the same problem was exposed approximately every three questions. This was meant to promote mastery of the problems before exposure to the next problem set, thus modeling traditional massed training. In the spaced trials, participants practiced all 12 problems in the set at once, with repetition of problems approximately every 12 questions. This was meant to model spaced learning, in which training on an item is separated by time or intervening activities.

Both the practice paradigm and problem set order were counter-balanced to create four conditions to which participants were randomly assigned. The multiplication problems were divided into two sets of 12 problems, and each set was presented to half of the participants first. In the training session, all 24 problems were presented 15 times over two separate blocks of practice: the spaced block and the massed block. In the testing session, the problems were presented only eight times, all in the same block and in the massed format.

Procedure

Day 1. Participants were trained in a method of calculating the multiplication problems. This method involved (a) multiplying the single digit number by the tens place digit of the larger number, (b) multiplying the single digit number by the ones place digit of the larger number, and (c) adding up the two results.

The participants indicated they were ready to begin each trial by pressing the space bar. This would reveal a multiplication problem on the screen. When the participants solved the problem, they would say the number out loud, triggering display of the correct answer. After each response, the experimenter would press one of the three buttons on the switchboard indicating performance: correct, incorrect, or malfunction. This information was stored along with the problem number. The experimenter's button press triggered the presentation of the next multiplication problem. After completion of the first block of 12 problems, the participants were given one minute to rest before beginning the next block of 12 problems.

Day 2. Participants were informed that they would be solving the same type of mathematical problems as they had learned the week before. In contrast to the first session, the participants saw the problems from both training sets (massed and spaced) in the same block. The presentation order of the problems was randomized for each participant. Answers were given and recorded in the same manner as during training. A break was not provided during testing.

Results

The primary measure of participants' learning was latency to respond to questions (RT) during each condition (spaced and massed) and session (training and testing). Reaction time was measured from presentation of a problem to vocalization of an answer. The error rate, calculated as the number of incorrect responses, for each condition and session was also noted.

Participants' mean error rate did not exceed 5% in any condition. Error rate collapsed across conditions for the training (3.5%) and testing (3.5%) session did not differ. The error rate did differ by

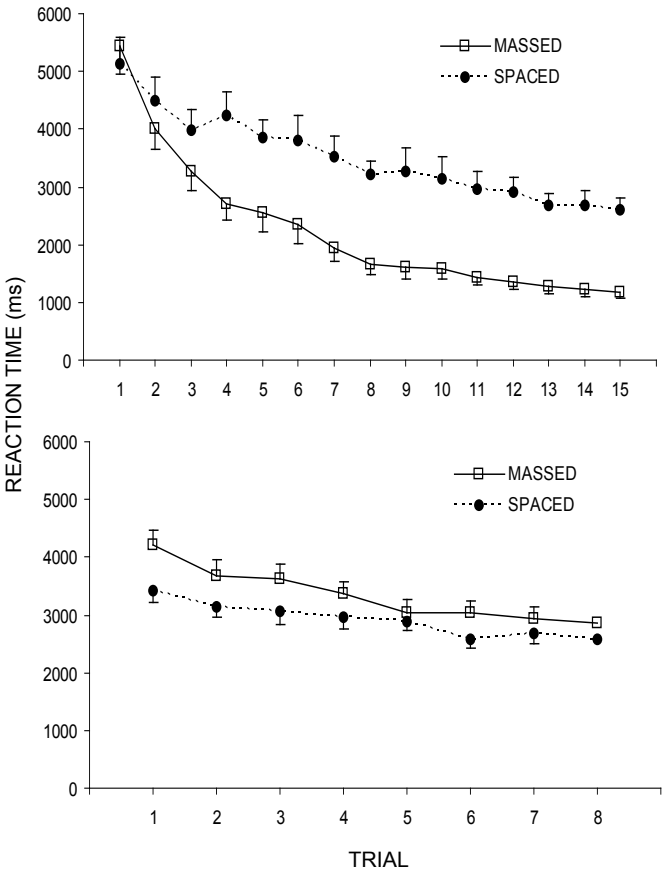

Figure 1. Participants' mean reaction time (+*SE*) across trials during training (top) and testing (bottom) for the massed and spaced practice conditions (*n*=30 per condition).

condition (massed=2.8%, spaced=4.2%), but only during the training session, $t(29)=2.66$, $p=.01$ (two-tailed).

RT was analyzed with a two-factor (2 training types x 2 sessions) repeated measures analysis of variance. Participants' RT was shorter during testing than training, indicating improvement in performance, $F(1, 87)= 14.47$, $p=.0005$. RT collapsed across sessions was also shorter for the massed condition than the spaced condition, $F(1, 87)=15.97$; $p=.0001$.

Figure 1 illustrates participants' mean performance during training and testing as a function of practice condition. The difference between participants' RT for the spaced versus massed conditions was greater during training than during testing, $F(1,87)=62.86$; $p<.0001$. Post hoc comparisons using Tukey's *HSD* reveal that the difference in RT between conditions was significant for both sessions. In addition, though RT for the massed condition was significantly shorter than that for the spaced condition during training, this pattern was reversed during the testing.

Discussion

Participants' overall performance as measured by reaction time improved from training to testing, but this improvement was differential based on the type of training. Though performance on the massed condition problems was better than performance on the spaced condition problems during training, performance on the spaced problems was better than performance on the massed problems during testing, which clearly demonstrates the predicted spacing effect. Interestingly, the error rate—which also indicated superior performance on the massed problems during training—did not reveal the difference between conditions during testing. Reaction time, then, in conjunction with error analyses, might be a more sensitive measure of learning than error rate alone.

The real-life implications of this study are clear. Every student has at some point practiced a set of facts until able to recall them correctly at each presentation, only to forget them directly following an exam. The results obtained demonstrate that this "cramming" (massed practice) before a test, though beneficial in the short term, will not lead to the best performance at a later testing date—for instance, a final. Students should take note, then, and space their practice of to-be-learned material prior to testing.

In sum, the present study has demonstrated that the spacing effect can be observed when learning is operationalized as speed of recall for mathematical problems. This serves to further specify the circumstances in which the spacing effect will be observed, and may offer insights into how to better structure educational and training schedules.

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Author note

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Aggressive Priming Effects on Situational Helping Behavior

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The effect of aggressive priming on helping behavior in two types of hypothetical situations was assessed in sixteen university undergraduates. Only situation type influenced propensity to help. Situations in which others were unambiguously in need of help and the participant was not otherwise busy were more likely to generate helping responses than ambiguous situations in which the participant would have been inconvenienced by helping. The findings suggest that people engage in helping behavior only when they are available to help and there is a clear need of immediate assistance.

It has been suggested that empathy is the mediator between conflicting egoistic and altruistic motives in humans (Hoffman, 1981). Empathy predisposes an individual to help others, and can be influenced by both perception and cognition. According to a widely cited meta-analysis, men provide help more often than women, and women receive help more often than men (Eagly & Crowley, 1986). People are also more likely to help a member of their in-group or a neutral group than a member of an out-group (Levine, Prosser, Evans, & Reicher, 2005).

A recent meta-analysis found a causal link between exposure to violent video games and both increased aggression and decreased helping behavior (Carnagey & Anderson, 2004). Situational factors also seem to influence a decision to help. People are more likely to help others in a low-level emergency than in a high-level or non-emergency (Solomon & Grota, 1976), perhaps because inaction can be rationalized in the latter situations. In a non-emergency, there is no obvious need for help, and in a high-level emergency, there is a diffusion of responsibility (justified or not) to others who seem more capable of helping.

The present study tests the hypothesis that exposure to a violent or aggressive prime will result in less reported willingness to help than exposure to a neutral prime. Participants should also report less willingness to help for ambiguous situations, in which inaction might be justified by personal inconvenience, than for non-ambiguous situations, in which failure to act would be more difficult to rationalize.

Method

Participants

A total of 16 (10F, 6M) university undergraduate students (*M*=21, *SD*=0.73 years) served as participants in exchange for a food reward. An equal number of males and females participated in each condition. All participants were fluent English speakers, and familiar with American culture and norms.

Design and Stimuli

A repeated measures design was employed to manipulate prime type and question type. The primes were 1-minute clips of either a violent scene from the movie *Fight Club* or a visually complex pattern. The questions concerned helping behavior in two types of hypothetical situations, ambiguous and non-ambiguous. In the type of question describing ambiguous situations, choosing not to help could be justified (e.g., walking up to a stranger and offering to carry their groceries). In the type of question describing non-ambiguous situations, choosing not to help could not be easily justified (e.g., holding the elevator door for someone rushing to get on in time). Two questions of each type appeared in alternating order on each of two unique questionnaires. Neither the ethnicity nor the age of the person in need was revealed to minimize the influence of other variables on helping responses.

Procedure

Participants were assessed individually in a small classroom with adequate lighting. Participants first watched a video clip to which they were instructed to pay close attention. After watching the clip,

participants responded in writing to questions regarding their behavior in the hypothetical helping situations. Participants then engaged in a two minute distracter task to increase their cognitive workload and decrease the influence of the first prime. For this task, participants counted backwards from 299 by threes and then connected numbers on paper by the same counting rule. Following the distracter task, participants watched the second video and completed the second questionnaire. Counterbalancing controlled for presentation order.

Results

The effects of prime type and situation type were analyzed. The effect of priming was calculated by dividing the participants' questionnaire responses by the type of prime viewed (aggressive or neutral) and totaling the number of indicated helping behaviors. The effect of helping situation was also calculated by dividing the questionnaire items, this time by situation (ambiguous or non-ambiguous), and totaling the number of indicated helping behaviors.

A chi-square test of categorical independence revealed that prime type was unrelated to situation type, $X^2(1)=0.039$. The data were analyzed with a two-factor (2 prime types x 2 situation types) repeated measures analysis of variance. The primes used did not have a significant effect on participants' decisions to help, $F(1,22)=0.077$, $p<.784$. However, the effect of situation type was significant, $F(1,22)=7.016$, $p<.015$. Figure 1 illustrates the mean number of helpful responses as a function of situation type. There was no differential effect of situation type on responses by prime type. Greenhouse-Geisser corrections were applied to the degrees of freedom as needed.

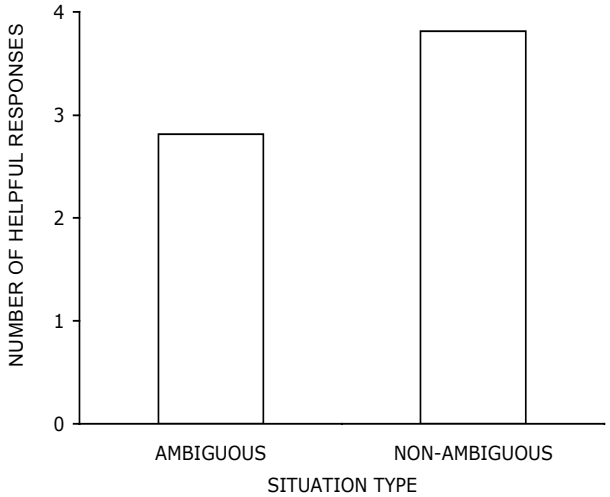

Figure 1. Mean number of helpful responses as a function of situation type (n=16/group).

Discussion

The type of prime used did not significantly influence hypothetical helping behavior. It seems that passively viewing violent behavior does not decrease willingness to help as much as does actively participating in simulated violence (Carnagey & Anderson, 2004).

Situation type was a significant influence on hypothetical helping behavior. Helping behavior was more likely in unambiguous situations in which it was clear that help was needed than in ambiguous situations that might pose an inconvenience by requiring behaviors outside social norms. Participants also justified not helping in ambiguous situations—through free-response items on the questionnaire—more often than in unambiguous situations, reasoning that someone else would help or that the person in need might be offended if help was offered.

It should be noted that the experimenters chose not to consider the gender of the person in need of help. The questionnaires were designed with more males in need of help than females in need of help, and the female participants outnumbered the male participants—both possible influences on the results obtained. Due to the limited scope of this project, it was not possible to test enough participants of both genders or to design three different questionnaires with female, male, and androgynous people in need of help. However, these variables may be worth exploring in the future.

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The Gender Effect: Uneven Distribution of Behaviors in Mixed-Gender Pairs

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The present study examines the influence of gender on computer use and propensity to speak in 5th graders participating in the 5th Dimension Computer Program at Torrey Pines Elementary School. Trends demonstrated in field notes collected by University of California, San Diego undergraduate tutors were investigated by collecting data from 17 mixed-gender pairs over the course of two 40-minute rotations. Overall, males dominated the observed interactions. Males used the computer more than females, with peak computer use for males occurring at the beginning of the class session and peak computer use for females occurring mid-session. Males also spoke more than females throughout the observed rotations.

Integrated versus same sex education has been a predominant issue in the United States education system for several decades. Issues of harassment, stereotyping, and discrimination make open investigation of the matter a complicated business, as many fear appearing politically incorrect. Still, same sex education is an increasingly viable option, and many parents are left wondering which educational environment would be best for their child.

The debate over the benefits of integrated- versus same-sex education has intensified in recent years. The debate started in 1972, with the development of Title IX, an Educational Amendment to the Civil Rights Act of 1964. Title IX states, "No person in the United States shall, on the basis of sex, be excluded from participation in, or denied the benefits of, or be subjected to discrimination under any educational program or activity receiving federal assistance," (Civil Rights Act, 1964). Though the intent behind Title IX was to ensure an equal learning environment regardless of gender, many question whether the opportunities offered in a mixed-gender learning environment will ever be equal—particularly with respect to technological training. According to the National Coalition for Women and Girls in Education, females are not receiving equal treatment when it comes to education in computer science and technology. In general, the Coalition noted, "…low expectations based on gender stereotypes and hostile classroom environments interfere with female students' opportunities to learn," (Title IX at 30, 2002).

The present study on mixed-gender interactions emerged from an ongoing implementation of the 5th Dimension Program (see Procedure below for program description) at Torrey Pines Elementary in La Jolla, California. Field notes collected by University of California, San Diego undergraduates suggested that the male members of mixed-gender working pairs were more active participants than their female counterparts. A more rigorous study was then implemented to investigate the validity of these observations. Two types of behaviors in the mixed-gender pairs were of interest: computer use and spoken communication. It was hypothesized that the males would operate the computer more than the females, while the females would contribute equally, if not more, to the verbal interactions.

Methods

Participants

5th grade students (F=17, M=17, *mean age*= 10 years) in the 5th Dimension Program at Torrey Pines Elementary in La Jolla, California participated in this study. Students were randomly assigned to working pairs by their teacher. A total of 17 mixed gender pairs were observed; these pairs remained constant throughout the study.

5th Dimension

The 5th Dimension is a school-based program modeled after Vygotskian principles. It was created by Dr. Michael Cole in an effort to improve literacy rates and accustom children to computers. To motivate children to learn, the program presents and tests learning material within the context of a computer game. By

engaging in various projects and assignment, students advance through different levels of a mystical land controlled by a wizard. Mastery of arithmetic, grammar, or spelling skills is rewarded with advancement to the next level or access to a fun computer game. During the course of this study, the 5th Dimension Program at the Torrey Pines Elementary included two main projects for the students to complete—Road Trip Project and The Explorers Project—and they were administered simultaneously for all rotations of students. Hence, the study monitored only these assignments.

Observation

Data were gathered over two forty minute rotations of 5th Dimension. A spot check analysis of behavior was used to measure computer use and propensity to speak. The following was noted at ten minute intervals during both rotations: the gender of the students using the computer, and the gender of the students currently speaking. Only the behavior of students in mixed-gender pairs was measured.

Results

Figure 1 illustrates average computer use by gender. Percents reported reflect the proportion of observations collapsed across rotations. Overall, males used the computer more than females (58% vs. 36%). Male computer use peaked at the beginning and end of class (68%). Female computer use peaked approximately 30 minutes after the start of class, (64%).

Figure 2 illustrates the average verbal participation by gender. The spoken contributions to the activity were more evenly distributed between genders, but were still skewed toward the males (54% vs. 48%). Male verbal participation peaked at the same time their computer use peaked (61% at the beginning of class). In the same trend, peak female verbal participation coincided with peak female computer use (65%).

Discussion

The dominant trend observed in the mixed-gender working pairs was one of unbalance. The male students were much more active than the female students with respect to computer use. Contrary to the hypothesized distribution of behaviors between genders, males were also more likely to verbally contribute to interactions with their partners. Though the observations collected cannot speak directly to the reason for this observed unbalance, field notes gathered by interns during the observation periods of this study suggest that at least two general processes influenced distribution of the measured behaviors between genders.

First, many of the students in the mixed-gender pairs actively discussed who would control the computer program during the session. Many of the males asked their partner if they could use the computer first, promising they would switch places later (Ostertag, 9/21/06). Other males were more forceful, grabbing the mouse first or complaining when their partner wanted to use the computer (Prax-Lodge, 9/21/06). Thus, part of the distribution of behaviors could be attributed to the students themselves.

Second, some students in the mixed-gender pairs did not have control over who used the computer. Instead, the particular roles were suggested to them by the undergraduate tutors. These tutors, consciously or unconsciously, often chose to ask the male student to use the computer first (Ostertag, 9/21/06). The distribution of behavior, then, can also be attributed to factors in the learning environment.

A reason for the difference in verbal contributions to the interactions is not as obvious from inspection of the field notes. However, the observations collected indicate that peak verbal contributions for both genders coincided with peak computer use. This suggests

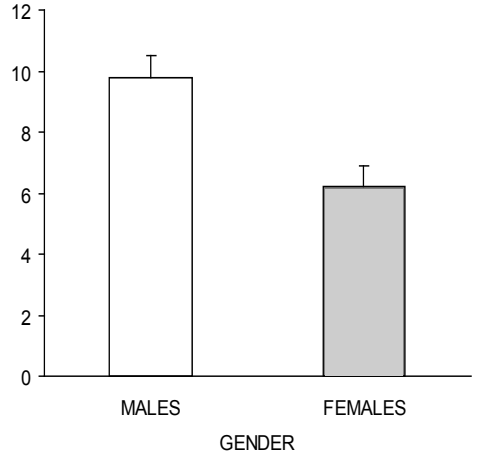

Figure 1. Mean number of males and females using the computer per observation (*N*=17 pairs).

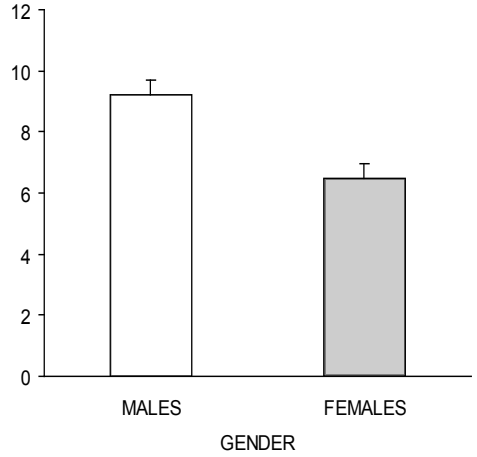

Figure 2. Mean number of males and females speaking per observation (*N*=17 pairs).

that engaging in verbal behavior is not independent of computer use in this context—it is not difficult to imagine that the student in control of the computer portion of the task would have more to contribute to task-oriented conversation.

Although the present findings cannot demonstrate whether these explanations are, in fact, the cause of the observed distribution of behavior, they still draw attention to a potential area of imbalance within mixed-gender educational settings. To make progress in understanding and equalizing the educational experiences of students of both genders, it is imperative that further research is conducted.

A useful way to continue to research within this particular school program would be to follow students throughout their entire 5th Dimension Program. With observation of more students and a spot-check method that lasted throughout the school semester, more information could be gathered regarding the trends observed in the present study. Also, it would be beneficial to collect additional measures of students' participation (e.g., the content of the students' verbal contributions could be recorded). The information gathered from such research would be of great importance as parents and policy makers weigh the costs and benefits of integrated- versus same-sex education.

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Summer of *Mrs. Wishy Washy*: Observation and Development of Literacy Activities

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Literacy activities for a transitional kindergarten/first grade summer session class were developed following three weeks of observation. The activities were redesigned each day in response to students' participation. The goal of these activities was to expose children to reading material across multiple modalities while providing an opportunity to assess developing literacy skills. Literacy was assessed using a method closely resembling the Cloze procedure, a diagnostic reading assessment technique. While the advances in reading and writing that children in this developmental stage demonstrate are difficult to measure, the design of this project highlights some of these important changes as they occur in a school setting.

When children are first exposed to literacy activities in a school setting, they rely on both their environment and their previous linguistic experience as they begin to develop fundamental reading and writing skills (Chomsky, 1999). Many educational activities have been created to help elementary school children acquire these skills.

The implementation of several of these activities was observed during a transitional class held at Doyle Elementary School during the summer of 2006. Through participation in the activities, the children demonstrated their current reading and writing abilities, which varied along the continuum of emergent reading development—from a pre-fluent stage, where children recite a memorized text, to a more advanced stage of meta-cognitive analysis, which involves thinking about the meanings of words with a deeper awareness of the text (Burns, Griffin, & Snow, 1999)

During the final week of the course, two new literacy activities were designed to align with the principles of cultural historical activity theory, which aims to understand the mental capabilities of individual human beings while focusing on the role of culture and technology. In accordance with this model, this project seeks to, "invent new teaching/learning activities, implement them, analyze them in theoretically relevant terms, and then use the results to modify instructional design for a next day's lesson," (Cole, 2001). Accordingly, activities in this study were redesigned and assessed according to the response of the students and the observations of the instructor. The goal in creating these activities was to expose children to reading across multiple modalities while assessing their literacy levels.

Method

Participants

The class consisted of fifteen students, ages four to six, who would be entering either kindergarten or the first grade in the upcoming school year. All of the children were identified as developmentally "at risk," and had been recommended to this transitional summer program to prepare them for the next grade. Some of the students had already completed kindergarten and were recommended for the program by their kindergarten teacher. The other students had been selected for this class because they were deemed too young to enter kindergarten without preparation. Approximately one third of the students had a primary language other than English (Spanish *n*=3, Japanese *n*= 1, French *n*=1, Russian *n*=1).

Curriculum Materials

The most prominent literacy activity during the summer session involved the famous children's book *Mrs. Wishy Washy,* by Joy Cowley (see Appendix for full text). There were two course instructors, one for each half of the session, and they familiarized the children with the text through different methods.

The book was introduced to the students by Miss Morales, the teacher for the first two weeks of the session. She read the book twice every day. First she read through the book to teach the children about punctuation and how it influences the way a book is read

aloud, showing them where to pause for a comma or raise their voice for a question; then she read through emphasizing the emotions expressed by the characters in the story. The children learned to read along with her and express the emotions of Mrs. Wishy Washy, the main character. This type of reading was identified as, "expressive language."

The teacher for the second half of the summer, Mr. Smith, continued to read the story twice a day, but in a different manner. First he read through the story as a "serious news caster," a term he coined to describe reading the book straight through with an emphasis on the content and plot of the story. Similar to the first instructor, he would then read it again, this time highlighting the emotions that the characters expressed.

The children became very familiar with the text over the course of the summer session. The story was always presented as a "big book"—in large format—and read in front of the entire class; thus, the book was contained in this medium and never became an individual activity.

Design of Activities

First Activity. The first activity designed for the course involved the following elements:

- The children dressed up as the characters in the story using scraps of fabric.
- The children acted out the narration of the story using various props

This activity relied heavily on the students' memory of the text and illustrations of the story. The children dressed up in the costumes and acted out the story as the characters Mrs. Wishy Washy, Cow, Duck, and Pig. Several students also served as prop characters, holding signs for "Mud" and "Tub." By acting out the story, the children had to think of the narrative from a different perspective: in terms of how to represent the narrative with respect to their surroundings, their bodies, and the other children. They were challenged both individually and collectively to recall and comprehend the story.

Second Activity. Based on reviews of the students' performance, a second activity was developed. In the second activity:

- Certain words were covered in the text with construction paper.
- The children's task was to identify the missing words, find them among strips of paper, and then tape them back into the story.

This new activity placed a stronger emphasis on reading and understanding the text of the book. It closely resembled the Cloze procedure, which involves omitting words from an unfamiliar passage and having participants complete and construct the meaning by inserting an appropriate word as they read. This procedure is based on three principles: to determine the students' independent instructional levels, to check the match between the readability of a textbook and the students' actual reading level, and to check for the students' use of available clues to aid them with their comprehension (Lapp, p. 526). The primary difference between the Cloze procedure and the new activity is that the new activity employed a passage with which the children had already become familiar.

For this activity, the children were divided into three subgroups determined by literacy level. The first group included the first grade students, and the second group included the more advanced kindergartners. The third group, which included children with less developed literacy abilities, did not participate in this task because the children were not familiar enough with the alphabet to be able to identify the words used. Clearly, the social arrangement of the children was important as a means of assessing the academic gap that existed between the pupils and their teacher (Cole, 2006, p. 23).

The second activity had a heavier emphasis on literacy in comparison with the first activity; it involved word identification, and required a strong comprehension of the story. Instead of relying on context, the children began to engage in a variety of meta-cognitive behaviors to complete the task.

Results

Children's Responses

In the first activity, the children became more involved in the reading of *Mrs. Wishy Washy* because they had the opportunity to act out the roles of the characters in the story. For example, when it was time to present the first action of the book (the cow jumping in the mud), the child wearing the cow costume quickly placed his hands on the brown paper that represented the mud. The child playing the duck quickly followed suit, but the child playing the pig had to be urged by the rest of the children to go to the prop mud and "roll" as the story indicated. She seemed to be struggling with the concept of participating in the story as a character, yet the majority of the children were anxious to assist by guiding her through the appropriate actions; this demonstrates the collective problem solving aspect of the activity.

The children's knowledge of the story as emergent readers was also evident in the first activity. For example, when the intern misread a line from the story as, "In the tub you go, she said," Trevor—who had been following the text with a pointer—quickly corrected the

error, “It is ‘she screamed!’” The other children agreed with his assertion, and then decided to read the line again, this time having the child dressed up as Mrs. Wishy Washy yell, “In the tub you go,” while the rest of the children read the direction, “she screamed.” This type of interaction reveals a great deal about the children’s emerging understanding of the text. Their keen interest in correctly expressing the characters’ dialogue demonstrated their familiarity with the character’s emotions, a skill that was emphasized earlier in the summer session.

Some of the children were engaging in the activity on a meta-cognitive level. For instance, Diana employed comprehension monitoring, a subset of metacognition which involves consciously thinking about the meaning of the text. She challenged the reenactment by telling the other children that the cow still needed to be in the tub; however, upon referring to the text, she agreed that only the duck should be in the tub.

Because amount of participation varied among the students in the first activity, the second activity was designed for smaller groups. The first graders seemed to grasp the activity with relative ease. For example, Haley read “Oh, lovely _____,” when it was her turn and then quickly said, “So I have to find ‘mud’,” proceeding to look for the correct word and then taping it in the appropriate place.

The kindergartners’ experience with this task varied greatly. Many of the students in this group required assistance in completing the activity, relying of the levels of support built into the task. First, they could rely on their recall of the story to identify the correct word. Second, they could flip up the paper to reveal the missing word, and then search for the correct word by matching letters. The children also occasionally received help from their peers. For example, Kylee was reluctant to participate and complained, “The thing is, I don’t know how to read.” She attempted to pick the word “mud” when she needed the word “wishy,” but had difficulty finding the right word even when the instructor gently explained the difference between *M* and *W*. Mateo, who had been watching her search for the correct word, soon crawled over and handed her the strip of paper she needed.

The students also developed their own methods for completing the task. Jose, a kindergartner, did not know how to spell, but he used his problem solving ability to narrow his search for the correct word. For example, when he immediately found the correct word, “cow,” he explained that he knew it was the right answer, “because it is little.” This awareness that “cow” is a short word demonstrated an important stage in phonological awareness.

Assessment of Children’s Performance

Within the context of these activities, the children were able to demonstrate the extent of their literacy skills. The first activity tested their comprehension of *Mrs. Wishy Washy* by involving them in a re-enactment of the plot. Recreating the story required an understanding of the progression of the important events as well as critical thinking skills.

The second activity highlighted very different elements for the different subgroups of students. For the first grade group, the activity confirmed their ability to read and use clues to complete the story. For the kindergartners, who struggled to identify the missing words, the activity highlighted the fact that they had not really been reading the story, but had begun to memorize the text. Furthermore, their struggle to find the correct words demonstrated that they were still in the process of learning their letters and sounds. Unable to rely on their reading ability to complete this activity, the kindergartners made use of other strategies: they searched for words according to their length or according to a recognizable letter. Their use of these strategies was also informative; for instance, the confusion of “mud” and “wishy” alerted the intern to the fact that the students were confusing the letters *M* and *W*.

Discussion

To continue a study of these approaches to literacy, various activities could be created which involve the children’s participation to a greater extent. Exposure to different texts might also highlight the degree to which children are learning through repetition, emergent readings, or thinking metacognitively. Evaluating the influence of these transitional literacy activities on the later academic performance of these students would also be valuable.

In conclusion, the activities introduced in the final week of this transitional session enabled the children to learn in several different ways. Though the activities that the teachers implemented encouraged the children to memorize the stories and understand the text, the new activities challenged the children to apply what they were learning. The activities also promoted collective problem solving within a looser classroom structure. *Mrs. Wishy Washy* was no longer a book that the teacher read to them; it was a play they had performed, and a book they had helped to rewrite. The process of altering the activities each day in response to the children’s performance was also beneficial. As a result, the activities could cater more directly to the students’

needs, while helping the instructor identify and address the difficulties the children encountered while reading and comprehending the story.

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Appendix:

Mrs. Wishy Washy (Cowley, 1980)

"Oh lovely mud," said the cow. And she jumped in it.
"Oh lovely mud," said the pig. And he rolled in it.
"Oh lovely mud," said the duck. And she paddled in it.
Along came Mrs. Wishy Washy. "Just look at you!" she screamed.
"In the tub you go." In went the cow, wishy washy, wishy washy.
In went the pig, wishy washy, wishy washy.
In went the duck, wishy washy, wishy washy.
"That's better," said Mrs. Wishy Washy and she went into the house.
Away went the cow. Away went the pig. Away went the duck.
"Oh lovely mud." They said.

The Role of Context in Early Adolescent Reasoning about Motivational Strategies

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The purpose of this study was to understand adolescents' perceptions of effective motivational strategies and whether these perceptions varied as a function of context. Participants were 85 young adolescents in the sixth grade (n=55) and eighth grade (n=30) who filled out a questionnaire rating appropriate motivational strategies for children of varying competency levels in either academic or social tasks. Results showed that children do not hold one model that they apply broadly, but rather hold multiple models that they apply flexibly across different contexts, and that there are gender differences in such beliefs.

It is very likely that every school-aged child has been enticed to complete a task through the use of motivational strategies, regardless of the task's initial appeal to the child. Such extensive use of motivational strategies by adults prompts them to question, "What is the best way to motivate my child or student?" Much research has attempted to address this question by asking how parents and teachers choose to motivate (Boggiano, Barrett, Weiher, McClelland, & Lusk, 1987; Reeve, Bolt, & Cai, 1999; Reeve & Jang, 2006), and then analyzing the long-term effects of such behaviors (Deci, Koestner, & Ryan, 1999; Deci, Nezlek, & Sheinman, 1981). However, little is known about children's views of what is motivating.

Understanding the effect of various motivational strategies from the viewpoint of the child is important for several reasons. One reason is that children can consult their own experiences and feelings when forming their motivational opinions; thus, it is possible that they can give a more accurate account of the things that are most motivating for themselves and their peers. Another reason is that understanding children's reasoning about motivation can be helpful in developing prevention and intervention programs aimed at optimizing adult and child interactions to enhance motivation and achievement in academic and social tasks. Such intervention programs are important because the immediate increase in the desired behavior that rewards provoke is believed to have long-term effects (Boggiano et al., 1987; Gurland, 2007), when, in fact, empirical research has shown that it actually leads to a decrease in intrinsic interest in the behavior (Deci, Koestner, & Ryan, 2001; Kruglanski, 1975; Ryan, Mims, & Koestner, 1983). Thus, children's theories regarding the best motivational strategies for themselves and fellow peers serve as a crucial perspective needed to better understand achievement motivation.

At least for adults, there appears to be a strong belief that extrinsic motivators are the most effective technique to increase a child's interest in an activity. Research by Boggiano et al. (1987) has greatly increased our understanding of how adults reason about motivational strategies and their effect on the development, interest, and maintenance of desired behaviors in children. Their first study found that adults preferred rewards over reasoning, punishment, and noninterference to maintain intrinsic interest for activities, and did not discriminate between tasks of varying interest levels. A second study found that parents valued rewards more for maintaining or enhancing interest in academic behaviors in comparison to promoting the prosocial behaviors of altruism and friendship.

Suzanne Gurland (2007) has also found that rewards are the preferred motivator for increasing a child's interest in academic tasks. This recent work, instead of investigating adult theories, examined elementary school children's theories of other children's motivation by measuring preferences for motivators in the context of initially high interest and low interest activities. Regardless of the initial interest in a given activity, this study found that children viewed extrinsic rewards to be the most effective way to sustain or enhance interest. However unlike adults, children distinguished between activities of initially high and low interest levels, reporting greater interest for activities that were initially high-interest than for those that were

initially low-interest. In addition, children found rewards to have an additive, as opposed to an interactive, effect on the interest level of an activity. That is, children saw rewards to have the greatest effect when someone already had initial high interest in the activity. Though children believe that initial interest in an activity has important consequences for the effectiveness of a reward, it appears that adults do not modify their use of rewards according to a child's level of interest in an activity. This mismatch between adult and child theories of how to use motivational strategies may prevent adults from implementing the best motivational strategies in activities of varying interest levels for children.

The present research builds on the findings of Gurland (2007) by examining children's beliefs about what motivators are most effective among early adolescents. Like Gurland, beliefs about motivators in the academic domain are examined. In addition, this study explores the extent to which these beliefs tend to be specific to the academic domain, versus more general beliefs about motivation that would also apply to the social domain. Of particular interest was whether the domain differences observed by Boggiano et al. (1987) would also be apparent among early adolescents.

Another interest was the extent to which children's ideas about the effect of motivational strategies are applicable to all people and in all contexts. Thus, we had participants reason about what would be the most motivating to students of varying competency levels when engaging in academic versus social tasks. Competence is an important aspect to study in achievement motivation. The possibility of competence or incompetence directs choices and behaviors both consciously and unconsciously (Elliot and Dweck, 2005). Perceptions of competence can equally influence behavior in the social and academic domains, yet possibly in qualitatively different ways. Its broad impact on daily affect, cognition, and behavior makes it an important concept to study. This investigation asks whether young adolescents differentiate between the usefulness of extrinsic motivators for children of high and low competency or if they show overall preference for rewards much like the adults (Boggiano et al.,1987) and children (Gurland, 2007) in previous research.

The role of gender in adolescents' ideas about motivational strategies was another issue this study sought to address. Gender is a potential factor in the motivational perceptions that young adolescents have because a person's gender affects both the socialization process and social feedback that he or she receives from others, which in turn may influence his or her motivation or self-efficacy (Hyde and Durik, 2005). Indeed, it has been found that children's feelings of competence are likely to affect the interests and the activities that they pursue. Differences in motivation or personal interests may therefore lead to differing perceptions regarding the best way to motivate the completion of a task. The discovery of gender-differentiated theories regarding motivation would suggest gender-specific outcomes in the effectiveness of certain motivational strategies. Although research has looked at gender differences in regard to competency and self-efficacy, little is known about gender's influence on the perception of motivational strategies for situations that vary in initial competency levels. Thus, this study is one of the first to explore such potential gender differences.

In review, this study first attempts to investigate how early adolescents reason about the effectiveness of extrinsic motivators for an individual of a particular competence level, while also observing the types of motivators that are preferred. Second, whether young adolescents view the effectiveness of motivators to remain stable across academic and social contexts is examined. Lastly, the influence of gender on motivational theories will be assessed.

Method

Participants

Participants were 85 early adolescents in the sixth grade (*n*=55, mean age=11 years 7 months, range=11 years 0 months to 12 years 9 months, F=36 and M=19) and eighth grade (*n*=30, mean age=13 years 8 months, range=13 years 2 months to 14 years 0 months, F=16 and M=14) recruited from a middle-school in San Diego, California. The sample was approximately 56.5% European American, 10.6% Asian American, 24.7% Hispanic American, and 8.2 % African American.

Design and Procedure

Participants were given a 25 minute questionnaire to fill out in a quiet classroom in groups of approximately twenty students. An experimenter was present to answer any questions. The questionnaire consisted of eight scenarios that could be categorized into two domains. The first four scenarios involved a target child completing an academic task and comprised the academic domain. The last four scenarios involved a target child completing an altruistic task and comprised the social domain.

Scenarios within the academic domain depicted the need for a target child to complete a book report. Following each scenario were five potential motivators for that target to complete the book report. The target child in each scenario was either a high achiever, low

or average achiever, and the last scenario asked the student specifically which motivator he or she would find most motivating. The five motivators were: threatening a punishment, promising a reward, stating the importance of the activity, giving the student an option (of choosing a book to use for the report), and parents and teachers stating their high expectations. An example of an academic scenario is given below.

> Imagine a person who is a high achiever and often gets good grades on assignments and tests. One day the teacher assigns her students to do a book report. Which of the following do you think is most important in encouraging the person to do the book report?

In the scenarios comprising the social domain, the motivational strategies were identical except that the option in the task was the choice to baby-sit or not. The scenarios depicted a social situation in which the target was asked to help his or her parents watch a younger sibling and sacrifice going out with friends in order to do so. In this case the targets were either always very helpful, not very helpful, or sometimes helpful, and the last scenario asked which motivator the student would personally find most influential. An example social scenario follows.

> Imagine someone who is not very helpful, who always tries to avoid being asked for help and complains when he/she has to do something for someone else. One day this person's parents ask if he or she would watch a younger sibling. This means that the person cannot go out with friends that night as he/she had hoped. Which of the following do you think would encourage this person to agree to baby sit for his/her parents?

Results

Preliminary analyses indicated no significant effects of age and no significant effect of personal competency ratings on personal preference for motivational strategies; therefore these factors will not be discussed.

One key contrast of interest was students' preferences for extrinsic motivational strategies and whether these preferences differed by domain. In order to investigate this factor, the five motivational strategies were coded as either "clearly extrinsic" or "not clearly extrinsic" to create an extrinsic score. Two motivational strategies were coded as "clearly extrinsic": the threatening of a punishment and the promising of a reward. The other three motivational strategies were coded as "not clearly extrinsic": stating the importance of the activity, having some sort of option in handling the task, and the high expectations of parents and teachers.

Extrinsic scores were compared across four domains. The academic domain consisted of four scenarios presenting the target child with the need to complete an academic task. This academic domain was compared to the social domain, which consisted of four scenarios presenting the target child with the need to complete a social, or altruistic, task. The high competence domain consisted of the scenarios that presented the target child as doing well in either an academic or social task. This domain was compared to the low competence domain, which consisted of academic and social scenarios in which the target child showed low performance on the task.

The first question concerned whether students considered extrinsic strategies to be equally rewarding in the academic versus social domains. In order to examine this question, an academic extrinsic score, which was an average of the extrinsic scores across all four academic scenarios, and a social extrinsic score, which was an average of the extrinsic scores across all four social scenarios, were calculated. A paired *t* test was used to examine the difference between these scores. Results showed that social extrinsic scores were significantly higher than academic extrinsic scores, $t(83)=2.97$, $p<.01$. This suggests that students expect extrinsic strategies to be more motivating for engagement in a prosocial task than for engagement in an academic task.

Next, the question of whether students have different ideas about what is motivating depending on an individual's level of competence in a domain was examined (e.g., are the same strategies considered to be the best motivators for high versus low achievers?). A high competence extrinsic score, which was the average of the two extrinsic scores in which individuals described in the scenarios were doing well in the domain in question, and a low competence extrinsic score, which was an average of the two extrinsic scores in which individuals described in the scenarios were doing poorly in the domain in question, were computed to assess potential differences. Results showed that low competence extrinsic scores were significantly higher than high competence extrinsic scores, $t(82)=4.2$, $p<.001$. This suggests that students expect extrinsic strategies to be more motivating for students who are having difficulties in a given task (academic or altruistic) than for students who are doing well in the same task.

Preliminary analyses revealed that males and females have different motivational views within some of the domains examined. Within the academic domain, males had a much higher extrinsic score than females, $t(82)=2.38$, $p<.05$. In the social domain, however, there were no gender differences: both females and males selected extrinsic motivators as the best motivators.

This preference mirrored the males' ratings of extrinsic motivators in the academic domain. These results suggest that females are making more of a distinction between the two domains. They rate extrinsic strategies as high as males rate them in the social domain, but rate them significantly less than males in the academic domain. Gender differences were again found when comparing the personal preferences of males and females across the academic and social domains, with males demonstrating a higher extrinsic score than females, $X^2(1)$, $p<.05$. These results suggest that, regardless of the domain, males personally prefer extrinsic motivators more than females prefer extrinsic motivators.

Detailed Motivational Descriptions

The particular strategy that students found most motivating in the specific scenarios presented was also of interest. Tables 1 and 2 show these results. In the following analyses, the most common motivator (e.g. the strategy chosen as the most motivating by the majority of the subjects) is described as the "best" or "most" motivating strategy for a given situation. When motivational values were compared, the term value referred to the relative strength of a particular motivator (given by the number of subjects that choose it as the best strategy) compared to the relative strength of the other motivators. For example, a strategy chosen by 20 students has more motivational value than a strategy chosen by 10 students.

Of primary interest was whether specific strategies differ in their motivational value depending on the type of scenario presented. Within the academic domain, rewards were rated as the most motivating strategy in the high competence, low competence, and personal scenarios (the low competence condition had the highest value placed on this motivational strategy). One interesting difference, however, is that almost three times as many adolescents chose punishment as the best motivator for low achievers as chose punishment for high achievers. In contrast, twice as many students considered having an option involved with the task to be more motivating for high achievers than for low achievers. These results suggest that, after the use of rewards, the use of punishment has the greatest value for motivating those who usually don't do well on a task, whereas giving options may be a better technique for motivating those who display high competence on a task.

Table 1
Academic domain: motivation selection by condition (%)

	Competence			
Motivation	High	Low	Average	Personal
Punish	6	16	5	10
Reward	34	45	33	32
Importance	23	18	28	23
Option	33	16	22	26
Expectations	4	5	12	9

Table 2
Social domain: motivation selection by condition (%)

	Competence			
Motivation	High	Low	Average	Personal
Punish	6	35	5	6
Reward	48	40	49	54
Importance	19	6	16	10
Option	23	17	22	23
Expectations	5	2	7	7

Within the social domain, rewards were again seen as the best motivational strategy for completion of the task. In fact, even more weight was put on the use of rewards for the social scenarios than for the academic ones, with personal preferences favoring the use of rewards the most. Furthermore, punishment played an even greater motivational role for low helpers than it did for low academic achievers, with almost six times more adolescents considering punishment to be the best motivator for low helpers compared to high helpers. In contrast, more than three times as many students found that stating the importance of the activity was the best motivator for high helpers compared to low helpers. These results suggest that the use of punishment is believed to become even more effective in motivating low competence individuals to complete social tasks than to complete academic tasks, and that high competence individuals may switch from displaying an increased concern over having an option in academic tasks to becoming more concerned over the importance of the activity in social tasks.

Another question concerned whether the gender of the subject influenced preferences for some motivational strategies over others for specific scenarios. Indeed, gender differences were found, as shown in Tables 3 and 4. In the academic domain, males and females rate rewards as having the highest motivational value for low achievers. However, males consistently favor rewards in the high achiever and personal option scenarios, whereas about twice as many females favor options in these scenarios.

Within the social domain, rewards were consistently seen as the most motivating strategy to promote

Table 3
Academic domain: gender differences in motivation selection by condition (%)

Motivation	Competence					
	High		Low		Personal	
	M	F	M	F	M	F
Punish	7	6	21	14	7	12
Reward	43	29	52	41	45	25
Importance	27	21	10	22	31	19
Option	20	40	14	18	17	31
Expectations	3	4	3	6	0	13

Table 4
Social domain: gender differences in motivation selection by condition (%)

Motivation	Competence					
	High		Low		Personal	
	M	F	M	F	M	F
Punish	7	6	26	40	9	4
Reward	43	50	32	44	59	50
Importance	20	18	13	2	9	10
Option	30	18	29	10	22	24
Expectations	0	8	0	4	0	12

engagement in an altruistic task. For both males and females, compared to the academic domain, punishment increased in motivational value for tasks set in the social domain. However, whereas males remain stable in their valuing of extrinsic motivators across the academic and social domains, females seem to distinguish the two. Not only do females come to consider rewards to be the most effective motivator in the high competence and personal social condition, but in the low competence social condition females rate punishment to be nearly as valuable as rewards. These results show that females' preference for the use of extrinsic motivational strategies in encouraging low competence individuals is greater for prosocial than academic tasks.

Discussion

The goal of the present study was to analyze the motivational theories of early adolescents by understanding their reasoning about competence on a task and its influence on choosing the best motivational strategy for that task. One of the main findings was that young adolescents generally consider rewards to be the best extrinsic strategy to motivate engagement in a task, regardless of whether the task is academic or altruistic. This finding supports the results of previous studies (Boggiano et al., 1987; Gurland, 2007) in which both adults and children were found to prefer rewards as a motivational strategy for increasing interest in an activity. Taken together, this research suggests that both children and adults believe rewards to be highly effective motivators.

The results also showed that, independent of domain, students expect extrinsic strategies to be more motivating for students who are having difficulties in a given task than for students who are doing well in the same task. This finding is somewhat surprising in light of Gurland's discovery that elementary school children thought rewards were most beneficial to those that had high interest in an activity. In fact, the early adolescents in this study seem to have more in common with the adults in Boggiano et al.'s (1987) study, who perceived attributional strategies to be more effective for high interest academic tasks than for low interest academic tasks. Similarly, the adolescents in this study perceived high achievers to benefit less from extrinsic motivators such as rewards and punishment, and more from autonomy supportive strategies such as having an option or understanding the importance of the activity. Thus, it is possible that adolescent theories about motivating students with different initial interest or competency parallel those of adults, suggesting the existence of a shift in such theories between elementary and middle school. Further research should explore the possibility of a developmental shift in such motivational theories. Further research is also needed to explore whether children's views regarding competency levels directly correlate with interest levels in the activity; for example, whether a high competence individual has more interest in the task than a low competence individual.

Another significant finding was that students expected extrinsic motivational strategies to be more motivating for engagement in a prosocial task than for engagement in an academic task. Furthermore, while rewards were preferred for low achievers in the academic domain, they were preferred as personal motivators in the social domain. These findings appear to be opposite to the pattern observed with adults, who value rewards more in the academic compared to the social domain (Boggiano et al., 1987). Boggiano and colleagues hypothesized that adults differentiate between the academic and social domains in their valuing of rewards for two main reasons. First, parents do not see rewards as effective means of promoting altruistic behaviors in children because the very nature of altruism implies that prosocial behaviors are performed for the intrinsic satisfaction of helping one another; thus

extrinsic motivators are not seen as appropriate to promote altruistic behavior. Second, parents assume that children are more passive in academic learning situations than they are in social contexts, and thus they feel the need to intervene more in academic situations. The present findings suggest that early adolescents may have the opposite intuitions regarding the motivational value of rewards in the social domain, preferring them for social tasks regardless of competency level (and especially for themselves). This may be due to an adolescent's perception of responsibility within each domain. For example, adolescents may feel that academic tasks are a responsibility they did not choose to undertake. Thus, they may not feel the need to be compensated for their efforts in this domain, at least not to the extent that they would expect in the social domain, where their behavior will likely benefit others. This greater need to be compensated for prosocial behavior may also be because more personal sacrifices have to be made—at least in the context of the scenarios presented in this study. The conflicting theories of adults and adolescents regarding the effectiveness of rewards within the academic and social domain is a perfect example of why it is important to study children's theories of other children's motivation. Further understanding of these beliefs is important in obtaining a well-rounded picture regarding motivational strategies and their effect on achievement.

When individual motivators were examined, both domain and gender differences were found. One such difference was that females considered extrinsic motivators to be much more valuable in the social domain than in the academic domain, while males consistently preferred extrinsic motivators across both domains. Further research is needed to better understand why females may discriminate between the two domains. Perhaps there is something about a female's experiences within these particular domains that differs from a male's. Indeed, personal experiences in socialization processes are thought to contribute to many of the gender differences found in the literature (Hyde and Durik, 2005).

It was also found that both genders rate rewards as having the highest motivational value for low achievers in the academic domain, but gender differences arise when rating high competence and personal scenarios. Males saw rewards as the best motivator throughout, but females sometimes gave the highest value to having an option in the task. The two genders came to agree in the social domain, as both viewed rewards as the best motivator across all scenarios. Both genders also believed that the value of threatening punishment increases in the case of low competence helpers, with the females exhibiting the greatest increase in valuation of this motivator. Overall, these results suggest that females tend to be more flexible in their application of motivational strategies; they assess the appropriateness of strategies with respect to both the domain of the desired behavior and the competence of the target individual.

It is possible that the males in this study preferred rewards regardless of relative competency or domain, because rewards serve as visual proof of their accomplishments and would support their performance orientation. Indeed, a few studies have found that males are more likely than females to preserve their self-worth and maintain academic motivation in contexts that emphasize performance goals (Eccles, Alder, & Meece, 1984; Miller, 1986). In addition, a more recent study found that males have a higher performance orientation than females, and appear to be more concerned about demonstrating high ability relative to others (Rogers, Galloway, Armstrong & Leo, 2001). Future research should further consider this relationship between gender and preference for rewards.

Another major finding was that having an option was valued almost as much as being rewarded in high competence scenarios for the academic domain, which was almost twice the value assigned to options for low achievers. In the social domain, the importance of the activity was given higher values for high competence helpers than for low competence helpers. Both motivational strategies chosen for individuals of high competence in a given domain support mastery, or learning orientations. It makes sense that highly competent individuals, being more autonomous, would seek motivators that promote this autonomy. Indeed, being motivated by having options in academic tasks and by understanding the importance of a social activity are arguably in line with this autonomy. Also, the importance behind a task may be a more relevant motivator for social tasks because they concern other individuals, whereas having an option may be more relevant for academic tasks because they have mostly personal significance. In addition, as mentioned before, academic tasks may be perceived as more obligatory. Thus, high competence individuals, being more capable of completing academic tasks, may feel more obliged to do so, and therefore seek an outlet for the expression of their autonomy. Having an option in how to complete the task is one such way in which their autonomy can be supported, which may be the reason

why adolescents chose this as a key motivator for high achievers to complete academic tasks.

Conclusion

Prior research has suggested that how children interpret and respond to new information is affected by what they already believe (Heyman, Gee, & Giles, 2002); thus, it is important to understand children's intuitive beliefs in a domain prior to developing prevention and intervention efforts. The present research examined such intuitive beliefs about motivation. Findings indicate that children do not hold one model that they apply broadly, but rather hold multiple models that they apply flexibly across different contexts. There are also gender differences in beliefs about effective motivation, which may be the result of different socialization processes for males and females in academic and social domains. These findings suggest that efforts to improve intrinsic motivation by removing extrinsic motivators might meet less resistance from females than from males and be more successful in the academic versus social domain.

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Appendix A

Academic Scenarios:

Imagine a person who is a *high*/*low*/*average* achiever and *often*/*rarely*/*sometimes* gets good grades on assignments and tests. One day the teacher assigns her students to do a book report. Which of the following do you think is most important in encouraging the person to do the book report?

If your teacher were to assign a book report, which of the following would be most important in encouraging you to do the book report?

- the threatening of a punishment
- the promising of a reward
- stating the importance of the activity
- giving the student the option of choosing a book at their grade level
- parents and teachers stating their high expectations

Appendix B

Social Scenarios:

Imagine someone who is *always*/*not very*/*sometimes* helpful who *does things without complaining and always offers a helping hand/ always tries to avoid being asked for help and complains when he has to do something for someone else*/*doesn't mind helping when asked, but sometimes prefers to do other things instead*. One day this person's parents ask if he or she would stay home and watch a younger sibling. This means that the person cannot go out with friends that night as he/she had hoped. Which of the following do you think would encourage this person to agree to baby sit for his/her parents?

If your parents asked you to skip going out with friends in order to stay home and watch a younger sibling, which of the following would encourage you to agree to baby sit?

- the threatening of a punishment
- the promising of a reward
- stating the importance of the activity
- giving the person the option of babysitting or not
- parents stating their high expectations

Appendix C

Personal Altruistic Competence Measure:

In general, how often do you think you go out of your way to help other people?

not at all=1 rarely=2 sometimes=3
most of the time=4 very often=5

Personal Academic Competence Measures:

Compared to other kids in your classes, how well do you usually do on tests?

a lot worse=1 a little worse=2 about the same=3
a little better=4 a lot better=5

Compared to other kids in your classes, how well do you usually do on book reports?

a lot worse=1 a little worse=2 about the same=3
a little better=4 a lot better=5