THE EFFECT OF ABILITY-BASED VERSUS EFFORT-BASED PRAISE ON TASK PERFORMANCE, TASK PERSISTENCE, AND INTERNAL FACTORS IN CHILDREN IDENTIFIED AS GIFTED OR TALENTED IN MATHEMATICS

by Robert W. Greene

The purpose of this study was to further investigate possible differences that exist in the levels of task performance and task persistence exhibited by students identified as gifted in mathematics on a tiered mathematical task (i.e. Below, At, and Above the student’s identified instructional level) when receiving either ability- or effort-based praise. Three 2nd grade students, identified as gifted/talented in mathematics, participated in the current study in a one-to-one setting with the examiner. In completing the tiered mathematical tasks, either ability- or effort-based praise was provided dependent on the testing condition. Each student’s task-performance was assessed by recording the percentage of correct items on a mathematical task, while task-persistence was quantified by documenting the percentage of intervals each student was coded as on-task. Internal factors (attention, interest, and motivation) were measured for each student using a Likert scale self-report questionnaire. Findings suggest that overall: student task performance increased with exposure to effort-based praise, but decreased with ability-based praise; student task persistence increased with exposure to ability-based praise, but decreased with effort-based praise; and student internal factors increased with exposure to both effort- and ability-based praise, although effort-based praise had a stronger effect. Implications, limitations, and future research possibilities are presented.
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Dedication

This research paper is dedicated to my mother, Joan Dorothy Bishop, for always encouraging me to pursue my dreams and her continued support along the way. This is as much yours as it is mine. I did it.
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I would like to acknowledge and extend many thanks to Dr. Amity Noltemeyer for her support with this research project and throughout my graduate career at Miami University, without which I may have never found the motivation to complete this thesis. Your drive, encouragement, and flexibility allowed me to see this project through to the end, and for that, I am forever grateful.

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Introduction

Teachers are frequently trying to discover new ways to help motivate their students to become more concerned engaged with their academic activities. In the 1970’s, research began exploring underlying factors that could be associated with motivation. To better understand this phenomenon, experiments were conducted to examine the effects of external rewards on an individual’s intrinsic motivation (Deci, Ryan, & Koestner, 1999). In 1968, intrinsic motivation was defined by DeCharms as an individual’s driving force to be in charge of their own behavior and change within his or her own environment. Since DeCharms first proposed the concept of intrinsic motivation, studies have reported contradictory results when looking to find the true effects of these rewards. This topic continues to be explored in the school setting when working with typically developing children, as well as children who experience learning disabilities and behavioral disorders.

Although an extensive amount of research exists in the area of intrinsic motivation, one population that has been largely ignored in the research of motivation: gifted and talented students. The lack of research could be due to the assumption that gifted students already possess an elevated amount of intrinsic motivation. The number of studies on gifted students’ motivation dwindles even more significantly when specifically considering the subject area of mathematics. Advancing research in this area would provide better insight into developing novel and more stimulating ways to help teachers motivate academically gifted students in their classrooms. Shedding more light on what it is that motivates this particular population could provide the necessary support to these students in achieving their full academic potential.

The purpose of this research is to examine if differences exist amongst students identified as having giftedness in mathematics on task performance, task persistence, and motivation when completing a tiered mathematical task (e.g., below, at, and above the student’s instructional level) while receiving either ability-based or effort-based praise during the task. It is hypothesized that student task performance will be greater when provided effort-based praise than when provided ability-based praise on the tiered-mathematical tasks. Furthermore, it is hypothesized that students receiving effort-based praise will be more persistent on a tiered-mathematical task than when they receive ability-based praise on a similar tiered-mathematical task. Lastly, it is hypothesized that students’; (a) motivation to perform the tiered mathematical...
tasks, (b) level of interest in the tasks, and (c) attention to the tasks, will be rated higher following exposure to effort-based praise than when provided ability-based praise.
Literature Review

The overjustification effect occurs when external rewards negatively impact an individual’s intrinsic motivation (Cameron & Pierce, 1994, 2002; DeCharms, 1968; Deci, Koestner, & Ryan, 1999; Eisenberger, Pierce & Cameron, 1999; Greene & Lepper, 1978; Tang & Hall, 1995). The overjustification effect postulates that when an individual initially participates in an activity, he or she is intrinsically motivated to do so; however, when an external reward is given to an individual for performing a certain task, the reasoning for why an individual engages in that same behavior begins to change. This means that exposure to an external reward causes the function of an individual’s behavior to change. Existing research has found that if an individual is provided with too many external rewards for engaging in specific behaviors, their intrinsic motivation may no longer be considered responsible for their engaging in those behaviors (Cameron & Pierce, 2002).

The theory of personal causation defines intrinsic motivation as an individual’s driving force to be the one in charge of their own behavior and change within their own environment. An intrinsic motivation approach assumes that people have the natural tendency to seek experiences that increase their competence, elicit curiosity, and promote autonomy. Learning activities that are optimally challenging (not trivially easy or too difficult), are novel and interesting, and offer choice and self-direction, tap into intrinsic motivation, and provide the opportunities for individuals to increase mastery, satisfy their curiosity, and enhance their sense of personal control (Lee, 2005).

DeCharms (1968) posited that it is human nature to control the choices that an individual makes, rather than being controlled by their surrounding environment. In order to gain support for DeCharms’ belief in role of human nature decision making, Deci conducted three different experiments in 1971 to examine the effects of external rewards on college students’ intrinsic motivation when dealing with a non-academic task. Deci hypothesized that external rewards would lead to a decrease in an individual’s intrinsic motivation, which would support the overjustification effect in which the use of external rewards decreases and negatively affects an individual’s intrinsic motivation.

The first of Deci’s (1971) experiments consisted of a sample of 24 college students who were enrolled in an introduction to psychology course, whereas the second experiment consisted of eight college students enrolled in an introduction to psychology course. The methodology for
each of these experiments was conducted in the same manner in a college classroom. The participants were asked to participate in three separate fifteen minute sessions, in which they were asked to complete a Soma, which consists of building various formations with cubes. To obtain measurements of each individual’s motivation for the Soma activity, Deci first operationally defined intrinsic motivation as the amount of time spent actively engaging the task during each session. Aside from the collection of observational data, the participants were also asked to complete a rating scale intended to measure their interest/enjoyment level in the activity through a self-report. The first session was conducted to establish baseline data for both the amount of the Soma completed and the level of motivation experienced under invariable conditions. For the second session, the participants received one dollar (an external reward) for every Soma that they completed. In the third session of the study, the researcher explained to the participants that they would not be receiving money for the completion of the Soma puzzles. The results provided support for the phenomenon of the over-justification effect. Deci found that students’ intrinsic motivation to perform a task and work toward its completion tends to decrease after an external reward is implemented and then revoked.

The methodology of Deci’s third experiment remained similar, although the setting was changed from a classroom to a laboratory. Also, although the same procedures were used, the external reward given to the experimental group changed from money to verbal praise. Although the results from his previous two studies found a decrease in intrinsic motivation once an external reward has been implemented and removed, the third study found that the level of intrinsic motivation obtained during the baseline data collection session remained consistent when verbal rewards were given and when verbal rewards were removed across sessions. The control group did however express a significant difference in intrinsic motivation where the data showed a decrease in intrinsic motivation for the activity across sessions. These findings encouraged Deci (1971) to advocate that verbal rewards do not seem to have the same effect as tangible rewards, which could be due to the fact that this type of reward is viewed as a type of social reinforcer.

The results obtained by Deci (1971) can be explained by the behaviorist perspective and attribution theory. Attribution theory is often referenced to assist in exploring the rationale for the ways in which individuals interpret causal questions. Attribution theory explores changes in intrinsic motivation through a concept called the “subtraction rule.” Cameron and Pierce (2002)
defined the subtraction rule as an individual’s ability to discount the potential function of a behavior. The subtraction rule explains that the discounting of the function of a behavior may be due to other potential causes that ultimately affect the function of specific behaviors. This was demonstrated in Deci’s (1971) research, when the participants disregarded the primary function of the behavior, which was participating in the Soma during the baseline data collection session. The participants are then affected by other potential causes (external rewards/reinforcers), which in turn changes the function of participating in the Soma (behavior) during sessions two and three.

The behaviorist perspective seeks to explain possible changes in an individual’s intrinsic motivation in a different way. According to Eisenberger and Cameron (1996), the behaviorist perspective views actions as lawful, with predictable outcomes in which successful behaviors that are reinforcing become more frequent, and those behaviors that are not reinforcing decrease in frequency and may result in extinction. The terms reward and reinforcer are often erroneously used interchangeably. Whereas rewards do not always increase the frequency of a behavior, but are thought to be encouraging, a reinforcer always increases the frequency of the occurrence of a certain behavior (Cameron & Pierce, 1994, 2002; Cameron 2001).

Since Deci’s studies in 1971, hundreds of studies have been conducted in which researchers have reported inconsistent findings when attempting to explain the effects of external rewards on individual’s intrinsic motivation. Deci’s study in 1971, as well as Ryan and Deci’s study in 2000 supported the use of external rewards. These studies found that an individual’s intrinsic motivation can increase if rewards for task completion are tangible and unpredictable. Conversely, the initial interest level of an individual for a certain task affects how a reward impacts their intrinsic motivation after receiving the reward (Daniel & Esser, 1980; Loveland & Olley, 1979; McLoyd, 1979). Hitt, Marriot, & Esser (1992) found that immediate, as well as tangible rewards containing high and low value can increase an individual’s intrinsic motivation if a task had previously been rated as a one of low interest.

A verbal reward is a type of external reward that has been shown to increase intrinsic motivation. Across multiple studies, a reliable form of verbal praise in which individuals receive sincere and spontaneous praise for an activity has been found heighten intrinsic motivation (Henderlong & Lepper, 2002). Verbal praise has been defined as effort-based statements, in which learning orientation was developed (Pierce, Cameron, Banko, & Sylvia, 2003). Effort-
based praise has been found to be an effective strategy in increasing intrinsic motivation in different settings ranging from the classroom to athletics, and even in-home activities. Weaver and Watson (2004) expressed that effort-based praise encourages children to develop self-efficacy in which they can review and critique their own work, allowing for them to make improvements, and understanding what hard work might bring them.

Research suggests that effort-based praise aides in developing mastery goals for achievement. Ormrod (2007) describes a mastery goal as an individual’s desire to achieve competency by acquiring additional knowledge or mastering of a novel skill. Students who actively pursue this type of goal often pay attention in class, process information in ways that promote effective long-term memory storage, possess a drive to learn, and learn from their mistakes. Students with mastery goals understand learning by realizing the steps it takes to complete a task, and the processes that need to be completed even when difficult problems arise that might delay the process of completion (Ormrod, 2007). Though setbacks may occur, students with mastery goals are usually motivated to actively solve problems that require developing and understanding different problem solving techniques. Developing mastery goals enables the child to view a task as an opportunity to heighten their competence and acquire new skills (Weaver & Watson, 2004).

Ability-based praise is a type of reinforcer that is employed in an effort to increase motivation for humans and is thought to encourage performance goals rather than mastery goals. Performance goals are driven by individuals’ desire to present themselves as competent in the eyes of others. Mueller and Dweck (1998) conducted a study and found that 85% of parents believe that praising children’s ability (i.e. their intelligence) after performing well on a task is necessary to make them feel that they are smart. It is believed that when attempting to build competency within a child, an internal desire to do well helps encourage the child to want to take part in an activity, ultimately increasing his or her intrinsic motivation. Increasing motivation in achievement can help for developing habits of self-efficacy in a child (Mueller & Dweck, 1998).

People are more likely to engage in certain behaviors when they believe they are capable of executing the behaviors successfully (Bandura, 1982). Self-efficacy is the degree to which a person is convinced of his or her ability to effectively meet the demands of a particular situation (Hockenbury & Hockenbury, 2003). Developing and maintaining a sense of self-efficacy assists individuals in finding ways that they can become competent in certain activities, and perform
those activities successfully. This development helps individuals realize that they are responsible for their own behaviors, in this case, their achievement. Self-efficacy is directly linked with competence, which in itself is a basic human need. If individuals believe that they can successfully perform and achieve a goal, then their sense of self-competence will broaden. It is important for children to experience this success, which is often related to ability-based verbal praise. In receiving this type of praise, children will continue to push toward success in their endeavors, and be motivated to take each necessary step to reach a performance goal (Ormrod, 2007).

Although a great deal of research has supported the use of external rewards, a number of other studies have provided findings that do not encourage the use of external rewards. Specifically, many studies have found that when external rewards are expected, delayed, and/or given contingent upon performance, external rewards have decreased intrinsic motivation once the rewards were removed (Cameron & Pierce, 1994; Deci, Koestner & Ryan, 1999; Hitt, Marriot, & Esser, 1992; Lepper, Greene, & Nisbett, 1973). Negative effects have also been exhibited through use of ability-based verbal praise. The use of ability-based praise to increase intrinsic motivation attributes students’ intelligence as the driving force behind their task performance, while dismissing the notion that hard work is necessary to perform the same task (Mueller & Dweck, 1998). Cameron and Pierce (2002) found that praising a student within a peer setting can actually decrease a student’s intrinsic motivation, because it creates competition in which a performance-goal may be undertaken.

**Giftedness and Motivation**

The motivation of gifted students is of particular interest in this study. The federal definition of gifted and talented, as outlined in No Child Left Behind (NCLB) reads, “when used with respect to students, children, or youth, means students, children, or youth who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services or activities not ordinarily provided by the school in order to fully develop those capabilities” (Title IX, Part A, Section 9101 (22), p. 544). States and districts are not required to use this federal definition; however, many states base their definitions on the federal definition. Federal reports and legislation have assumed that 3-5% of the U.S. school population could be considered to have special gifts or talents (Hallahan, Kauffman, & Pullen, 2009).
The Ohio Department of Education defines the term "gifted" as those students who perform or show potential for performing at remarkably high levels of accomplishment when compared to others of their age, experience, or environment; students may be identified as gifted in one or more of the following categories: Superior Cognitive Ability, Specific Academic Ability, Creative Thinking Ability, and/or Visual and Performing Arts Ability (Refer to sections 3324.01 to 3324.07 of the Ohio Revised Code). Programs for academically gifted and talented students exist in every state and in many school districts, but the number and percentage of students identified as gifted and talented vary from state to state due to differences in state laws and local practices. Although Ohio's school districts are required to identify students as gifted in grades kindergarten through twelfth grade, they are not required to serve those children that have been identified as gifted, unless the child has also been identified as having a disability.

In recent studies, researchers have found that gifted students tend to hold high levels of intrinsic motivation (e.g., Dai, Moon, & Feldhusen, 1998; Gottfried, Cook, Eskeles Gottfried, & Morris, 2005). Dai et al. (1998) explained that the current gifted students within our school systems are those students who are known to be intellectually or academically talented. This notion is exhibited through class wide grade comparisons and standardized cognitive ability testing. In addition to possessing high levels of intellectual and/or academic talents, these students are thought to be motivated to learn (Dai, et al., 1998). However, Gottfried et al. (2005) found that there is a discrepancy between motivation and a student’s intelligence quotient. They referred to this as motivational giftedness rather than being intellectually gifted.

Gottfried et al. (2005) conducted a longitudinal study in which 130 students were followed from infancy through the age of 24. In this study, Gottfried et al. examined an array of different academic issues which included intrinsic motivation towards academic tasks, achievement within the classroom, functioning within the classroom, intellectual performance, and each of the students’ self-concept. These issues were scored using a comprehensive battery of standardized measures. Gottfried et al. (2005) found that there was a legitimate disparity between academic intrinsic motivation and an individual’s intelligence quotient. The study supported that those students who were identified as motivationally gifted, were not the same as students who were considered to be intellectually gifted. Results led Gottfried to propose that students who were considered intellectually gifted were four times less likely to attend a four year college than those who were considered motivationally gifted. These findings have fueled
concern for those students who are considered intellectually gifted and the underlying reasons/causes for their underachievement.

In 2006, Phillips and Lindsay performed a study that sought to identify factors that may have an impact on the motivation of gifted students. There were 15 total participants in this study, each of whom had been identified as gifted and referred to by the researchers as “very able.” Eight participants involved in this study were males whereas seven were females. All participants fell within an age range of 14-15 years. A series of semi-structured interviews were used by Phillips and Lindsay for data collection. These interviews were comprised of an array of open-ended questions and probes. Each participant was interviewed on an individual basis, along with the participant’s parents and teachers for cross-validation of participant. Interviews were held in an effort to gain a better understanding of the influence of the following areas on participants’ motivation: teaching and learning provisions, of support and of social and emotional factors; underpinning the work and effort needed for realization of the students’ high ability and their achievement of personal goals; ensuring that levels of success and achievement were not adversely affected by problems and difficulties; and the parts played by both extrinsic and intrinsic motivation in student behaviors.

The results of Phillips and Lindsay (2006) study found that students sustained their motivation through suitable challenges faced in the classroom and extra-curricular activity participation. The necessity of taking part in extra-curricular activities was a commonality across participants, and motivation in these activities was apparent by respondents indicating that these were favored activities for free time along with participants’ self-reported desire to continue to learn more about those activities. The importance of praise and encouragement from teachers and families was also found to be a highly motivating factor reported by participants. Participants also reported that they enjoyed involvement in some of the activities on their own, without the presence of external rewards. Although the absence of external reinforcers was preferred by participants from time-to-time, it was also evident throughout the interviews that they gain pleasure from the competitive nature of the extra-curricular activities, and the accolades or recognition they receive through participating in those activities.

**Foundational Research for Current Study**

The current research study seeks to extend the extant research by examining the effects of effort- and ability-based praise on a population of gifted students. Although there has been
limited research on this topic, the current study builds upon two recent related studies conducted by Fisher (2009) and Schmidt (2012). In 2009, Fisher sought out to investigate the role that ability- and effort-based praise might play when examining task persistence and task performance among children identified as gifted. Eleven middle school students, identified as gifted by their school district, participated in non-academic activities individually determined to be either low- or high-interest for each participant. In completing the identified activities, either ability-based or effort-based praise was delivered to the student dependent upon testing condition. The effects of each praise-type were measured through exploring each student’s levels of task performance and task persistence in relation to the student’s reported interest level in the non-academic task. Findings revealed that exposure to either praise type did not negatively affect student task persistence or task performance, regardless of the student’s reported interest level in the identified task.

To build upon the efforts of Fisher (2009), Schmidt (2012) further explored the effects of ability-based and effort-based praise on student task performance and task persistence. Schmidt extended the work of Fisher by asking students to complete a tiered-mathematical task (below, at, and above each student’s identified instructional level in mathematics) in a small group setting. In conducting this study, four 3rd grade students identified as gifted/talented in the area of mathematics were exposed to each of the different praise types during experimental trials, as well as to no praise during the control condition trials. Student task performance was measured by calculating the percentage of items answered correctly on the given mathematical task, whereas student task persistence was reported by the examiner through calculating the percentage of time on-task in using the Behavior Observation System, an interval time sampling coding form developed by Jones, Wickstrom, and Friman (1997). The findings of this study, as interpreted by the researcher, suggest that task performance decreases when students are exposed to either ability-based or effort-based praise. Furthermore, Schmidt reported that the results suggest that task persistence may also decrease when students are exposed to ability-based praise. The current study builds upon the work of Schmidt by exploring the effects of both forms of verbal praise on gifted students in a one-to-one setting rather than in a small group. Further, this research project incorporates a self-report questionnaire to explore the effects of both forms of verbal praise on internal factors including levels of attention, interest, and motivation.
Purpose

There are many studies in extant literature investigating the overjustification effect with the use of external rewards. Findings reported by Deci (1971) points to verbal rewards having a differential impact on a student’s motivation when compared to tangible rewards. In 2006, Phillips and Lindsay suggested that encouragement and praise from teachers and families are significant factors when exploring motivation in students. The effect of praise and rewards on student intrinsic motivation continues to be examined, predominantly amongst general education students, as well as students with behavioral or learning disabilities. To date, little research is known to exist in examining the effects of these factors in working with students identified as gifted or talented. In addition, much of the existing research exploring motivational factors in students has been conducted using non-academic tasks and those which did utilize academic tasks, did so at students’ identified instructional levels. Furthermore, when compared to reading, the research in the area mathematics is somewhat limited. Therefore, mathematical computation is a fertile and novel domain for exploring the effects of external rewards on student performance and persistence.

In an effort to bridge these gaps in the existing literature, the current study is being undertaken: (a) to examine possible differences within students identified as gifted in mathematics on task performance when completing a tiered mathematical task (e.g., below, at, and above the student’s instructional level) after receiving either ability-based or effort-based praise; (b) to examine possible differences within students identified as gifted in mathematics on task performance when completing a tiered mathematical task (e.g., below, at, and above the student’s instructional level) after receiving either ability-based or effort-based praise; and (c) to investigate the effects of ability- and effort-based praise on internal factors (attention, interest, and motivation) for students identified as gifted in mathematics. It is hypothesized that student task performance will be greater when provided effort-based praise than when provided ability-based praise on the tiered-mathematical tasks. Furthermore, it is hypothesized that students receiving effort-based praise will be more persistent on a tiered-mathematical task than when they receive ability-based praise on a similar tiered-mathematical task. Lastly, it is hypothesized that students’ motivations to perform the tiered mathematical tasks, (b) level of interest in the tasks, and (c) attention to the tasks, will be rated higher following exposure to effort-based praise than when provided ability-based praise.
Method

Participants

The participants for this study were selected from the gifted and talented population within two socio-economically diverse elementary schools within an urban school district in Ohio. All second grade students identified as gifted in mathematics across the school district (n = 9) were invited to participate in the current study. Direct contact was made with the parents of each of these students to probe interest in having their child participate in this study. Permission was received from the parents of three students to discuss their possible participation, with each student accepting the invitation. Signed parental consent and student assent were obtained from each of the participants prior to the commencement of data collection procedures. The participants included 1 male student (age 8) and 2 female students (ages 7 and 8, respectively). All participants identified ethnically as Caucasian. For the purpose of this study, the following pseudonyms were assigned to the participants: Suzy (7 year old female); Billy (8 year old male); and Anna (8 year old female). Prior to this research study; the examiner had no direct contact with any of the participants in either an individual or group capacity.

Setting

Data collection for this research project took place in two separate medium-sized elementary schools in Ohio. Each student participated in three testing sessions held on consecutive days after regular school hours. All testing sessions, across each of the students, lasted approximately one hour. Testing sessions took place in three separate locations, including an office and two classrooms typically used for small group instruction. Permission to conduct experimental testing sessions in each of the schools was obtained through direct contact with each of the building administrators.

Examiners

The primary examiner, a school psychology graduate student at Miami University, was trained specifically on the protocols required to review each session. The examiner worked with each of the participants in a one-to-one capacity and was required to collect data on the performance of each student. The primary examiner collected and reviewed all data for this study. A second school psychology student, who had also been trained in how to use the BOS, reviewed 33% of all videotaped sessions using the BOS for the purposes of calculating inter-observer agreement.
Materials

A series of AIMSweb® Mathematics Computation (M-COMP) assessments were used to complete a Survey Level Assessment (SLA) to determine the instructional level for each participant in the area of mathematics. An AIMSweb® M-COMP assessment is a curriculum-based measurement (CBM) which evaluates mathematical computation skills through accuracy and fluency on math problems. AIMSweb® M-COMP assessments are timed, eight-minute, open-ended, paper-based measures that can be administered in a whole-group or individual setting. AIMSweb® M-COMP assessments were also used during control and experimental sessions. Before beginning each testing condition, each participant was read aloud the standardized instructions for the given AIMSweb® M-COMP assessments by the examiner. An example of an M-COMP assessment, with further explanation of the assessment and standardized directions can be found at http://www.AIMSweb.com/uploads/AIMSweb%20M-COMP%20Flyer.pdf.

Following the completion of each of the individual M-COMP assessments, each participant was provided a short questionnaire, constructed by the examiner, designed with the intent to measure internal factors including the levels of attention, interest, and motivation for each student after completing each of the tiered-mathematical tasks. The three statements listed on the questionnaire were used to investigate student internal factors with statement one measuring student motivation, statement two measuring interest level, and statement three measuring level of attention. A Likert scale was utilized to obtain answers to general statements about each testing session, with responses ranging from one to five, where an answer of 1 = “strongly disagree” and an answer of 5 = “strongly agree” with the proposed statement. The mean of Likert scale responses was calculated for each level of the independent variable (ability-based and effort-based praise) and was compared to the mean of Likert scale responses for the control condition for each student. See Appendix B to view the internal factors questionnaire.

The Behavior Observation System (BOS) (Jones et al., 1997) was used to calculate each participant’s task persistence by recording the number of intervals each participant was observed as being on-task or off-task using momentary time sampling. Momentary time sampling is an observation technique in which the observer records whether a specific behavior is occurring at an exact designated time. For this current research study, each participant’s on-task/off-task behavior was coded at 15-second intervals for the duration of each testing session. On-task
behavior was defined as anytime a student is actively engaged in the activity or visually attentive to the activity, whereas off-task behavior was defined as any other behavior not related to the task at hand. Multiple observers/examiners were used to assist in documenting inter-observer reliability.

A video camera was used to record each of the individual sessions. This allowed for examiners to review testing sessions to ensure treatment integrity and inter-observer reliability. A MotivAider® (Levinson, 1987) was employed to prompt the examiners to administer the specific praise statements for each experimental condition on a 30-second fixed-interval schedule. A MotivAider® was also used to monitor the eight-minute time limit for each M-COMP assessment. Further information regarding the development, purpose, and uses for the MotivAider® can be found at http://habitchange.com/motivaider.php. Two sufficiently sharpened number two pencils were provided to each participant before each testing session.

**Dependent Variables**

Each participant’s task performance was measured by the percentage of points earned for correct responses given on the AIMSweb® M-COMP assessment during each testing session, relative to the total number of points possible on the given assessment. Task persistence was measured using the Behavioral Observation System (BOS), for which a fixed interval time sampling schedule of 15 seconds was followed for each M-COMP assessment. Persistence behaviors were operationally defined as when a participant was engaged in, either looking at and/or working on, the target activity. This variable was reported as the percentage of intervals the participant was coded as being on-task when compared to the total number of intervals the participant was observed. The internal factors questionnaire (see Appendix B) was used to assess self-reported levels of attention, interest, and motivation for each student following his or her completion of each tiered-mathematical task. The mean of Likert scale responses for each of the three areas assessed by the scale (attention, interest, and motivation) were used as dependent variables.

**Independent Variables**

Ability-based praise and effort-based praise were the independent variables in this study. Participants were given ability-based verbal praise during the ability-based praise condition, and were given verbal effort-based praise during the effort-based praise condition (see Appendix A for the ability-based and effort-based praise statements). Praise statements were delivered during
experimental trials at a fixed-interval of 30 seconds. The timing of praise statement delivery was monitored by using a MotivAider®. For the mathematical tasks completed for the Survey Level Assessment (SLA) and control testing trials, no verbal praise statements were provided.

**Procedures**

Before the experimental conditions were implemented, each student’s instructional level in the area of mathematics was measured through the use of a Survey Level Assessment (SLA). SLA is a process by which students are tested in successive levels of the general education curriculum, beginning with their current expected grade placement, until an instructional level was determined. For this SLA session, each participant was asked to complete three separate AIMSweb® Mathematical Computation (M-COMP) assessments across three different grade levels to identify his or her instructional level. The SLA portion of this study took approximately 45 minutes for each student (eight minutes per grade level assessment with a five minute free-choice period between assessments). Each student’s instructional level was identified using AIMSweb® national norms.

After each of the students’ instructional levels were indentified during the first of three testing sessions, students were asked to complete a series of nine M-COMP assessments over the final two testing sessions, completing five assessments in the second session and four during the final session. Three control (baseline) conditions (M-COMP assessments completed below, at, and above instructional level with no praise given) and six experimental conditions (described below) were utilized across two separate testing sessions. For this study, the six experimental conditions consisted of: (a) an M-COMP assessment below instructional level with effort-based praise, (b) an M-COMP assessment below instructional level with ability-based praise, (c) an M-COMP assessment at instructional level with effort-based praise, (d) an M-COMP assessment at instructional level with ability-based praise, (e) an M-COMP assessment above instructional level with effort-based praise, and (f) an M-COMP assessment above instructional level with ability-based praise. Each participant was exposed to each of the treatment conditions once during the two testing sessions. The sequence in which the assessments were presented to the participants was randomized by the examiner through the use of a random numbers table.

Before beginning each testing session, the lead researcher orally read the standardized instructions for the AIMSweb® M-COMP assessment aloud to the student. Each control and experimental condition lasted approximately 15 minutes (eight minutes to complete the
standardized M-COMP assessment, five minutes for a free choice period, and two minutes to complete the short interest/motivation questionnaire) for which each student’s task performance level was recorded for each activity. Task performance was measured by calculating the percentage of points earned for correct responses given on the M-COMP assessment for each testing condition, relative to the total number of points possible on the given assessment. Students were given the appropriate type of praise, ability-based or effort-based, dependent upon the experimental condition, at 30 second intervals. The participants were afforded eight minutes to complete the given M-Comp assessment for each control and experimental condition. After the eight minutes, the students were asked to complete a brief interest/motivation survey (Appendix B) which took approximately two minutes. Following the completion of the survey, participants were given the option to: continue to work on the given assessment (work completed after the testing session did not receive credit), choose a leisure activity for five minutes (draw, read, etc.), or move on to the next testing condition. Once the five minute free choice period had elapsed, the examiner moved to the next randomized testing condition.

All testing sessions were video-recorded to allow for data collection regarding each student’s task persistence and to calculate inter-observer reliability. Upon completion of all testing sessions across each of the participants, the examiner reviewed the video recordings of each session to record the on-task/off-task behavior (task persistence) of each student using the BOS. Each participant’s on-task/off-task behavior was coded at 15 second intervals. The number of intervals observed for each condition varied depending on the amount of time taken by each participant to complete the M-COMP assessments. After all video recorded sessions were reviewed by the primary researcher; inter-observer reliability was then calculated for 33% of the video recorded sessions by a second school psychology graduate student. Task performance was measured by the percentage of points earned for correct responses given on the M-COMP during each testing session, relative to the total number of points possible on the given assessment.

Research Design

A single-subject design was selected over a group design due to the individualized nature of intrinsic motivation and the potential effects environmental factors may have on an individual’s drive to complete a task. Specifically, an alternating treatments design across conditions was used to examine if the type of praise (i.e. effort- or ability-based praise) provided
during experimental conditions had a differential impact on task performance, task persistence, and/or internal factors. An alternating treatments design is most commonly used to determine the comparative effect of two treatments or variables, such as the effects of ability-based versus the effects of effort-based praise investigated in this study. This type of research design allows a researcher to discern the differential effects for each variable independent of the other in an efficient amount of time. Baseline data were collected through the administration of the control condition (no praise given for assessments below, at, and above participant instructional level). This was done for comparative purposes with the data collected during experimental testing sessions.

**Analysis**

Using the BOS (Behavior Observation System), the examiners reviewed the recordings of the testing sessions independently for on-task versus off-task behaviors. Inter-observer reliability was checked by having the secondary examiner review 33% or 9 of the 27 total testing conditions. Inter-observer reliability was then analyzed by dividing the sum of the total interval agreements by the total number of intervals recorded. Using this procedure, inter-observer reliability was found to be 98%. Treatment fidelity was monitored by the session examiner completing a checklist requiring that each condition statement be said during each session to ensure that the independent variable is correctly implemented to each participant. Treatment fidelity for the independent variable was found to be 100%. Task performance was measured by calculating the percentage of points earned for correct responses given on the M-COMP during each testing condition, relative to the total number of points possible on the given assessment. Responses provided by the participants on the motivation/interest surveys were analyzed by comparing the average item responses across testing conditions, including both praise type and the instructional level of assessments.

Participant data were graphed with individual statistics being calculated (e.g., the percentage of points earned, percentage of time on-task for each condition, and self-reported levels of internal factors) to explore results between subjects. Furthermore, summative statistics were calculated across the three participants (e.g., average percentage of points earned by instructional level, average percentage of time on-task by instructional level, and average ratings on the internal factors questionnaire for attention, interest, and motivation) to explore group findings.
Protection of Human Subjects

This study was proposed to and approved by the Institutional Review Board (IRB) before any data collection took place and continues to be considered confidential. The project was designed to minimize the potential risks to the participants beyond those that may be expected of daily life activities. Permission to complete this research was obtained from a district-level administrator, through direct contact, as the lead researcher was employed by the school district at the time of data collection. Participants, as well as their parent(s) and/or guardian(s) were required to provide signed assent and consent, respectively, prior to participating in this study. Participants were informed both verbally and in writing through the consent/assent forms of their ability to withdraw from this study at any time without penalty. The examiner maintained confidentiality with all participant data, with no data containing identifying information, and each participant was given a pseudonym for data reporting purposes. For the entirety of this research project, participants were only identified through the use of their assigned pseudonym. After completing the third and final testing session, each participant was debriefed and provided access to the data obtained through this study. The identifying information gathered as part of this research project consisted of parental consent and participant assent forms, as well as the video recordings of each testing session. All materials containing identifying information were kept in a locked cabinet in a locked office at Miami University. At the completion of this study, all consent and assent forms have been maintained in a locked cabinet, while all videotapes used to record testing sessions were promptly destroyed following the calculation of inter-observer reliability.

Results

Task Performance

Task performance for each of the individual participants (Suzy, Billy, and Anna) in this study is depicted in Figures 1 through 3, whereas overall task performance between-subjects is depicted in Figure 4. Prior to experimental sessions, a Survey Level Assessment (SLA) was conducted to identify each participant’s instructional level for mathematics using AIMSweb® Mathematics Computation (M-COMP) assessments. The SLA results found that Billy and Suzy were performing at a 4th grade instructional level, whereas Anna was found to be performing at a 3rd grade instructional level; therefore, Billy and Suzy were given 3rd, 4th, and 5th grade level assessments for the tiered-mathematical tasks, whereas Anna was given 2nd, 3rd, and 4th grade
level assessments for the tiered-mathematical tasks. Across each of the participants, some degree of change in task performance when compared to the control condition emerged, when participants received either ability-based or effort-based praise during testing sessions. Overall, two out of three participants exhibited a decrease in task performance when provided ability-based praise statements during the tiered mathematical tasks based on average performance across tasks completed when receiving such praise, whereas the other participant showed an increase in task performance. In addition, two of three participants exhibited an increase in task performance when provided effort-based praise statements during the tiered mathematical tasks based on average performance across tasks completed when receiving such praise, but the other participant showed a decrease in task performance.

Suzy’s overall average task performance, as seen in Figure 1, was found to increase with exposure to each of the independent variables (ability-based praise = +5.03%, effort-based praise = +4.03%). When compared to the control condition for the below-instructional level task, Suzy’s task performance was also found to increase with exposure to each of the independent variables (ability-based praise = +7.0%, effort-based praise = +10.0%). In comparison to the control condition for the at-instructional level task, Suzy’s task performance was found to increase with exposure to ability-based praise (+12.0%), but decreased when exposed to effort-based praise (-7.0%). When compared to the control condition for the above-instructional level task, Suzy’s task performance was found to decrease with exposure to ability-based praise (-4.0%), but increased when exposed to effort-based praise (+9.0%).

Billy’s overall average task performance, as seen in Figure 2, was found to decrease when given ability-based praise statements in comparison to the overall control condition (-10.3%). Conversely, Billy’s overall task performance was found to increase when given effort-based praise statements in comparison to the overall control condition (+4.7%). In comparison to the control condition for the below-instructional level task, Billy’s task performance was found to decrease with exposure to each of the independent variables (ability-based praise = +8.0%, effort-based praise = -1.0%). When compared to the control condition for the at-instructional level task, Billy’s task performance was found to decrease with exposure to each of the independent variables (ability-based praise = -31.0%, effort-based praise = -16.0%). In comparison to the control condition for the above-instructional level task, Billy’s task
performance remained the same with exposure to ability-based praise (task performance = 8.0%), but increased when exposed to effort-based praise (+4.0%).

Anna’s overall average task performance, as seen in Figure 3, was found to decrease with exposure to each of the independent variables (ability-based praise = -4.2%, effort-based praise = -4.9%). When compared to the control condition for the below-instructional level task, Anna’s task performance was found to decrease with exposure to each of the independent variables (ability-based praise = -2.0%, effort-based praise = -10.0%). In comparison to the control condition for the at-instructional level task, Anna’s task performance was found to decrease with exposure to each of the independent variables (ability-based praise = -25.0%, effort-based praise = -15.0%). Anna’s task performance on the above-instructional level task was found to increase with exposure to each of the independent variables (ability-based praise = +17.0%, effort-based praise = +15.0%) when compared to the control condition.

**Task Persistence**

Task persistence for each of the individual participants (Suzy, Billy, and Anna) in this study is depicted in Figures 5 through 7, whereas overall task persistence between-subjects is depicted in Figure 8. Across each of the participants, some degree of change in the level of task persistence when compared to the control condition was found in both the ability-based and effort-based praise conditions. Overall, two of three participants exhibited an increase in task persistence when provided ability-based praise statements during the tiered mathematical tasks based on average persistence across tasks completed when receiving such praise. In addition, two of three participants exhibited an increase in task persistence when provided effort-based praise statements during the tiered mathematical tasks based on average persistence across tasks completed when receiving such praise.

Suzy’s overall average task persistence, as seen in Figure 5, was found to increase when given ability-based praise statements in comparison to the overall control condition (+2.8%). Conversely, Suzy’s overall task persistence was found to decrease when given effort-based praise statements in comparison to the overall control condition (-3.6%). In comparison to the control condition for the below-instructional level task, Suzy’s task persistence was found to decrease with exposure to each of the independent variables (ability-based praise = -4.0%, effort-based praise = -3.0%). When compared to the control condition for the at-instructional level task, Suzy’s task persistence was found to decrease with exposure to each of the independent
variables (ability-based praise = -6.0%, effort-based praise = -3.0%). Suzy’s task persistence on the above-instructional level task increased compared to the control condition when exposed to either of the independent variables (ability-based praise = +13.0%, effort-based praise = +3.0%).

Billy’s overall average task persistence, as seen in Figure 6, was found to increase when given ability-based praise statements in comparison to the overall control condition (+9.8%). In addition, Billy’s overall task persistence was found to increase slightly when given effort-based praise statements in comparison to the overall control condition (+0.8%). When compared to the control condition for the below-instructional level task, Billy’s task persistence was found to increase with exposure to ability-based praise (+9.0%), but decreased when exposed to effort-based praise (-5.0%). In comparison to the control condition for the at-instructional level task, Billy’s task persistence was found to increase with exposure to each of the independent variables (ability-based praise = +9.0%, effort-based praise = +16.0%). When compared to the control condition for the above-instructional level task, Billy’s task persistence was found to increase with exposure to ability-based praise (+12.0%), but decreased when exposed to effort-based praise (-9.0%).

Anna’s overall average task persistence, as seen in Figure 7, was found to decrease when given ability-based praise statements in comparison to the overall control condition (-1.5%). Conversely, Anna’s overall task persistence was found to increase slightly when given effort-based praise statements when compared to the overall control condition (+0.9%). In comparison to the control condition for the below-instructional level task, Anna’s task persistence was found to increase with exposure to each of the independent variables (ability-based praise = +4.0%, effort-based praise = +4.0%). When compared to the control condition for the at-instructional level task, Anna’s task persistence was found to decrease with exposure to ability-based praise (-4.0%), but remained the same with exposure to effort-based praise (task persistence = 97%). Anna’s task persistence on the above-instructional level task decreased when exposed to ability-based praise (-4.0%), but remained the same with exposure to effort-based praise (task persistence = 97%) when compared to the control condition.

**Internal Factors**

Internal factors – including student-reported levels of attention, interest, and motivation in completing each of the tiered-mathematical tasks – are depicted for each of the individual participants (Suzy, Billy, and Anna) in Figures 9 through 11, whereas overall reported internal
factors between-subjects is depicted in Figure 12. Across participants, some degree of change was observed in each student’s reported levels of attention, interest, and motivation after receiving either ability-based or effort-based praise when compared to student’s reported levels after exposure to the control condition. The lone exception to this was Suzy’s reported level of motivation in completing the tiered-mathematical tasks, as these ratings were unchanged.

Overall, two out of three participants reported an increase in motivation to complete the tiered-mathematical tasks when provided either ability- or effort-based praise statements when compared to the control condition. Mixed results were found when interpreting the reported interest levels for each of the students when completing the tiered-mathematical tasks. One student reported increased interest in the math activities when exposed to either ability- or effort-based praise, whereas another student reported increased interest when provided ability-based praise, but decreased interest when receiving effort-based praise, yet the last student reported heightened interest levels when exposed to effort-based praise but decreased interest levels with ability-based praise. Attention levels were found to increase for each student when exposed to either praise type when compared to the control condition. Further, two out of three students reported higher levels of attention when given ability-based praise than when provided effort-based praise.

Suzy’s overall mean rating for the internal factors measured as part of this study, as seen in Figure 9, was found to increase with exposure to ability-based praise (+0.33) in comparison to the control condition, but the overall mean for effort-based praise was reported at the same level as the control condition (no change). Suzy’s reported motivation level remained the same across all trials with no effect found when comparing either praise type to the control condition. When compared to the control condition, Suzy’s reported interest level in the tiered-mathematical tasks was found to increase when provided ability-based praise (+0.33), but decreased when given effort-based praise (-0.33). Suzy’s reported attention level was found to increase when exposed to each of the praise types (ability-based = +0.67, effort-based = +0.33) when compared to the control condition.

Billy’s overall mean rating for the internal factors measured as part of this study, as seen in Figure 10, increased with exposure to either ability-based praise (+0.78) or effort-based praise (+0.89) in comparison to the control condition. Billy’s reported motivation level was found to increase when provided either ability-based praise (+0.67) or effort-based praise (+0.33). In
comparison to the control condition, Billy’s reported interest level in the tiered-mathematical
tasks was found to increase when provided either ability-based praise (+0.67) or effort-based
praise (+1.67). When compared to the control condition, Billy’s reported attention level was
found to increase when exposed to each of the praise types (ability-based = +1.00, effort-based =
+0.67).

Anna’s overall mean rating for the internal factors measured as part of this study, as seen
in Figure 11, was found to increase with exposure to effort-based praise (+0.88) in comparison to
the control condition, but the overall mean for ability-based praise was reported at the same level
as the control condition (no change). Anna’s reported motivation level was found to increase
when provided either ability-based praise (+0.33) or effort-based praise (+1.67). In comparison
to the control condition, Anna’s reported interest level in the tiered-mathematical tasks was
found to decrease when provided ability-based praise (-0.67), but increased when given effort-
based praise (+0.67). When compared to the control condition, Anna’s reported attention level
was found to increase when exposed to each of the praise types (ability-based = +0.67, effort-
based = +0.67).

**Discussion**

Past research exploring the effects of verbal praise have found that the delivery of ability-
based praise may actually hinder student educational performance, whereas effort-based praise
has not been found to show these similar adverse effects. However, the extant research has been
limited by concentrating primarily on the general education population. The current study was
undertaken to not only build upon the existing research base by investigating the effects of verbal
praise on student performance, persistence, and internal factors; but also in an attempt to provide
educators with evidence-based methods of increasing intrinsic motivation within their gifted
populations. More specifically, this research study was conducted: (a) to examine possible
differences within students identified as gifted in mathematics on task performance when
completing a tiered mathematical task (e.g., below, at, and above the student’s instructional
level) after receiving either ability-based or effort-based praise; (b) to examine possible
differences within students identified as gifted in mathematics on task performance when
completing a tiered mathematical task (e.g., below, at, and above the student’s instructional
level) after receiving either ability-based or effort-based praise; and (c) to investigate the effects
of ability- and effort-based praise on internal factors (attention, interest, and motivation) for students identified as gifted in mathematics.

For each participant (Suzy, Billy, & Anna) in this study, results revealed some degree of change in the level of task performance when participants received either ability-based or effort-based praise during testing sessions, as compared to the control condition. It was hypothesized that student task performance would be greater when provided with effort-based praise than when provided with ability-based praise on the tiered-mathematical tasks. The resultant data for students’ performance levels on the above instructional level mathematical tasks were found to be lower than their performance levels on mathematical tasks administered below and at their identified instructional levels. These lower performance levels may be due to a lack of exposure to the types of mathematical operations required when completing the above instructional level mathematical tasks. Based on the overall average task performance between-subjects, overall task performance was found to decrease with exposure to either ability-based praise or effort-base praise, when compared to the control condition. These findings support the previously stated hypothesis in that student task performance was found to be greater when participants were exposed to effort-based praise than when provided ability-based praise on the tiered-mathematical tasks. However, consistent with findings reported by Schmidt (2013), both types of verbal praise (ability- and effort-based) had an adverse affect on student task performance.

In completing mathematical tasks at and below their identified instructional levels, the participants’ overall average task performance was also found to decrease with exposure to each praise type when compared to the control condition. However, when completing mathematical tasks above their identified instructional levels, the participants’ overall average task performance was found to increase with exposure to each praise type when compared to the control condition. Although the overall findings for task performance support the stated hypothesis, as effort-based praise was found to have a more positive effect than ability-based praise, both praise types were found to have a detrimental effect on participant task performance when completing tasks at and below the participants’ identified instructional levels. These results provide tentative support for the use of effort-based praise in above-level work in the current sample. Due to marked differences in student performance between participants, however, these statistics may not be the most accurate representation of the effects of verbal praise on student performance and should be interpreted with caution. The variability in the
results found between subjects for task performance reveal the possibility that internal factors and prior experiences may most significantly impact a student’s perception of verbal praise and the influence praise has on his or her task performance at any given time.

Across each of the participants (Suzy, Billy, & Anna), results revealed some degree of change in the level of each student’s task persistence in comparison to the control condition, when participants received either ability-based or effort-based praise during testing sessions. It was hypothesized that students receiving effort-based praise would be more persistent on a tiered-mathematical task than when receiving ability-based praise on a similar tiered-mathematical task. Based on the overall average task persistence between-subjects, participants’ task performance was found to increase with exposure to either ability-based praise or effort-base praise, when compared to the control condition. These findings were not found to support the previously stated hypothesis; however, each praise type was found to positively affect student task persistence. The resultant increase in participants’ task persistence with exposure to ability-based praise found in this study, is inconsistent with the findings of Schmidt (2013) that ability-based praise may have an adverse affect on student task persistence.

In completing mathematical tasks below their identified instructional levels, the participants’ overall average task persistence was found to decrease with exposure to effort-based praise, but increased with exposure to ability-based praise in comparison to the control condition. After completing mathematical tasks at their identified instructional levels, the participants’ overall average task persistence was found to increase with exposure to effort-based praise, but decreased with exposure to ability-based praise in comparison to the control condition. When completing mathematical tasks above their identified instructional levels, the participants’ overall average task persistence was found to decrease with exposure to effort-based praise, but increased with exposure to ability-based praise in comparison to the control condition.

The increase in overall task persistence between subjects across each of the praise types would appear to support the findings of Henderlong & Lepper (2002) which state that providing a consistent form of sincere and spontaneous verbal praise increases intrinsic motivation; however, these findings are inconsistent with that of Deci, Koestner, and Ryan (1999) which suggested that effort-based praise increases task-persistence in females, but decreases task persistence in males. Despite the small sample size utilized in this study, effort-based praise
resulted in decreased task persistence for one female participant (Suzy), but increased task persistence for the lone male participant. It appeared to the examiner that by-in-large each of the praise types presented to the participants acted as a form of redirection back to the task. It should be noted that each of the praise types seemed to negatively affect Billy’s task persistence as it often invoked a response from him and appeared to take his attention away from the tasks; however, his recorded on-task behavior did not reflect these concerns noted by the primary researcher.

Internal factors, including student reported levels of attention, interest, and motivation in completing each of the tiered-mathematical tasks were measured as part of this study. Across each of the participants (Suzy, Billy, & Anna), some degree of change in each student’s reported levels of attention, interest, and motivation was observed compared to the control condition, when participants received either ability-based or effort-based praise during testing sessions. The lone exception to this finding was Suzy’s reported level of motivation in completing the tiered-mathematical tasks, as these ratings were unchanged. It was hypothesized by the primary researcher that students’ overall; (a) motivation to perform the tiered mathematical tasks, (b) level of interest in the tasks, and (c) attention to the tasks, would be rated higher following exposure to effort-based praise than when provided ability-based praise. Based on the overall average of participants’ self-reported levels of internal factors during the effort-based praise condition, participants reported increased levels for internal factors when compared to the control condition. Based on the overall average of participants’ self-reported levels of internal factors during the ability-based praise condition, participants reported increased levels for internal factors when compared to the control condition. These findings support the previously stated hypothesis in that participants’ overall average self-reported levels of internal factors were found to be rated higher following exposure to effort-based praise than when participants were given ability-based praise.

Participants’ overall average self-reported levels of motivation increased with exposure to either ability-based praise or effort-based praise when compared to the control condition. Extant research hints that external rewards which are expected or provided on a set time schedule, may actually decrease intrinsic motivation once removed (Cameron & Pierce, 1994; Deci, Koestner, & Ryan, 1999; Hitt, Marriot, & Esser, 1992; Lepper, Greene, & Nisbett, 1973). Though the results of the current study are difficult to generalize due to the narrow sample, the findings
related to the increase in participant-reported levels of motivation following exposure to both verbal praise types are inconsistent with those reported previously. Additionally, the overjustification effect has been explained by the notion that external rewards might decrease and negatively affect an individual’s intrinsic motivation (Cameron & Pierce, 1994, 2002; DeCharms, 1968; Deci, Koestner, & Ryan, 1999; Eisenberger, Pierce & Cameron, 1999; Greene & Lepper, 1978; Tang & Hall, 1995), meaning that when an individual first participates in an activity, he or she is initially intrinsically motivated to do so. The results of the current study may point to verbal praise being an external non-tangible reward that actually increases motivation after an individual begins participating in an activity.

Participants’ overall average self-reported levels of interest were also reported to increase with exposure to either ability-based praise or effort-based praise when compared to the control condition. These findings suggest that student interest levels increase when students are commended on the effort given in completing a task, as opposed to their ability to complete a task. Participants’ overall average self-reported levels of attention were again reported to increase with exposure to either ability-based praise or effort-based praise when compared to the control condition. Again, it seemed as though the experimental trials involving praise statements allowed for scheduled redirection back to the task at 30-second intervals for each of the participants; therefore, possibly inadvertently increasing student attention to the task.

Though the reporting of the effects of ability-based versus effort-based praise on task performance, task persistence, and internal factors in students identified as gifted in mathematics through a between-subjects analysis is useful in attempting to generalize data to an identified population, it is also important to explore individual differences within participants, as each student maintains unique characteristics which may impact their own outcomes as they relate to the variables explored through this research study. Based on the data collected across all testing conditions, Suzy was found to respond best to ability-based praise. Suzy’s overall average levels of task performance, task persistence, and self-reported internal factors were found to be highest when provided ability-based praise during the tiered-mathematical tasks. These results are inconsistent with the findings reported by Deci et al. (1999) which suggested that female students respond negatively to ability-based praise, but positively to effort-based praise. The findings of Deci et al. (1999) also suggested that female students react more positively to effort-based verbal praise, whereas male students react more negatively to effort-based praise, as it
relates to task performance. The current findings do not support either of these suggestions put forth by Deci et al. Overall, Suzy and Anna were each found to react more positively to ability-based praise than to effort-based praise. Conversely, Billy was found to respond more positively to effort-based praise than his female counterparts, but less positively to ability-based praise. Suzy’s overall average task persistence was found to decrease with exposure to effort-based praise, whereas Billy’s overall average task persistence was found to increase with exposure to effort-based praise, when compared to the control condition. These results were found to be inconsistent with those reported by Deci, Koestner, and Ryan (1999) which suggested that effort-based praise will increase task persistence in females, but decreases task persistence in males.

**Research Limitations**

The present study is not without limitations. First, it is not possible to generalize the findings of this study to all gifted students, due to the minimal sample size explored. In addition, the participants in this study were all students within one school district and each identified ethnically as Caucasian. It is not possible to know whether the results of this study would generalize to more culturally, racially, and socioeconomically diverse populations. For each of these reasons, the external validity for the reported results of this study could be called into question. Another limitation to the current study may be the validity or appropriateness of the praise statements provided to the students during testing sessions. Some praise statements provided to the participants during testing sessions were untimely in their presentation due to the randomization of the order in which they were given and the way in which they were phrased. These factors may have caused the praise statements to be perceived by the participants as awkward or insincere in their presentation (i.e., Awesome job! You are almost finished; you must be a hard worker!). Praise statements should also be perceived as spontaneous; however, being delivered at a fixed interval of 30 seconds, praise statements may have not been received by the participants in this way. The praise statements also appeared to negatively affect student attention at times, as task engagement was broken due to the distracting nature of the examiner talking to the participants.

Still another limitation to this research was the relationship between the researcher and the participants, as the lack of an established relationship with the participants may have negatively impacted the effectiveness of the praise statements. For instance, praise statements provided to the participants by a familiar teacher or parent may carry more influence than praise
given from a relatively unknown individual due to the student’s desire to please or impress prominent and/or familiar adult figures in their life. An additional limitation to this research may be the schedule for testing sessions. Testing sessions for this study included exposure to multiple testing conditions consecutively for each participant, which may have affected student performance, persistence, and internal factors due to boredom, mental fatigue, etc. The assessment tools utilized for the current study are not without limitations. The timed AIMSweb® M-COMP assessments used for each of the tiered-mathematical tasks were not designed with the intent to measure overall mathematical ability. The M-COMP assessment is intended to measure mathematical computation, accuracy, and fluency; however, an individual’s mathematical problem solving skills are not assessed by this tool. A student’s problem solving ability is one which should not be discounted when considering giftedness in mathematics; in addition, the assessments used to identify students as gifted in mathematics likely rely heavily on mathematical problem solving. Consequently, the M-COMP assessments used for this study may or may not be a quality indicator of a student’s mathematical ability level or giftedness in mathematics. Finally, the internal factors questionnaire is not without limitations. This self-report questionnaire was designed by the primary researcher and has not been evaluated for assessment reliability or validity. Further, this tool only assesses internal factors at a surface level and relies entirely on student self-report while lacking objectivity.

Lastly, and perhaps most significantly, the measured effects reported for this study were examined simply by noting whether participants’ performance, persistence, or reported internal factors improved or not in comparison to the results found during the control conditions. Statistical significance was not accounted for as part of this study, due to the single-subject design, and it remains possible that the reported improvements or declines in the measured levels of performance, persistence, and/or reported internal factors for participants’ occurred due to chance or measurement error.

**Implications for Future Research**

Furthering the research on student motivational techniques and exploring new methods of increasing student levels of attention/engagement are essential components to boosting educational performance and promoting self-efficacy in all students. Despite the efforts of the primary researcher to investigate the differences which may exist among students identified as gifted or talented in the area mathematics when investigating their task performance, task
persistence, and internal factors (attention, interest, and motivation) on a tiered-mathematical task (e.g., Below, At, and Above each student’s instructional level) after receiving either ability- or effort-based praise; the results obtained through this research lack external validity. The current research may be considered a pilot study, yet the implications of the results are encouraging when prognosticating new directions for the continuation of research in this area. Future research should continue to explore the effect of praise statements in working with gifted students as it relates to task difficulty. It is also recommended that praise statements be simplified and a more variable time schedule be utilized in the delivery of praise statements to avoid the limitations previously noted.

Future studies investigating similar principles to those outlined in this study should look at increasing the sample size and including a more diverse population. The exploration of possible cultural or socio-economic differences, while furthering the research of gender differences in motivation, may help educators in maximizing students’ intellectual potential. Gender stereotypes have long existed, often undermining and negatively distorting the abilities of those populations perceived to be weaker in the area of mathematics (e.g. girls, African American students, etc.). Stereotype threat posits that when individuals are primed about a fixed characteristic of their own that is negatively stereotyped in relation to a task (i.e., girls cannot do math), and subsequent performance on the task is adversely affected (Wei, 2008). Investigating both environmental and internal factors which may allow stereotypes to threaten the mathematical performance of specific populations is an area worthy of further exploration. Another possibility for future research would be to shed a brighter light on the underrepresentation of minority students in gifted/talented identification. A better understanding of the motivation for these students and possible deterrents from pursuing gifted or talented identification/programming may assist in transforming such processes and diminish the negative cultural stigmata associated with gifted identification.

Future research of motivation in gifted students should also branch out to investigate the effects of ability- and effort-based praise on students identified as gifted in other academic subjects (i.e., reading, writing, etc.). A similar methodology could be utilized in measuring these academic areas by incorporating subject dependent tasks such as writing prompts for written expression. With students being identified as gifted/talented in a variety of areas it is important to explore the methods which motivate these students as well. Future research could also use
multiple academic tasks in a single subject area to also investigate the role that task interest plays in student motivation. Finally, to further investigate the effects of verbal praise statements on task performance and task persistence, one could look to involve some type of standardized continuous performance testing (CPT). A CPT is a neuropsychological test intended to measure a person's sustained and selective attention and impulsivity (Dougherty, Marsh, & Mathias, 2002). Conducting research with this type of assessment may benefit educational professionals as it relates to motivating students with Attention-Deficit/Hyperactivity Disorder.

In summarizing, it is always important to remember that each individual student is indeed unique, owning their own set of characteristics.

Although future research may lead to findings which may be more easily generalized across the gifted population, it is pivotal to always put the student first. Within an elementary setting where students are not as stratified in terms of ability level, as compared to middle and high school settings, it is vital for educators to account for each student’s unique set of characteristics to avoid the fallacies that may be found in the deployment of a one-size-fits-all model for motivating students. Maintaining creativity in the classroom and utilizing a child-focused approach can only help when investigating how to motivate even the most difficult or apathetic of students.
REFERENCES


Figure 1. Task Performance for Suzy. Task performance was measured by calculating the percentage of points the student earned out of the total number of points possible on each of the tiered-mathematical tasks.
Figure 2. Task Performance for Billy. Task performance was measured by calculating the percentage of points the student earned out of the total number of points possible on each of the tiered-mathematical tasks.
Figure 3. Task Performance for Anna. Task performance was measured by calculating the percentage of points the student earned out of the total number of points possible on each of the tiered-mathematical tasks.
Figure 4. Task Performance Between-Subjects. Task performance between-subjects was measured by calculating the average percentage of points earned out of the total number of points possible across all participants for each independent testing condition.
Figure 5. Task Persistence for Suzy. Task persistence was measured by calculating the number of intervals the student was coded to be on-task divided by total number of intervals observed during each testing condition.
Figure 6. Task Persistence for Billy. Task persistence was measured by calculating the number of intervals the student was coded to be on-task divided by total number of intervals observed during each testing condition.
Figure 7. Task Persistence for Anna. Task persistence was measured by calculating the number of intervals the student was coded to be on-task divided by total number of intervals observed during each testing condition.
Figure 8. Task Persistence Between-Subjects. Task persistence between-subjects was measured by calculating the average percentage of time coded as on-task across all participants for each independent testing condition.
Suzy's Internal Factors Questionnaire Results

<table>
<thead>
<tr>
<th>Internal Factors Measured</th>
<th>Ability-Based</th>
<th>Control</th>
<th>Effort-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Interest</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Attention</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 9. Internal Factors for Suzy. Internal factors including student levels of motivation, interest, and attention were measured by calculating the mean Likert scale responses provided by each student on items 1-3 of the internal factors questionnaire following each testing condition.
<table>
<thead>
<tr>
<th>Internal Factors Measured</th>
<th>Ability-Based</th>
<th>Control</th>
<th>Effort-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>4.5</td>
<td>4.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Interest</td>
<td>3.8</td>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Attention</td>
<td>4.3</td>
<td>3.7</td>
<td>4.1</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>4.1</td>
<td>3.7</td>
<td>4.0</td>
</tr>
</tbody>
</table>

**Figure 10. Internal Factors for Billy.** Internal factors including student levels of motivation, interest, and attention were measured by calculating the mean Likert scale responses provided by each student on items 1-3 of the internal factors questionnaire following each testing condition.
Figure 11. Internal Factors for Anna. Internal factors including student levels of motivation, interest, and attention were measured by calculating the mean Likert scale responses provided by each student on items 1-3 of the internal factors questionnaire following each testing condition.
Figure 12. Internal Factors Between-Subjects. Internal factors between-subjects were measured by calculating the average Likert scale responses provided across participants on items 1-3 of the internal factors questionnaire for each independent testing condition.
Appendix A- Praise Statements to be Used during Testing Sessions

Effort-Based Praise Statements

1. Good work! I can tell you are trying your best.
2. Excellent Job! You must be working hard on this activity.
3. Nice work! You are really trying to figure out those problems.
4. Awesome job! You are almost there, you are a hard worker.
5. Great job! Your hard work is really paying off.
6. I like your effort. You are really working hard to figure out the answers.
7. Good work! You are really working hard to solve those problems.
8. Excellent job! I am proud of your hard work.
9. Awesome job! You are really working hard on the activity.
10. Good work! You are putting a lot of effort into finishing that problem.
11. Good work! I can tell you are trying your best.
12. Excellent Job! You must have worked hard on this activity.
13. Nice work! You are really trying to find those words.
14. Awesome job! You are almost finished; you must be a hard worker.
15. Great job! Your hard work is really paying off.
16. I like your effort. You are really trying to figure out that problem.
17. Good work! You are putting a lot of effort into solving the problems.
18. Excellent job! I am proud of your hard work.
19. Awesome job! I can tell that you are trying hard on this activity.
20. Good work! You are putting a lot of effort into finishing that problem.

Ability-Based Praise Statements

1. Nice Job! You’re a good problem solver.
2. You are doing great! You have talent.
3. Excellent job! You’re a natural.
4. Wow! You must be really talented.
5. Good work! You’ve gotten really far. You must be a natural.
6. Excellent! You are halfway there; you must be a natural at solving problems.
7. Nice Job! You must be smart to have solved all of those problems.
8. Nice job on that problem, you are really good at this.
9. Great job! You are a talented problem solver.
10. You are doing great! You are a natural at solving problems.
12. You are doing great! You have talent.
14. Wow! You must be really talented.
15. Good work! You’ve gotten really far. You must be a natural.
16. Excellent! You are almost finished; you must be a natural problem solver.
17. Nice Job! You must be smart to have solved all of those problems.
18. Nice job on that problem, you are really good at this.
19. Great job! You are a talented problem solver.
20. You are doing great! You are a natural at figuring out problems
Appendix B- Post-Testing Session Internal Factors Questionnaire

Post-Math Activity Session Questionnaire

Student Identification Number _________________
Math Activity Session Number _________________
Date of Math Activity Session _________________

Directions: Now that you have finished the previous math activity, please read each of the following questions carefully and answer each as accurately as possible. Your answers will be used for reporting purposes only and will in no way effect your future participation in this study, nor will it have any impact on your school grades. Again, your participation is entirely up to you and all answers given will remain confidential. Thank you for all of your time and hard work!!!

For each question, please enter the number that describes how you felt while taking part in the math activity. Remember, there is no right or wrong answer.

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

1.) When working on the math problems, I felt motivated to do my best work. _______

2.) This math activity was very interesting to me. _______

3.) I was able to keep my attention focused on the math activity during the session. _______