THE ROLE OF MODEL PERSUASIVENESS AND PERCEIVED SIMILARITY IN A SELF-EFFICACY INTERVENTION

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ABSTRACT

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This study explores the impact of model persuasiveness and perceived similarity on a self-efficacy intervention in a graduate statistics course. I hypothesized that the extraversion of the presenter (i.e., model) would influence persuasiveness in a vicarious self-efficacy intervention. I also hypothesized that a student's perceived similarity to the model can influence the intervention's effectiveness. Participants ($N = 46$) completed a self-efficacy scale and a personality index at the beginning of a research methods and statistics course. Two weeks later, participants were randomly split into two groups and each group watched a self-efficacy intervention video. One group watched a video containing a model delivering the self-efficacy intervention in an extraverted way, and the other group watched a video of the self-efficacy intervention with a non-extraverted model. After the video students reported levels of self-efficacy, their perceptions of similarity to model, and model persuasiveness. Analysis of pre- and post-intervention

self-efficacy indicated no significant gains in self-efficacy in relation to perceived similarity to the model nor any significant effect of model persuasiveness. Further analysis revealed significant gains in self-efficacy for students who were high on extraversion and for students who were low on agreeableness. Implications of the results and unexpected findings are discussed regarding their potential to help instructors determine the optimal use of self-efficacy intervention.

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Introduction

Self-efficacy is "an individual's judgements of his or her capabilities to perform given actions (Schunk, 1991, p. 207). Self-efficacy beliefs affect how effectively students apply what they know (Bandura, 1997, p. 216). Low self-efficacy often decreases student performance (Bong & Skaalvik, 2003). Students with higher levels of self-efficacy manage their time better and have greater success at problem solving than students with lower self-efficacy of the same cognitive ability (Bouffard-Bouchard, Parent, & Larivée, 1991).

Instructors are faced with the task of presenting and explaining course material in a comprehensible way while maintaining their students' sense of self-efficacy to achieve the highest levels of learning. This environment leaves the instructor with a challenge: how does one increase students' efficacy? This thesis tests an intervention that should increase self-efficacy in students in a graduate level statistics course.

Literature Review

Given that academic self-concept shares common traits and is closely related to self-efficacy, I will briefly explain their differences. Academic self-concept is defined as a composite of cognitive descriptions of one's attributes and the evaluation of those attributes in comparison to others (Schunk, 1991). Bandura (1997) explained self-efficacy as, "beliefs in one's capabilities to organize and execute the courses of action required to produce attainments" (p. 3). Choi (2005) described the differences between academic self-concept and self-efficacy in that self-concept is multidimensional, encompassing cognitive descriptions of one's abilities and an affective evaluation of those attributes in comparison with others, whereas self-efficacy is unidimensional and

primarily cognitive, consisting of an appraisal of a prospective task based on past performances.

Self-efficacy Sources

According to Bandura (1997), there are four sources of efficacy expectations, each with their own method of changing behavior:

> Enactive mastery experiences that serve as indicators of capability; vicarious experiences that alter efficacy beliefs through transmission of competencies and comparison with the attainments of others; verbal persuasion and allied types of social influences that one possesses certain capabilities; and physiological and effective states from which people partly judge their capableness, strength, and vulnerability to dysfunction (p. 79).

Developing self-efficacy from positive past experiences creates self-regulatory and cognitive skills necessary to accomplish goals. Resilient self-efficacy is created when recalling the persistence and effort necessary to successfully complete a task despite setbacks. The mastery experience efficacy source is not just gauged by the contemplation of feedback from past positive experiences. From an instructional point of view, just giving students the tools and rule structures needed to apply effort and produce a desirable outcome will not improve their perceived sense of capability. They must be assured that they are exercising better control over academic tasks previously mastered and conveying that success feedback as evidence that they were applying their past experiences well (Bandura, 1997, p. 81). Slavich and Zimbardo (2012) expand on this idea by framing the instructor as an inspirational motivator. The instructor models optimism and shared beliefs of success, encouraging the students to frame challenging

situations as opportunities to practice new skills acquired through careful attention and belief in their abilities.

Vicarious experiences are sources of efficacy in a sense of social learning and modeling observed behavior. The level of mastery the model demonstrates and the level of effort exerted by the model to attain their results has direct effect on the amount of influence it has on the observer's efficacy beliefs. Students observing a model similar to them succeed can provide a sense that they too have the abilities to succeed in a task. The more similar the observer assumes their competence to be, the more persuasive are the model's success and failures (Bandura, 1997, p. 87). The duration of effort exerted by the model can also make a difference to a vicarious learning opportunity. Zimmerman and Ringle (1981) noted that when a model persisted in trying to solve a wire puzzle in front of students, the students would try for longer periods of time to try and solve a similar wire puzzle. An interesting note is that the students' persistence in their task was regardless of vicarious success or failure of the model, but success of the model was additive to student motivation.

Verbal persuasion from any given source alone is not enough to boost self-efficacy, but it can encourage greater effort if it is used to positively frame and organize task competency that the person already possesses. Persuasion can also mitigate the effect of failed previous experiences if used to highlight personal strategies and coping mechanisms that previously worked but may not have worked in that particular instance (Bandura, 1997, p. 101). Wise and Trunnell (2001) studied the effect of combining efficacy sources including verbal persuasion to influence self-efficacy. Whenever a verbal message was combined with a model demonstration of a physical activity,

resulting self-efficacy to complete the same task was higher than the demonstration alone. This combination provides evidence of verbal persuasion's scaffolding effect on other sources of self-efficacy.

Physiological states often affect efficacy in compounding ways. Because people will read their signs of stress in a particular task as vulnerability to failure, they will fabricate thoughts of inefficaciousness, which will in turn further degrade not only their sense of efficacy but their actual performance (Bandura, 1997, p. 106). This particular self-efficacy source will not be a large contributing factor in this study as the classroom environment does not pose a substantial personal threat and the topic of the intervention is academic in nature.

Measuring Self-Efficacy

Self-efficacy tends to be a better predictor of performance when intervention is done within a short time frame of the task. Lane and Lane (2001) tested the effects of self-efficacy with a 13-week lag between self-efficacy intervention and academic task. Results indicated that stable self-efficacy measures were associated with 11.5% of performance variance, suggesting a poor effect of self-efficacy on academic performance over longer periods of time (Lane & Lane, 2001). This was not a good example of self-efficacy research because the time lag between intervention and academic task was not optimal for measuring the effect of self-efficacy. This time lag may have had a negative effect on the increase in self-efficacy (Lane & Lane, 2001).

In a study by Lane, Lane, and Kyprianou (2004), effects of self-efficacy were measured in regards to the ability to pass a class in a post-graduate setting. Students were given an induction to the class and the module handbooks and syllabi right before the

self-efficacy assessment. These module handbooks and syllabi included examples of pervious exam papers and assignments. Results of the Lane et al. (2004) study show student's perceptions of passing the class were positively associated with the self-efficacy variables of 'maintain motivation in light of difficulties' and 'to cope with intellectual demands', which correlated with previous work done by Lane and Lane (2001). The procedure followed in the Lane et al. (2004) study was much better at judging self-efficacy because of the shorter time between being presented with information regarding a task and assessment of self-efficacy (Bandura, 1997).

An issue with self-efficacy assessment is a matter of asking the right questions in a precise way. When measuring self-efficacy, any attempt to try to get a broad, generalized sense of self-efficacy runs the risk of not measuring it at all. Bandura (1986) argues that global scores of self-efficacy decontextualize the behavior and self-efficacy begins to resemble a generalized personality trait. In this case, students are asked to think about their general academic abilities without having a clear task in mind, which results in generalized self-efficacy assessments that bear no resemblance to the task at hand (Pajares, 1996). There is also the matter of the items used from these assessments that are used to calculate self-efficacy of a given type. Researchers have used composite scores from multifaceted instruments to score self-efficacy in mathematics in disparate types from geometry to accounting to varying degrees of algebra (Pajares, 1996). These types of mathematics have a wide range of difficulty and application, causing the items used to compile a self-efficacy score to vary just as much (Pajares, 1996). When involving the weaker effects of verbal persuasion and vicarious learning efficacy sources,

the most precise and topic specific assessments of self-efficacy are necessary to determine, and not underrepresent, any benefit of intervention.

Self-efficacy Intervention

Research centered on the benefits of self-efficacy intervention began taking shape in the late 1980's and early 1990's in the form of career decision self-efficacy, where the bulk of literature on self-efficacy intervention has been within the category of social cognitive career theory (SCCT). Fukuyama, Probert, Neimeyer, and Nevill (1988) were among the pioneers using the DISCOVER computer assisted career guidance software and evaluating its effect on career decision self-efficacy (CDSE). Their results showed positive gains in CDSE and decreases in indecision in undergraduate students compared to a control group (Fukuyama et al., 1988). Luzzo and Taylor (1993) used Bandura's *verbal persuasion* component of self-efficacy as part of their experiment variables on CDSE intervention. After completing a CDSE pretest and the World of Work Inventory, counselors met with participants to persuade them that they had the ability to acquire the skills necessary for effective career decision. Results indicated an increase in CDSE from pretest to posttest with no significant difference in terms of gender (Luzzo & Taylor, 1993). These results generalized to nontraditional students, that is, students over the age of 25 (Foltz, 1998)

Luzzo, Hasper, Albert, Bibby, and Martinelli (1999) studied performance accomplishment and vicarious learning treatments on career-undecided college students. The focus of self-efficacy interventions was narrowed to math and science careers. This study is of particular relevance because the media used to deliver the vicarious learning variable was a video recording. Results indicated that, when used alone, self-efficacy

building interventions do not have a significant effect in boosting math/science self-efficacy, but in conjunction with performance accomplishment treatments, participants scored significantly higher on math/science career interests than with performance accomplishments alone. It is noted that a limitation of the study was the fact that the vicarious learning intervention was not delivered via live model and that students simply talking about their choices may not be the best intervention that can be developed (Luzzo et al., 1999).

In-class self-efficacy interventions have used peer models in different ways to increase self-efficacy. Bartsch, Case, and Meerman (2012) explored the use of a live, peer model presenter in a self-efficacy intervention for a graduate level statistics course. The control group was tasked simply to write about an imagined peer who was successful in said course. A notable variation in this study was the use of a model presenter of comparable age to the participants who did not take the role of an 'expert' but of an average, like-minded student. Results indicated a marginally significant increase in self-efficacy in the experimental group versus a significant drop in the control group. In the study, emphasis was given to the similarity and sincerity of the model presenter as a key factor contributing to changes in efficacy due increased persuasion effect (Bartsch et al., 2012). Peer mentoring was used in a study by Harlow, Burkholder, and Morrow (2006) to provide specific guidance on challenging tasks through the length of a quantitative psychology course. Mentors were chosen based on their interest and enthusiasm, and helped students during the course. When controlling for precourse math skills, self-efficacy scores were significantly increased while anxiety levels decreased.

The verbal components of self-efficacy intervention depend on how self-efficacy fits into a study's manipulated variable, even though the construct of self-efficacy remains the same. Schunk and Ertmer (1999) studied the effects of using self-evaluation and process goals to increase self-efficacy during related tasks. Students assigned to the process goal group were given verbal directives to be mindful of the task and were given a list of expected outcomes. Those students in the self-evaluation group were given the same instruction as the process goal group but also filled out a self-efficacy assessment regarding their task. Results for the process goal group and self-evaluation group showed enhanced self-efficacy for achievement vs. control groups (Schunk & Ertmer, 1999). Self-efficacy was combined with theories of hope and sense of coherence in a study by Davidson, Feldman, and Margalit (2012); together the theories are seen as protective factors to a demanding academic setting. During the interventions, a brief lecture on hope was given to all groups while individual groups received words of encouragement for the verbal persuasion efficacy source, cognitive mapping exercises for sense of coherence, and a mental rehearsal exercise for affect regulation. Average self-efficacy scores both immediately after and one month after the intervention showed significant increases compared to before the intervention (Davidson et al., 2012).

Model Persuasiveness and Personality

The effectiveness of self-efficacy intervention relies on the ability of the intervention model to deliver their message in an effective and salient way. Increasing the influence of the model is a reliable way to increase self-efficacy gains in students. A persuasive model may have a better chance at relaying a message that is meaningful and retainable.

Early models of persuasion from the 1950's established dual processes for persuasion. Kelman (1958) outlined research regarding two types of persuasion: *internalization* and *identification*. *Internalization* refers to acceptance of the messages' argument while *identification* refers to agreeing with the message because one likes the message source. These two types of persuasion can be paired with the same message to produce learning in different ways. A message source with high expertise facilitates learning by way of *internalization*; the high credibility of the source fosters acceptance of the argument. If a message source is attractive or relatable, learning is associated with *identification* with the source (Petty & Briñol, 2008). These theoretical processes were the basis of more contemporary dual route theories.

The 1980's saw the rise of the elaboration likelihood model (ELM). Petty and Cacioppo (1986) explain ELM as a general theory of attitude change that serves as a framework for organizing and understanding the basic processes underlying the effectiveness of persuasion communication. According to the ELM there are two main routes of persuasion: *central* and *peripheral*. The *central* persuasion route is a person's careful and thoughtful consideration of the merits of information presented in a message or argument. The *peripheral* persuasion route involves simple cues in the persuasion context (e.g. an attractive source) that induces change without necessarily scrutinizing the true merits of the argument or message (Petty & Cacioppo, 1986). An important distinction about the ELM is that the various sources of attitude change can take the *central* or *peripheral* route. They are not theoretically locked into one or the other.

The method of delivery can be just as important as the message when attempting to persuade people. The model in a self-efficacy intervention has an effect on whether

the intervention is effective and what that effect is. A self-efficacy intervention is an opportunity to persuade students that they have the capability to do well and the model's presentation is one of the variables that can contribute to the success of the intervention.

Oreg and Sverdlik (2014) explored the effects of source personality on persuasiveness. The preliminary study was designed to ascertain what kind of personality traits were associated with persuasiveness. Participants were asked to think of a person was very effective at persuading others and of a person who was not effective at persuading others. Participants then reported on personality aspects of the persuasive and non-persuasive people they thought about. Results indicate the traits of extraversion, and openness were positively correlated to a persuasive person and neuroticism and agreeableness was negatively correlated to persuasive person (Oreg & Sverdlik, 2014). Extraversion is more easily detectable than the other Big Five personality factors (Kenny, Albright, Malloy, & Kashy, 1994). Therefore, to create a more persuasive model, one could have the model be extraverted.

Model Perceived Similarity

Having a relatable model in a self-efficacy intervention can also enhance the message and its effect on students. Bandura (1997, p. 96) discusses two facets of perceived similarity to models of particular interest: similarity to past performances and similarity to attributes. Finding common ground with the model's past performances increases self-efficacy by providing the best comparative information for the student to gauge their own capabilities. If the model's success was vastly superior or inferior to the student's own successes, that success does not provide any basis for changing self-efficacy. The student observing a model with similar attributes to themselves will find

the model's message more salient through *identification* or peripheral route persuasion because they will assess the similar attribute presumably as part of the set of attributes necessary to complete the task at hand (Bandura, 1997, p. 98). Although manipulating a model's similarity is difficult, measuring perceived model similarity is possible.

Hypotheses

I propose these hypotheses:

Hypothesis 1 predicts an extraverted model will have higher message persuasiveness and therefore will be associated with a greater increase in student's self-efficacy compared to a non-extraverted model.

Hypothesis 2 predicts that when the model and student are more similar (e.g., match on extraversion) there will be a greater increase in student self-efficacy.

Methods

Participants

Participants were drawn from two sections of a graduate research design and statistics class in a medium-sized state university. There were 54 students in the first wave of data collection and 52 students in the second wave. Of these two waves, 46 students were in both waves and agreed to participate in the study. The sample consisted of 12 males and 34 females. Ages for the group ranged from 20 to 57 (M = 26.8, *SD* = 7.5). Students received extra credit in their respective class for participating in this research.

Instruments

The self-efficacy scale used was based on of the self-efficacy items used from Bartsch et al. (2012). This scale consisted of eight items designed to determine levels of

confidence in the competencies needed to succeed in the research design and statistics course. An example is, "You can cope with the intellectual demands of this course." Responses were given on a 10-point Likert scale, 1 meaning *no confidence* and 10 meaning *total confidence*. The Hexaco Personality Inventory-Revised 60-item test (Ashton & Lee, 2009) was used to measure five facets of personality: emotionality, extraversion, agreeableness, conscientiousness, and openness to experience. Internal validities for the test range from .77 to .80 (Ashton & Lee, 2009). A set of six items was developed for this study to measure the impact and effectiveness of the interventions. The first three items measured persuasiveness, "I found the student presenter in the video to be persuasive", comprehension, "I understood the message the student presenter was conveying", and perceived similarity, "I find myself to be similar to the student presenter". The other items measured sub-facets of extraversion: social boldness, "The student presenter seemed really outgoing and enthusiastic", sociability, "The student presenter seems like a person I could get along with well", and liveliness, "The student presenter was talkative and active" (Ashton & Lee, 2009). Responses were on a 5-point Likert scale from 1 (*completely disagree*) to 5 (*completely agree*).

Procedure

At the beginning of the semester, students from the morning and evening classes of the research designs and statistics course were invited by the female instructor to participate in a fellow graduate student's research experiment. Students were assured that participation was completely voluntary, anonymous, and would not affect their final grades. Their instructor informed them at this point that they would receive extra credit for participating in the research. Those who agreed to participate were given consent

forms to sign. The students were not told of any future measurements. Participants then completed the self-efficacy scale and the personality inventory.

Two weeks later, the same two classes were asked again if they would like to participate in research for a fellow graduate student. Those who agreed signed another consent form and were randomly assigned into two groups. There were 23 participants in each group. One group was the extraverted model condition, and the other group was the non-extraverted model condition. Groups were assigned randomly within each class to reduce any bias from the students' selection of the morning or evening class. The groups were then led by a female assistant to separate classrooms and shown a five minute video. The male model in the video portrayed a student close to the average age of the group who had completed the course previously. The only scripting for the video was a general outline of topics on an off-screen whiteboard. The model gave an account of the strategies that helped him be successful: proper study habits and the importance of rote memorization and practicing concepts, active reading and reading in chunks with small breaks, and reducing test anxiety with proper test-taking habits (See Appendix for transcripts of both conditions). The content of the video was kept the same over both groups. For one group, the model was extraverted. He presented the content in an enthusiastic, engaging way using hand gestures and maintaining eye contact. For the other group, the model was non-extraverted. He presented the material in a softer, monotone voice with less general audience engagement. There was less movement, little to no eye contact, and no hand gestures. After the video the participants, in the same room, retook the same self-efficacy inventory from two weeks prior along with the six items developed for this study in the location the video was shown.

Results

I first examined the self-efficacy based on the demographic characteristics of the participants. One of the first things noted was that students' pretest self-efficacy was remarkably high ($M = 7.59$, $SD = 1.20$). This finding has implications for the rest of the results. Unlike other studies (e.g. Bong 1999; D'Lima, Winsler, & Kitsanas 2014), there was no significant difference between female ($M = 7.50$) and male ($M = 7.86$) pretest self-efficacy $F(1,44) = .78$, $p = .38$. Also, age was not found to be a significant predictor of initial levels of self-efficacy $r(46) = .01$, $p = .94$. Next, I checked the simple relationship between initial self-efficacy and personality characteristics. Across the Big Five factor model of personality (see Table 1), none of the dimensions (extraversion $r = .10$, conscientiousness $r = -.08$, agreeableness $r = .14$, openness $r = .11$, emotionality $r = -.22$) significantly correlated with initial levels of self-efficacy, all p's $> .10$, all df's $= 46$.

Manipulation Check

The hypothesis regarding model personality necessitated a clear difference in the presentation between conditions. To this end, three of the manipulation check items were designed to measure levels of perceived extraversion of the model. Results showed that model presentation was significantly different between conditions regarding sociability, liveliness, and social boldness, all F's > 8.0, all p's $< .01$. In all cases, students perceived the extraverted model higher in extraversion (social boldness $M = 4.22$, sociability $M = 3.91$, liveliness $M = 4.48$) than the non-extraverted model (social boldness $M = 2.04$, sociability $M = 2.95$, liveliness $M = 2.78$). In other words participants, as expected, perceived a difference between the extraverted and non-extraverted models.

Table 1

Student Big Five Model personality dimension Means (SD)

	N	Min	Max	*M*	*SD*
Extraversion	46	2.20	4.60	3.37	0.62
Conscientiousness	46	1.90	4.50	3.48	0.58
Agreeableness	46	2.20	4.40	3.32	0.59
Openness	46	3.30	5.00	4.06	0.42
Emotionality	46	2.20	4.90	3.60	0.61

Note. All 46 participants were in the analysis.

Overall Change in Self-Efficacy

Given the high levels of self-efficacy in participants reported before intervention, I looked at the relationship between pre- and post-levels of self-efficacy. Correlation between levels of initial and post-intervention self-efficacy was high, $r(46) = .77, p < .001$. Students who started with higher self-efficacy tended to end with higher self-efficacy, and students with lower self-efficacy tended to end with lower self-efficacy.

I then reviewed the data for any effect the intervention had on reported self-efficacy, regardless of whether the participants were in the extraverted model intervention or the non-extraverted model intervention. Self-efficacy intervention did not have a significant overall effect on students' reported self-efficacy (mean difference = 0.05, $t(45) = 0.41, p = .69$).

Effects of Student Personality

Having found no self-efficacy change from before and after the intervention, I turned to the two conditions. I wanted to see if there was any change in self-efficacy due to the different intervention presentation styles. A two-way mixed factorial ANOVA was used to determine any changes in self-efficacy in the extraverted model intervention and the non-extraverted model intervention group presentations (see Table 2). Hypothesis 1 predicts a Condition x Time interaction such that participants who saw an extraverted model had a larger increase in self-efficacy. There was no significant change in overall self-efficacy from before to after the intervention, $F(1, 44) = 0.17, p = .68$, or overall difference between extraverted and non-extraverted presentation conditions $F(1,44) = 0.02, p = .88$. Likewise, contrary to Hypothesis 1, there was a non-significant Time x Condition interaction, $F(1,44) = 2.52, p = .12$. In other words, although there were

Table 2

Student Self-Efficacy Means (SD) as a Factor of Model Extraversion at Pretest and Posttest

	Pretest	Posttest
Model Extraverted		
Student Self-efficacy	7.72 (0.97)	7.47 (1.29)
Model Non-Extraverted		
Student Self-efficacy	7.47 (1.40)	7.61 (1.40)

Note. All 46 participants were in the analysis.

patterns of changes in Table 2 from pre-intervention to post-intervention, these patterns were not significant. If anything, the results were in the opposite direction predicted.

After studying the data for effects the model presenter had on self-efficacy, I looked to the students' personality as factors for changes in self-efficacy. Students' reported personality traits were within expected levels (extraversion *Mdn* = 3.45, agreeableness *Mdn* = 3.45, openness *Mdn* = 3.60, emotionality *Mdn* = 3.40) with conscientiousness (*Mdn* = 4.05) being higher than the rest. I categorized participants' personality factors by high/low median split. To investigate the effects of participant personality, model personality, and time on self-efficacy, a set of 2 (Participant Personality: high, low) x 2 (Condition: model extraverted, model non-extraverted) x 2 (Time: pretest, posttest) ANOVAs were examined.

For the Participant Extraversion analysis (see Table 3), hypothesis 2 predicted a three-way interaction such that when the model and student matched in extraversion there would be a greater increase in self-efficacy. However, contrary to Hypothesis 2, the main finding was a Participant Extraversion x Time interaction such that students who reported a high level of extraversion reported gains in self-efficacy following intervention $F(1,42) = 5.86$ $p = .020$. This gain in self-efficacy was regardless of which presentation the students saw, all other main effects and interactions were non-significant, all F's < 2.00, all p's $> .20$.

A second personality trait interaction had interesting results. Findings for the agreeableness personality trait in students were unexpected. These findings were analyzed using a set of 2 (Agreeableness: high, low) x 2 (Condition: model extraverted, model non-extraverted) x 2 (Time: pretest, posttest) three-way mixed factorial ANOVA.

Table 3

Student Self-Efficacy Means (SD) as a Factor of Model Extraversion and Student Extraversion at Pretest and Posttest

	Pretest	Posttest
Model Extraverted		
Student Extraverted	7.90 (1.27)	8.02 (1.59)
Student Non-Extraverted	7.60 (0.76)	7.11 (0.96)
Model Non-Extraverted		
Student Extraverted	7.43 (1.57)	7.82 (1.39)
Student Non-Extraverted	7.52 (1.17)	7.30 (1.44)

Note. All 46 participants were in the analysis.

Those students who scored low on Agreeableness (See Table 4) had a significant gain in self-efficacy overall as shown by a significant Agreeableness x Time interaction $F(1,42) = 7.17, p = .01$.

The other three personality traits (conscientiousness, emotionality, openness) had no main effects or interactions of Participant Personality, Condition, and Time, all p's > .05.

Further Testing of Hypotheses

Lastly, the data were analyzed based on two predictions made by the hypotheses. Hypotheses 1 stated that there would be a gain in student self-efficacy following the intervention if the student found the model presenter to be persuasive. Persuasiveness was represented in the post-intervention manipulation check item "I found the student presenter in the video to be persuasive". I organized the persuasion manipulation check item results by median split ($Mdn = 3.5$) and conducted a 2 (Persuasiveness: high, low) x 2 (Condition: model extraverted, model non-extraverted) x 2 (Time: pretest, posttest) three-way mixed factorial ANOVA. Hypothesis 1 predicted that if the student found the model presenter persuasive, there would be a gain in self-efficacy in post-test. Results indicated the hypothesis was not supported (see Table 5) because there was no significant change in self-efficacy between conditions as shown by an nonsignificant Persuasiveness x Time interaction $F(1,42) = 0.78, p = .38$.

Hypothesis 2 stated that there would be a gain in self-efficacy following an intervention if the student felt similar to the model presenter. Similarity was represented in the manipulation check item "I find myself to be similar to the student presenter". I organized the similarity manipulation check item results by median split ($Mdn = 3.5$) and

Table 4

Student Self-Efficacy Means (SD) as a Factor of Model Extraversion and Student Agreeableness at Pretest and Posttest

	Pretest	Posttest
Model Extraverted		
Student High Agreeableness	7.78 (1.03)	7.33 (1.37)
Student Low Agreeableness	7.63 (0.93)	7.68 (1.20)
Model Non-Extraverted		
Student High Agreeableness	7.84 (1.92)	7.49 (2.08)
Student Low Agreeableness	7.22 (0.95)	7.69 (0.81)

Note. All 46 participants were in the analysis.

Table 5

Student Self-Efficacy Means (SD) as a Factor of Model Extraversion and Student Perceived Persuasiveness at Pretest and Posttest

	Pretest	Posttest
Model Extraverted		
Student High Perceived Persuasiveness	7.66 (1.02)	7.51 (1.16)
Student Low Perceived Persuasiveness	7.90 (0.93)	7.33 (1.20)
Model Non-Extraverted		
Student High Perceived Persuasiveness	8.14 (1.02)	8.36 (0.71)
Student Low Perceived Persuasiveness	7.23 (1.46)	7.35 (1.51)

Note. All 46 participants were in the analysis.

used a 2 (Similarity: high, low) x 2 (Condition: model extraverted, model non-extraverted) x 2 (Time: pretest, posttest) three-way mixed factorial ANOVA.

Hypothesis 2 predicted that if the student felt similar to the model presenter in the intervention, there would be a gain in self-efficacy. Results indicate the hypothesis was not supported (see Table 6) because there was no significant change in self-efficacy as shown by a nonsignificant Similarity x Time interaction $F(1,42) = 0.02$, $p = .89$.

Discussion

Improving self-efficacy in students is beneficial for students and instructors alike. Self-efficacy intervention can increase student academic performance and confidence. Understanding how the model in a self-efficacy intervention accomplishes this task is paramount to making self-efficacy intervention a valuable tool in an instructor's arsenal.

If a self-efficacy intervention is to be successful, the content of the intervention is not the only important aspect. The delivery of the message can enhance what would be a minimal increase in self-efficacy to a meaningful change in a student's thinking. Regarding this study, students found the models' styles to be distinctly different, so the manipulations were effective. Furthermore, students reported understanding of the underlying message to be high across both model styles of intervention. These results set the environment to verify that any gains in self-efficacy would be based on the style of message delivery and student reported similarity to the model presented.

Hypothesis 1 stated that an extraverted model in a self-efficacy intervention would produce greater gains in self-efficacy. I assessed hypothesis 1 in two ways: greater gain in self-efficacy from an extraverted model presenter over a non-extraverted model presenter and gain in self-efficacy from pretest to posttest from the more

Table 6

Student Self-Efficacy Means (SD) as a Factor of Model Extraversion and Student Similarity at Pretest and Posttest

	Pretest	Posttest
Model Extraverted		
Student High Similarity	7.86 (1.05)	7.63 (1.20)
Student Low Similarity	7.54 (0.89)	7.26 (1.43)
Model Non-Extraverted		
Student High Similarity	7.39 (1.50)	7.55 (1.51)
Student Low Similarity	7.50 (1.40)	7.65 (1.40)

Note. All 46 participants were in the analysis.

persuasive model presenter. While students reported modest levels of persuasiveness and a distinct difference in model presentation style, neither had meaningful interaction with pretest-posttest levels of self-efficacy. Hypothesis 2 stated that if the students found themselves to be similar to the model presenter, they would report a gain in posttest self-efficacy. I assessed this hypothesis in two ways: a greater gain in self-efficacy from students whose reported level of extraversion matched the extraverted model presenter and a gain in self-efficacy from students who felt similar to the model presenter. The results for perceived similarity to the model were the same as the perceived persuasiveness and did not have a significant effect on self-efficacy levels posttest. Therefore, neither hypothesis was supported. These findings seem contradictory to previous research (Markus, 1977) indicating that increasing similarity will increase liking and lead to attitudinal change. A possible explanation for the shortcoming of this study is that the model was appealing to the students in more of a *peripheral* route of persuasion, but given that their own performance was being examined, students were more focused on arguments that engaged the *central* route of persuasion.

A correlation between student personality and self-efficacy was uncovered in this study. It is important to reiterate that the personality of the model was not a significant factor for the gains in self-efficacy based on student personality. Regardless of the delivery style of the intervention message, students who reported higher levels of extraversion reported a significant gain in self-efficacy posttest. There is research correlating extraversion and self-efficacy directly (De Feyter, Caers, Vigna, & Berings, 2012; Esfandagheh, Harris, & Oreyzi, 2012). There is scant research, if at all, describing any link of effectiveness of self-efficacy intervention based on the personality of the

student. Among the defining characteristics of extraversion is being comfortable with social interactions with large groups of people, that is, the give and take of information from people in close proximity. This ease translates to lower levels of physiological stress. Extraversion can lead to a greater receptiveness to influence from those in the group. Therefore, when a model is giving a self-efficacy intervention, the student higher in extraversion may benefit from the message delivered. Students with lower levels of extraversion would not be as receptive to a classwide self-efficacy intervention because of their aversion to crowds in general, resulting in a reduced intervention effect.

Results also uncovered a significant increase in self-efficacy when students reported low levels of agreeableness. Regardless of which model presenter the students observed, the students reporting lower levels of agreeableness had significant gains in self-efficacy posttest. High levels of agreeableness denote a desire for social harmony, compromise, and a willingness to comply. A lower level of agreeableness conveys a concern for the self and less reliance on opinions or well-being of the group as a whole (Rothmann & Coetzer, 2003). This means a sort of inverse reaction regarding self-efficacy intervention. Students with higher levels of agreeableness may see the self-efficacy intervention as a sort of mandate. The student will take inventory of their own efforts in comparison to the message delivered by the model presenter and if the student finds their efforts lacking in comparison, they may develop physiological stress, fearing the consequences of not following the advice given. This would lead to adverse effects on the student's self-efficacy. Students with low agreeableness will not be as beholden to the model presenter. The advice given by the model will be taken at face value and internalized in a way that would best benefit the student personally without regard to how

either the model or the class feel about the student. The student low in agreeableness is freer to consider and weigh the benefits of the self-efficacy intervention without fear of reprisal from the group as a whole. Given the general stability of personality traits, further study into this correlation would benefit instructors in helping define what kind of help for struggling students would be best.

While self-efficacy intervention will often result in gains in self-efficacy, there were factors that limited success of this study. The initial self-efficacy assessment revealed a high initial level of self-efficacy in the student sample. The high starting self-efficacy created a ceiling effect that may have limited the gains in self-efficacy during this study. The fact that the students in the sample were graduate students who already completed a Bachelor's degree may have contributed to this high sense of self-efficacy. A study by Bartsch et al. (2012) involved a similar student sample and also experienced a high starting self-efficacy level but not as high as reported in this study. This study resulted in mild gains in self-efficacy using a model presenter so it was believed that positive gains in self-efficacy in this study would be attainable despite the high starting self-efficacy.

The independent variables of model personality, verbal persuasion, and perceived similarity may have also contributed to the limited success of this study. Verbal persuasion has been documented as the efficacy source with the least effect on self-efficacy when used by itself. There has been success in increasing self-efficacy when combining verbal persuasion with other methods of increasing self-efficacy so it was believed that combining verbal persuasion with the other independent variables would lead to increases in self-efficacy. Perceived similarity to the model may not have

produced the desired result because of the media used to deliver the persuasive argument. Perceived similarity may lose its influence when a video is used as opposed to live presentation. Model personality, specifically extraversion, is known to increase persuasion and attitude change, but its effects are strongest when using the peripheral route of persuasion, that is, when the observer is not very engaged or interested in the argument. The results of this study are similar to a study by Oreg and Sverdlik (2014), which showed source personality to have low effect on persuasiveness when message involvement was high and a higher effect on perceived source persuasiveness when message involvement was low. The nature of the sample again comes into play again because they were highly motivated, conscientious graduate students, meaning they were keenly interested in the argument matter. This lessened the chance that students would be less interested or motivated in which a peripheral route of persuasion might have been more successful.

There is more to explore regarding the interactions of student and self-efficacy intervention than was covered in this study. A larger sample size would be beneficial in making effects of student personality and self-efficacy intervention more evident. Persuasion and student similarity to model presenter being subtle boosters of self-efficacy, having a larger sample size would allow for a definitive footprint of their effects.

There are practical conclusions to be drawn from this study that are applicable in a number of real world situations for instructors. From this study and closely related others (Bartsch et al., 2012) it can be safely assumed that for graduate, non-mathematical courses, self-efficacy is going to be generally high. Instructor personality will have less

of an impact on self-efficacy as long as the message is clear and the subject matter properly explained. Instructors would benefit from being aware of the general personality trend in their classroom. Students who tend to be eager to please or more withdrawn may not benefit as much from self-efficacy intervention. Keeping these concepts in mind will allow instructors to better tailor their self-efficacy boosting efforts.

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Appendix

Extraverted Model

Hi! My name is Jason Hernandez. I'm a former graduate student, right here at the University of Houston-Clear Lake. And I just recently took this research design and statistics class, and I want to give you some of my tips to try to do better in class like this and try to have a good experience and so far as your class, because this is mandatory. Really, what worked for me was good study habits, good reading habits and good testing habits. Let's go through those right now.

Good studies habits. One thing that I found that really worked for me was to highlight specifically formulas; not only the formulas but their description, kind of help you conceptualize them a little better. Also, I know people don't like this, but you have to use rote memorization. I know people like to say hey, you know, rote memorization is difficult, and you know it's maybe a little boring to try to remember all of those formulas; but rote memorization will help you when you talk about testing habits later on, and they will help you to really pull it to the forefront when you really need it in that crunch time.

Also, you have to practice the concepts. When it comes to standard deviation, and variance population samples and stuff like that, you have to practice the concepts; just writing them, even if you're over writing the examples that they give in the book, even if you just write them down yourselves, just that I found really helps out. Now, when it comes to reading habits, there's one thing that people do that really hurts them when it comes to reading; that is passively reading. You have to actively read. Don't just kind of glaze over the book and kind of just let the words wash over; really be interested in what you're reading. Also read in small chunks, you know. Twenty to thirty minutes,

take a little break, another twenty to thirty minutes; and also please, for all of your health sake get plenty of good sleep, because it will help you refresh what's in your mind. And believe it or not, the next day you will remember more if you get a good night sleep.

Always remember, you're going to want to take small breaks between readings. About 20 to 30 minutes, in my opinion, that's what helped me get a pretty good grade. And you know, I'm any regular student. I'm no smarter or less smart than any of the other students here. So, always remember to actively read, read in small chunks and get good sleep. By good sleep I mean six to seven hours at the very least. Now, the hard part, testing.

Now I know that people have test anxiety, and I know that people get locked up and they get worried when they take tests. First and foremost relax; it's just like doing school work but there's just a little more emphasis on it now. So if you read right, you got a good amount of sleep, the thoughts will come. Also, never second guess. If you write something down go with your instinct. Your first instinct is usually the correct one. So if you answer a question on standard deviation or Enova or t-tests and you think it's a certain answer, go with that, because if you constantly rethink you'll actually argue yourself out of the right answer. Also be sure and check your work, especially if you're doing Scantron, you don't want to be that one bubble off, right, because that gets everything else wrong on the test. And through the only fault of not being careful, you'll have messed everything up.

Don't forget to pass hard questions and always come back to them. Also, you know, I'm not an expert in this. I took this class just a few semesters ago, just like you're taking it now. So don't get down on yourself; don't think, oh, this is math, maybe I'm a

humanities major, or liberal arts, and I don't do a lot of math. Don't get down on yourself. You are a lot brighter than you realize. You just don't have to tell yourself that you failed before you've even tried; and remember your friends and your classmates are there to help you. They're there to help you study, you perhaps get some friends, get some emails and get a study group going. Also, your professor is not your enemy. He's there to help you. He wants to see you succeed just as much as you yourself do, just as much as your classmates do. So go to him for help if you have any problems. The whole class will go a whole lot better for you if you don't realize that they're there to help you out.

In summary, just study well, my name is Jason once again, and study well, read well and relax on the test. Remember, it's two semesters so be sure to kind of get in good with everybody around you and this time will pass a lot better for you and believe it or not everything you learn as graduate students in this research design and statistics class is going to be helping you out. Thanks a lot and thank you.

Non-extraverted Model

Hi, my name is Jason Hernandez, and I took this research design and statistics class a couple of semesters ago. And I just wanted to share a couple of things to help you with the semester. It's not as bad. Good study habits, good reading habits, and try to do good on the tests, that's the hard one, and you should be okay.

The study habits, what I mean by that is, use your highlighter, because when you do, you can make sure to get the formulas and their descriptions, and that will help. You're going to have to learn how to memorize. It's not too hard. You just try to

memorize the formulas as they are, because it'll help, you know, during the tests you'll be able to think about it just as it was.

And try to practice the concepts. Like, what I mean by that is do over the examples in the book and just try to practice them. I find that if I write it, then it sticks in my mind a little more, and it makes it easier when I have to do it on the tests.

So always use your highlighter and remember to memorize and just practice the concepts. When you're reading, one thing that is a little better is to make sure to actively read. By that I mean to not just stare at the page and just try to spend time. You have to actually be interested in what you're reading.

And make sure to actively read. Don't try to read too long, either. Try to read in small chunks. By that I mean, to read 20 or 30 minutes and then take a break. And make sure you get a lot of sleep because you can't do well on the tests if you're tired and believe it or not, when you get a good night's sleep, you'll remember more and you'll be able to bring it up easier on the test.

So the test. So the important thing about the test is you've got to relax. You can't get too nervous on the test and then you might lock up a little bit, but the first thing is to breathe and to just try to relax. And when you're making answers, be sure to go with your first thought. Don't try to second-guess yourself, because if you look at the same question and you keep thinking about it and guessing and guessing, you'll actually guess yourself out of the right answer.

Always make sure to check your work. In case your professor does Scantrons, you don't want to be one bubble off, because that will make all the work, the whole thing, wrong from wherever that bubble was. And don't forget to, if you have a hard question,

pass on it and then come back to it later. So basically I'm just like a student just like you. I took this two courses a couple semesters ago, and it went pretty good for me. Don't get down on yourself. Don't think it's too hard because you might actually convince yourself that you can't do it before you even try. And you're going to have these same people for two semesters, so that's a long time.

So try to ask your friends, try to make friends with those around you, maybe pass your email, and try to ask them for help because they're in it with you. And it may be hard to do, but your professor is not your enemy. He's there to help you, and he will help you. He wants to see you succeed just as much as you do.

So really, that's all I got. My name is Jason and I did pretty well in this class and I'm no different than you. I'm a graduate student just trying to make it through this mandatory class. So I wish you well and whatever you do just remember to read well, relax, and try to settle in because you're going to be with these people for two semesters. So good luck. Thank you.