THE EFFECT OF GOAL ORIENTATION ON WOMEN'S CAREER CHOICES

by

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Abstract

Women remain underrepresented at the highest levels of science, technology, engineering, and mathematics (STEM; National Science Board, 2010). This review covers the major theoretical perspectives on the mechanisms by which people choose STEM careers, focusing on the effects of goals and stereotypes about particular careers' goal affordance on women's career choices. In particular, goal congruity theory (Diekman, Clark, Johnston, Brown, and Steinberg, 2011) is an important theoretical explanation for the continuing disparity in the numbers of men and women who choose STEM career fields. According to goal congruity theory, people hold stereotypes about the types of goals that different careers afford, and when personal goals do not match their goal affordance stereotypes, people's interest in a particular career drops (Diekman et al., 2011). From the perspective of goal congruity theory, if goal affordance stereotypes could be changed, more women would be interested in entering STEM careers, and more employers would be open to hiring women. In this review, I covered the current literature on factors influencing career choice, discussing the state of the STEM literature with regard to possible relevant causal variables that impact on women's career choices. I particularly focused on the effects of study participants' goals (Diekman, Brown, Johnston, & Clark, 2010; Diekman et al., 2011; Evans & Diekman, 2009; Morgan, Isaac, & Sansone, 2001; Park, Young, Troisi, & Pinkus, 2011; Ramsey, 2011). Although the literature is very small, I computed effect sizes (Hedges & Olkin, 1984) to examine the particular relationship between the type of goal held by a person and that person's interest in STEM careers, and I attempted to organize the literature in terms of important findings. Finally, I discussed general conclusions about the effects of these variables on STEM choices and presented possibilities for future research.

Keywords: STEM career, communal goals, romantic goals, goal affordance

The Effect of Goal Orientation on Women's Career Choices

Although women have made much progress in the workplace in recent years, they remain underrepresented at the highest levels of science, technology, engineering, and mathematics (STEM; National Science Board, 2010). Greater workplace diversity is desirable, and in order to determine the best ways to attain this goal, researchers have posited many different theories that may account for the imbalance between men and women in STEM-related careers (Diekman et al., 2011; Eagly, & Karau, 2002; Eccles, 1994; Graziano, Habashi, Evangelou, & Ngambeki, 2012; Lockwood, 2004; Nosek, Banaji, & Greenwald, 2002; Spencer, Steele, & Quinn, 1999).

No single theory is sufficient to explain the imbalance between numbers of men and women in STEM careers, but my study focuses on the roles that personal goals, beliefs about goals afforded by a particular career choice, and person (versus object) orientation (Graziano et al., 2012) play in women's career choices. In this review, I will cover the important theories that researchers have posited to explain the processes by which people make career choices, as well as what I believe to be important causal variables in the process, based on the research literature. As my review will show, women's goals and their beliefs about the goals that particular careers will allow them to achieve (i.e., *goal affordances*; Evans & Diekman, 2009) are among the most important factors implicated in their career choices. Although the literature is very small, I attempted to classify studies that show the importance of these variables, and computed combined effect sizes on particular relationships that I believe to be important in producing career choice.

The Importance of Gender

Gender is an obvious factor in career choice. How gender interacts with one's goals is a particularly important focus of the social cognitive career theory (Lent, Brown, & Hackett, 1994). Bradley defined gender as "the varied and complex arrangements between men and women, encompassing the organization of reproduction, the sexual divisions of labour and cultural definitions of femininity and masculinity." (1996, p. 205) In the present literature review, I view gender as a social construct and differentiate it from one's biological sex. This is in accordance with the 6th edition of the Publication Manual of the American Psychological Association, which states, "*Gender* is cultural and is the term to use when referring to women and men as social groups. *Sex* is biological; use it when the biological distinction is predominant" (p. 71).

The U.S. Department of Commerce, Economics and Statistics Administration released a report on women in STEM written by Beede, Julian, Langdon, McKittrick, Khan, and Doms in 2011. They reported that women hold less than a quarter of STEM jobs despite filling nearly half of all jobs in the U.S. They also reported that women hold a low number of undergraduate STEM degrees when compared with men, and this disparity is especially evident in the engineering field. Another discouraging finding they reported is that women who hold degrees in STEM are less likely than men who hold those same degrees to end up working in a STEM career. Whatever the cause, the report suggests that it is necessary to determine a way to change these patterns.

Some researchers have focused on the importance of the gender of people's role models on later career choice. Lockwood (2004) researched the effects of a gender-

matched career role model for young girls on their sex-self, self-behavior and sex-behavior associations by altering the sex-behavior association. Sex-self associations refer to how strongly the individual associates herself with her biological sex, and sex-behavior associations refer to how strongly the individual associates gender roles with the biological sexes. Self-behavior associations are those beliefs about what behaviors are appropriate for oneself.

In her first study, Lockwood (2004) presented a gender-matched career role model and a gender-mismatched career role model to both male and female participants. These career role models were intended to alter sex-behavior associations in order to alter self-behavior associations. The participants in this experiment were instructed to read a fake newspaper article about a highly successful professional who was either of the same sex as the participant or of the opposite sex. After having read the article, the participants were instructed to rate themselves on a scale intended to measure their beliefs about their own career success. Female participants who read an article about a successful female professional rated themselves more positively than did female participants who read about a successful male professional. This effect was not found for male participants.

In a second study, Lockwood (2004) examined participants' self-reports describing people who served as career role models for them in the past. She found that the majority of the female participants selected a female role model, and that these women were more likely to report having considered the role model's gender when determining that role model's motivational impact.

Past Theories Proposed to Explain Career Choice

Researchers have posited several important theories that help to explain how people choose their careers, which help us to understand women's general tendencies to lack interest in STEM careers. Eccles (1994) developed the model of achievement-related choices. This model links achievement-related choices to an individual's (a) expectations of success and (b) the value he or she places on perceived available options. For example, an individual may have so strongly assimilated a gender role that activities judged to be for the opposite gender may be dismissed without consideration, even unconsciously. According to Eccles, gender roles may impact both individuals' perceptions of available career options as well as the value that is placed on those options. High-achieving women may experience a conflict between traditional feminine values and goals and the demands of traditionally male-gendered careers, and they may resolve this conflict by instead entering traditionally female-gendered careers.

Social cognitive career theory offers a popular model for determining how people make career choices. The theory is based on Bandura's (1999) social cognitive theory and was developed by Lent, Brown, and Hackett in 1994. According to social cognitive theory, "people are producers as well as products of social systems" (Bandura, 1999, p. 21). Just as people observe and learn from social situations, they also process that information before acting and forming attitudes (Stajkovic & Luthans, 1998). An important aspect of social cognitive theory is self-efficacy, which is the belief that one is capable of achieving a particular goal (Stajkovic & Luthans, 1998). Perceived self-efficacy can affect achievement outcomes; if people do not believe they are capable of

achieving a goal, they will most likely fail to achieve that goal (Stajkovic & Luthans, 1998). Social cognitive career theory attempts to explain career choice and development as a product of one's career-relevant interests, selection of career options, and performance in career pursuits (Lent, Brown, & Hackett, 1994). In explaining career choice, social cognitive career theory focuses on one's feelings of self-efficacy, expected outcomes after a choice, and the ways in which goals interact with personal and contextual factors (Lent, Brown, & Hackett, 1994).

Greenwald, Banaji, Rudman, Nosek, Farnham, and Mellot (2002) proposed a unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept as an explanation for the mechanisms underlying career choice. One noteworthy aspect of the unified theory is that researchers can use implicit measures such as the implicit associations test (IAT; Greenwald, McGhee, and Schwartz, 1998) in addition to explicit measures when studying the unified theory. The IAT measures implicit associations between different categories by instructing participants to categorize two concepts with an attribute. Participants are able to make some pairings faster based on whether they are more strongly associated (Greenwald et al. 1998).

In a typical IAT measuring gender-career associations, a participant would begin by matching male names to the category "male" and female names to the category "female." Then the participant would match family-themed terms to the category "family" and career-themed terms to the category "career." It would be obvious to the participant which category these terms belonged in. Next, the participant would be instructed to match female names and family-themed terms to the category "female/

family" and male names and career-themed terms to the category "male/career." Finally, the participant would be instructed to match female names and career-themed terms to the category "female/career" and male names and family-themed terms to the category "male/family." The participant's reaction times when completing these tasks are compared to determine whether she took a longer time to pair male names with family-themed terms than she took to pair male names with career-themed terms and vice versa. Most people who take this particular IAT display implicit associations between "female" and "family" and between "male" and "career," despite having opposing explicit associations.

Unified theory also incorporated Heider's (1946) balance theory, which suggests that people tend towards "balanced" thoughts and relationships, in which there are consistent thoughts or relationships between a person, his or her thoughts about another person, and an attitude object. Inconsistent, competing attitudes about the same attitude object create discomfort that must be resolved. According to balance theory, attitudes towards people and objects can also influence one another. An example of a balanced triangle relevant to the present topic might be, "I (the person) like science, my teacher (another person—a role model) likes science, and I like my teacher." An example of an imbalanced triangle might be, "I like science, my teacher likes science, but I don't like my teacher." Again, imbalanced triangles lead to feelings of discomfort according to balance theory, and these feelings of discomfort serve as a motivation for reaching a balanced resolution. In the example just cited, a person who dislikes her teacher may

resolve the inconsistency by deciding that she does not really like science as much as she thought she did.

Nosek, Banaji and Greenwald (2002) tested unified theory in an experiment, and they found that female college students' implicit attitudes toward math and science were more negative compared to their attitudes toward arts and language. They concluded that when one's self-concept was essentially "female," but math is associated with being male, participants found it difficult to associate math with the self. This tension leads to occupational constraints based on one's gender group membership, consistent with balance theory.

Other Factors that May Affect Career Choice

Researchers have examined other factors in the psychological literature that have been shown to impact career choice or affect the factors that underlie that choice. Stereotype threat (Spencer, Steele & Quinn, 1999) may play a role in causing the gender gap at the highest levels of STEM. Stereotype threat is defined as feelings of anxiety experienced when people worry about confirming a negative stereotype that exists about their group (e.g., women are bad at math, or blondes are dumb). Spencer et al. proposed that when women perform math activities, they risk being judged according to negative stereotypes, whereas men do not. Stereotype threat is a particular risk for people who have identified themselves as being strong in a particular domain, for whom that domain is important. Thus, ironically, women who are especially good at and who like math are those most likely to be affected by stereotype threat (Fiske & Taylor, 2008).

Spencer et al. (1999) demonstrated that when women who were very good at math were told that gender made a difference in scores on a difficult math test, they performed more poorly than men (who were equally good at math). However, when Spencer et al. eliminated stereotype threat by telling participants that gender had no effect on test scores, women performed just as well as men on the test. Theoretically, the anxiety associated with worrying that one will fulfill a negative stereotype about one's group depresses performance on a test on which one would normally do very well. Theoretically, this anxiety is distracting and leads to poorer performance. This literature suggests that stereotype threat may affect women's interest in STEM fields, causing them to avoid these career fields because of the fear that they will fulfill negative stereotypes about their gender.

Another factor that may play a role in career choice is *person versus thing orientation*. Thorndike (1911) first defined person orientation versus thing orientation, stating that "the greatest difference between men and women is in the relative strength of the interest in things and their mechanisms (stronger in men) and in the interest in persons and their feelings (stronger in women)" (p.31). Recently, researchers have returned to studying this theme (Graziano, Habashi, Evangelou & Ngambeki, 2012; Woodcock, Graziano, Branch, Habashi, Ngambeki & Evangelou, 2013). These recent studies focus on the effects person orientation and thing orientation have on women's career choices.

Graziano et al. (2012) confirmed Thorndike's (1911) original suggestion that boys are higher in thing orientation and girls are higher in person orientation, by analyzing

undergraduate students' Big Five Personality Inventory results and responses on occupational scales. Participants were selected from STEM classes and from introductory psychology classes at a midwestern university. The researchers conducted a regression analysis with participant sex, person orientation, and thing orientation as predictors. They hypothesized that these predictors would affect interests in person- and thing-oriented careers. Their study confirmed their hypothesis: They concluded that person and thing orientations are motivational variables "not only because they are related to interests, but because they appear to influence the direction, intensity and persistence of academic/ educational behaviors" (p. 471).

Graziano et al. (2012) conducted a second study, this time sampling third grade and sixth grade children from the Midwest. The children were instructed to complete an age-appropriate person- and thing-oriented scale, in addition to measures assessing their interest in STEM and non-STEM related classes and careers. Graziano et al.'s results showed that at the third-grade level, girls' thing orientation was related to an interest in thing-oriented careers, but was not related to less interest in person-oriented careers. On the other hand, person orientation was related to greater interest in person-oriented careers, but did not seem related to interest in thing-oriented careers. For third-grade boys, neither thing orientation nor person orientation was a significant predictor of career interest.

By the time the children reached sixth grade, however, thing orientation was related to interest in thing-oriented careers for boys and girls. By that time, thing orientation was also related (albeit marginally) to less interest in person-oriented careers

for both boys and girls. The study showed that person orientation generally was not a predictor of career interest for sixth grade boys or girls. Overall, these results suggest a progression over time, in which thing-orientation increasingly impacts career interests, with girls seeing the distinction between thing- and person-oriented activities earlier in their development.

Woodcock et al. (2013) also studied person- versus thing orientation and their effects on occupational interests. They distributed scales measuring person and thing orientation and educational and occupational intentions to engineering majors, science majors, a sample from the general population of university students, and elementary, middle and high school children from the United States, Turkey and Greece. They used logistic regression to predict choice of STEM versus non-STEM majors, and found that thing orientation was positively related to enrollment in STEM majors. They stated that "The odds of being enrolled in a STEM major quadruple as a function of a one point increase in thing orientation" (p. 120). Interestingly, they also found that the participant's sex did not predict STEM major enrollment. Their study demonstrates the importance of person versus thing orientation in career choice.

Role Congruity Theory

Eagly and Karau (2002) developed role congruity theory to explain prejudice against female leaders. Role congruity theory states that perceived incongruity between the female gender role and leadership roles leads to women being perceived less favorably than men as potential leaders, as well as to women's actual leadership behavior being evaluated less favorably than that of men. Gender roles are defined as the socially

constructed behavioral norms that are considered socially appropriate for people of a given sex, or "the consensual beliefs about the attributes of women and men" (Eagly & Karau, 2002, p. 574). The authors argued that gender roles remain influential in the workplace, which is why people feel the need to reconcile gender roles with leadership roles. The theory predicts that attitudes are less positive towards female versus male leaders, and that it will be more difficult for women to become successful in positions of leadership.

An example of role incongruity was presented by Gray, Knobe, Sheskin, Bloom, and Barrett (2011). These researchers showed that the gender gap that exists at the highest levels of STEM (STEM; National Science Board, 2010) may be influenced by the objectification of women, which in turn affects women's perceptions of their own agency and experience. In their study, Gray et al. showed that that focusing on someone's face leads to perceptions of agency, whereas focusing on someone's body leads to perceptions of experience (emotion and sensation). In other words, when people focus on someone's body rather than face, they tend to perceive that individual to have less agency. Thus, because women's bodies are more prominent in advertisements than men's (Archer, Iritani, Kimes, & Barrios, 1983), and because, as Gray et al. demonstrated, focusing on someone's body leads to an attribution of less agency, mere focus of attention on different aspects of a person may generally contribute to a perception that men have more self-control and agency than women. Agency is considered to be important in leadership roles, and when gender roles are perceived as incongruent with leadership roles, women are considered to be unfit for these positions (Eagly & Karau, 2002).

Goal Congruity Theory

Evans and Diekman (2009) connected Eagly and Karau's (2002) role congruity theory to the endorsement of goals, suggesting that the endorsement of gender-normative goals depends on how much an individual endorses personal gender roles. Goal congruity theory is another of the many attempts that have been made to explain why the gender gap continues to exist at the highest levels of STEM. Goal congruity theory builds on role congruity theory; both theories are based on how strongly the individual subscribes to gender roles and posit that the degree to which one adopts a particular gender role affects the individual's entrance into certain careers.

Diekman, Clark, Johnston, Brown, and Steinberg (2011) proposed goal congruity theory to explain attraction to and avoidance of STEM fields. They hypothesized that goal affordance stereotypes, or beliefs about whether certain fields impede or facilitate their goals, would affect career choices. In particular, certain kinds of goals are especially relevant to a career choice. In my study, I was particularly interested in the impact of communal and romantic goals. Communal goals are goals related to one's desire to promote relationships with others (e.g., the desire to be with others, to have a family, to serve others, etc.). Communal goals are often compared with agentic goals, which are related to the achievement of wealth, power and status. Stereotypically, STEM careers are perceived as affording agentic goals more than communal goals. Diekman et al. found that activating communal goals led to decreased interest in STEM fields for female participants. They also found that STEM fields are seen more positively by female

participants when participants perceived a potential to achieve communal goals associated with STEM careers.

Park, Young, Troisi, and Pinkus (2011) investigated romantic goals to answer the question of why women remain underrepresented at the highest levels of STEM. They specifically examined the impact of romantic goals on women's attitudes toward STEM. They hypothesized that women distance themselves from STEM when pursuing romantic goals because pursuing success in masculine domains conflicts with pursuing romance, which is associated with traditional gender roles. Park et al. found that women, but not men, who were primed with romantic visual or auditory stimuli reported less positive attitudes toward STEM, a finding that supported the researchers' hypothesis.

Predictions and Purpose of Study

An important goal in my review was to analyze studies in this literature to specifically examine the effects of goals and goal orientation on STEM interest. The sample of studies I examined consisted of the following experiments: Diekman, Brown, Johnston, and Clark (2010); Diekman, Clark, Johnston, Brown, and Steinberg (2011); Evans and Diekman (2009); Morgan, Isaac, and Sansone (2001); Park, Young, Troisi, and Pinkus (2011); and Ramsey (2011). All of these studies directly examined the effect of goal orientation on STEM interest. I predicted that, across the board, female participants in these studies would report less interest in STEM if their goals differed from their STEM goal affordance stereotypes. I also predicted that, if these goal affordance stereotypes were altered to fit with female participants' goals, these participants would express more interest in STEM. I did not predict any such effect for male participants. In

addition, I predicted that goal orientation would mediate the effects of participant sex such that if goal orientation were controlled for there would be no significant difference in STEM interest between male and female participants. The purpose of my study is to better understand the causes of the underrepresentation of women at the highest levels of STEM so that greater diversity in STEM fields can be achieved. I hope that the results of my research will shed some light on some of the reasons that women are underrepresented at the highest levels of STEM, and I hope that with this knowledge changes can be made to promote women's entry into these positions.

Analysis of Study Findings Across the Literature: Plan of the Present Study

At the outset of my study, my original goal was to examine studies across the literature that manipulated type of activated goal (communal or romantic versus agentic or neutral goals), and examine the effect of that goal type on STEM interest. I was particularly interested in computing effect sizes for each study. My goal was to combine the effect sizes to get an average effect size showing the effects of the compared goals on STEM interest across the literature, as well as to examine the effects of important moderator variables (e.g., participant sex, or the way in which STEM interest is measured) on the size of the effect. In this way, I could examine the effects of goals on STEM interest using meta-analytical methods (Hedges & Olkin, 1984).

I began this process by searching PsychNET with the keywords STEM and goals. My search discovered all the relevant articles published in this literature ($N = 19$), including dissertations. I discarded studies that did not manipulate goal type, or orientation (e.g., communal or romantic goals) as an independent variable (IV), and all

studies that did not measure STEM interest as a dependent variable (DV) from my analysis. My final sample contained only six studies that fit my requirements. For each study, I coded variables that could moderate the relationship between goal orientation and STEM interest. These potential moderators included year of publication, publication source type, age and sex of participants, the design of study, the geographic area in which study was conducted, the way in which STEM interest was measured, the way in which goal orientation was activated, and the size of the effect when it could be computed.

Of the sample of 6 studies examining STEM interest, as it turned out, only 2 studies across the entire literature yielded effect sizes that could be analyzed to examine the effects of goal orientation on STEM interest—a fact that was difficult to determine before I actually undertook my analysis. . All other studies that seemed to fit my requirements either did not report usable results, or failed to report information necessary (such as the sample sizes) to compute an effect size for the specific comparison I was interested in.

However, I did conduct analyses on the two acceptable studies (Diekman et al. 2011; Ramsey, 2011). When I meta-analytically combined the two effect sizes I obtained using standard meta-analysis techniques (Hedges & Olkin, 1984) via a program called *DSTAT* (Johnson, 1989), the average effect size was $d = +.13$ (95% Ci = -0.12 - +.37), which suggests a very weak, and indeed nonsignificant, effect of goal orientation on STEM interest.

This result is obviously not the whole picture, however. A narrative analysis of the literature suggests that goal orientation does indeed affect STEM interest, and that there is a high probability that the weak average effect size I computed is merely a function of

the small number of studies that could be used in the analysis. With that hypothesis in mind, I proceeded to a narrative analysis of the relevant studies in the literature, in an attempt to assess the effects of goal orientation on STEM interest, and to gain a better picture of studied variables that may impact the relationship.

Examination of Various Task Variables Across Studies

My first task was to examine potential task variables that could differ across studies, and potentially affect the relationship between goal orientation and STEM interest. Some variables are simple typical variants across studies, but they may be nonetheless important. For example, studies are run in different areas of the country, but perhaps there is a difference between the women who choose to attend a big eastern university versus a small Midwest college. In the same way, study methods such as whether participants are tested alone or in groups, or whether participants overhear a conversation or are asked to write essays to activate their goals may make an important difference in the results of an experiment. Thus, all of the studies I examined were coded on various factors or tasks that differ from study to study, in an attempt to examine whether there could be consistent methodological or other factors that could have influenced the relationship between goal orientation and STEM interest across the studies I examined.

Nearly all of the studies I analyzed were conducted in the Midwest, with the exception of the studies run by Park et al. (2011), which were conducted in the Northeast. All the sources included in the analysis were journal articles, with the exception of Ramsey's (2011) dissertation. Because all the studies were similar on these two aspects, it is not likely that they led to differential results across studies.

The majority of the researchers studied participants from an introductory psychology course, but some researchers purposefully recruited students who were self-proclaimed STEM majors. Park et al. (2011) included one study sampling only STEM majors. Diekman et al. (2010) conducted a study measuring STEM majors and introduction to psychology students, and Ramsey (2011) ran two studies sampling both of these groups of students. Ramsey (2011) also conducted one study sampling both STEM majors and STEM faculty members. The differences between STEM majors and the general pool of students that tends to come from introductory psychology courses (for example) is one of initial interest in STEM; this difference in initial interest ought to interact with the manipulations and lead to different measurements of STEM interest.

I attempted to ascertain the method by which participants were run in studies, whether they were run individually or as a group; however, this information was seldom recorded by the researches and as a result it was discarded as a factor in the coding. I regard this as a potential problem in the literature: The presence of a group of others when communal goals are activated and compared to other kinds of goals, such as agentic goals, represents a potential confound for goal orientation studies (Mullen, 1983). Specifically, to the degree that the mere presence of others may serve to activate, or at the very least accentuate, communal goals, group size ought to be controlled for in goal orientation studies.

There is a large body of research in the social psychology literature that shows that the mere presence of others affects behavior. For instance, Zajonc (1965) presented the social facilitation theory, which posits that “the presence of others, as spectators or as co-

actors, enhances the emission of dominant responses" (p. 273). This means that when somebody is already skilled at an activity, the presence of a group will serve to improve that person's performance of the activity. However, when someone is less skilled at an activity, the presence of a group may worsen the performance for that person; the presences of others facilitates his or her dominant response. In both cases, the change in performance is due to an awareness of evaluation from others.

Another case in point comes from self-attention theory (Carver & Scheier, 1981): Mullen's (1986) study on group composition effects shows that as people become more deindividuated by belonging to larger groups, there is a breakdown in normal self-regulation processes and an increase in transgressive behaviors. More to the point, Mullen (1983) demonstrated that becoming self-aware because one realizes that one is identifiable as the "only" type of person in a group of others (e.g., the only man, or the only woman) has the same effect as other self-focusing stimuli. Being the only woman in a group, for example, may cause one to focus on one's gender roles and norms associated with it. The self-attention literature shows that when one is self-aware, one is, under certain conditions, more likely to match one's behavior to salient norms in particular settings.

Self-attention theory thus asserts that group composition is important. In the goal orientation literature, group composition of participant groups could easily have affected how participants rated STEM interest in a particular context, and Park et al. (2011) were the only researchers to carefully report the group composition in their studies as being five or fewer people of the same sex led by a same-sex experimenter. Researchers in this

literature should all control for the experimental group's effects to make sure that it is not influencing study results. In the future, care should be taken to record whether studies were run individually or in groups, and especially when goals are being manipulated, the participants should be run on an individual basis.

All of the studies included in this analysis were run after the year 2000, which demonstrates the recency of this literature. Indeed, 67% of the studies in this analysis were conducted within the last three years. This, in an of itself, is an interesting fact, if only because ideas about a traditional female role still seem to influence the choices of young women in the 21st century. One of the things that is fascinating about this literature is the very fact that the influence of the traditional female role seems to persist, and continues to influence women in their choice of careers.

However, that fact may be due largely to the influence of goal orientation on women; goal orientation is often confounded with the traditional gender role. For example, communal goals are arguably much more consistent with a traditional female role than are agentic goals. A woman who does not hold to notions consistent with a traditional female gender role may nonetheless strongly hold communal goals. This question has not yet been examined in the literature directly. Future studies ought to separate the two variables clearly to examine their distinct effects.

Examining the Effects of Different Goals

The sample of studies I examined measured and manipulated different kinds of goals. My primary interest was in those studies that compared communal goals or romantic goals to some other type of comparison goal. Sometimes the comparison goal

that researchers activated was neutral (e.g., thinking about nature); sometimes the comparison goal was intended to be one that was in seeming opposition to communal goals (e.g., agentic goals). An analysis showed that studies in my sample compared romantic versus intelligence goals (such as performing well on an exam), romantic versus friendship goals (such as nurturing a platonic relationship), communal versus agentic goals, communal versus neutral goals (such as caring for nature), caregiving versus status goals, and interpersonal versus extrinsic reward goals. Obviously, the goal type is not clear cut: Romantic and friendship goals could both be construed as having communal elements. In addition, caregiving and interpersonal goals are very similar in meaning to communal goals, just as status and extrinsic reward goals are very similar in meaning to agentic goals. Because of this, I present these comparisons under my analysis of communal goals and make a distinction between this analysis and my analysis of romantic goals.

The comparisons in my sample were as follows: Only Park et al. (2011) included romantic goals as part of their comparison, but their article summarized the results of four different studies, each measuring or manipulating romantic goals. Three of these studies compared the effects of romantic goals to intelligence goals, but one study compared the effects of romantic goals to those of friendship goals. Several studies compared communal goals to agentic goals: Diekman et al. (2010); Diekman et al. (2011); and Ramsey (2011) (four studies). Diekman et al. (2011) also conducted a study comparing communal versus neutral goals. Evans and Diekman (2009) compared caregiving versus

status goals, and Morgan, Isaac, and Sansone (2001) conducted two studies, both comparing interpersonal versus extrinsic rewards goals.

In order to include all of these studies in my analysis, they had to measure or manipulate some form of communal or romantic goal, and examine its effect on STEM interest. I included any study that seemed to examine some element of communal or romantic goals; thus, studies that measured or manipulated communal, caregiving, interpersonal or romantic goals were all included. These studies, of course, were designed to explain women's interest in STEM based on the goals women were striving to achieve.

Studies that Measured or Manipulated Communal Goals

Morgan, Isaac, and Sansone (2001). Morgan et al. (2001) studied the roles of interpersonal and extrinsic reward goals in career choice. They asked participants to report their current major, work plans, and reasons for choosing a career. The researchers then assessed the importance that the participants placed on work goals such as interpersonal and extrinsic reward goals. The researchers found that women were more likely than men to report interpersonal goals as a reason for having chosen their careers, while men were more likely than women to report extrinsic reward goals such as high pay and status as a reason for having chosen their careers.

To delve into the issue further, Morgan, Isaac, and Sansone (2001) conducted a second study. Participants completed a questionnaire that measured their perceptions of different careers' goal affordances. Interpersonal goals were assessed through agreement with the statements that this career "would allow me to work with other people" and "would allow me to help others." Extrinsic reward goals were assessed through

agreement with the statement that this career "would provide the opportunity for high pay and status." After having responded to these statements, the participants reported how likely they were to enter into each career. The researchers grouped the careers into the physical and mathematical sciences (math, chemistry, computer science, and engineering), education and social services, and medicine.

Morgan, Isaac, and Sansone (2001) found that participants perceived careers in the physical and mathematical sciences and medicine as affording extrinsic reward goals more than careers in education and social services. They also found that participants perceived careers in education and social services and medicine as affording interpersonal goals more than careers in the physical and mathematical sciences. The participants' interpersonal goal affordance stereotypes predicted their interest in careers, and any sex differences in career interest were mediated by goal affordance stereotypes.

Evans and Diekman (2009). Evans and Diekman (2009) studied caregiving versus status goal affordance stereotypes held about gender-typical careers. Participants took a survey measuring the extent to which they perceived female- and male-stereotypic careers as affording caregiving or status goals. Participants rated on a 7-point Likert scale (1932) how much each career would help them "achieve high status" and how much each career would help them "take care of others." The researchers hypothesized that the participants would consider male-stereotypic careers as affording status goals and female-stereotypic careers as affording caregiving goals, and their findings supported this prediction.

Evans and Diekman (2009) then conducted a study on motivated role selection by measuring the importance of goals for undergraduate students at a midwestern university and their interest in different careers. Career interest was measured on a 7-point Likert scale, and the goals were measured through four item status and caregiving goals scales. Next, the researchers conducted a 2 (Participant Sex: Male or Female) X 2 (Goal: Communal or Agentic) *ANOVA*, with participant sex as a between-subjects variable and goal as a within-subjects variable. Then they conducted a 2 (Participant Sex: Male or Female) X 2 (Career: Female-Stereotypic or Male-Stereotypic) *ANOVA* with career as the within-subjects factor. The researchers concluded that the results of the analyses supported the hypothesis that gender differences in career interest are caused by gender differences in goals. The male participants endorsed status goals more than did the female participants, and participants who endorsed more status goals were more likely to be interested in male-stereotypic careers. Female participants, on the other hand, endorsed caregiving goals more highly, and participants who endorsed caregiving goals were more likely to be interested in female-stereotypic careers. It was not participant sex, the researchers concluded, but instead it was different goal endorsements that led to different levels of career interest.

Evans and Diekman (2009) then conducted a third study in which they measured participants' gender-typical or -atypical self-concept, beliefs about gender norms, ambivalent sexism, gender-typical or -atypical goals, and career interest. The results of this study provided confirming evidence for the results of the second study's findings that differently gendered goals underlie sex differences in career interest (Evans & Diekman,

2009). Males endorsed more status goals, and a higher endorsement of status goals predicted a greater interest in male-stereotypic careers. Females endorsed more caregiving goals, and a higher endorsement of caregiving goals predicted a greater interest in female-stereotypic careers. Goals significantly mediated the relationship between sex and career interest. Through their analysis of their results of the third study, Evans and Diekman (2009) also discovered that gender differences in goals and career interest are completely accounted for by differences in beliefs about gender roles. This is further evidence for the connection between role congruity theory (Eagly & Karau, 2002) and and the later posited goal congruity theory (Diekman, Clark, Johnston, Brown, & Steinberg, 2011).

Diekman, Brown, Johnston, and Clark (2010). Diekman et al. (2010) conducted a study measuring the extent to which participants seek congruity between goals and roles. They sampled students from STEM and introductory psychology courses at a university in the Midwest. The students completed randomly ordered measures of goal endorsement, career interest, and self-efficacy. They were also instructed to provide goal-affordance ratings and information about their math and science experience. Participants rated the importance of agentic and communal goals to them on 7-point scales, and the results within each scale were averaged. Agentic goals included such elements as power, recognition, achievement, mastery, self-promotion, independence, individualism, status, focus on the self, success, financial rewards, self-direction, demonstrating skill or competence, and competition. Communal goals included the elements helping others, serving humanity, serving community, working with people,

connection with others, attending to others, caring for others, intimacy, and spiritual rewards. Career interest was measured on a 7-point scale, and careers were categorized as STEM (industrial engineer, chemical engineer, electrical engineer, and network and computer systems administrator), male-stereotypic (chief executive, surgeon, chiropractor, and pediatrician), and female-stereotypic (elementary-school teacher, administrative assistant, therapist, and health-services advocate). Participants were additionally asked to rate the perceived goal affordance of these careers, rating how much they believed that each career would fulfill agentic and communal goals.

Diekman, Brown, Johnston, and Clark (2010) analyzed the results of the study using a 2 (Goal: Communal or Agentic) X 3 (Career Type: STEM, Male-Stereotypic, or Female-Stereotypic) X 2 (Participant Sex: Male or Female) *ANOVA*. Career type and goal endorsement were within-subjects variables, and participant sex was a between-subjects variable. For STEM careers, the researchers found that endorsing communal goals significantly inhibited female participants' STEM interest, whereas endorsing agentic goals endorsement facilitated female participants' STEM interest. They also found that endorsing communal goals predicted the discrepancy between STEM and female-stereotypic careers and the discrepancy between STEM and male-stereotypic careers. This is in line with my prediction that participant goals rather than participant sex affect interest in STEM. Participant sex cannot be changed, and participant goals cannot be easily changed either. However, if participant goal affordance stereotypes can be manipulated, participants' interest in STEM could be changed.

Diekman, Clark, Johnston, Brown, and Steinberg (2011). Diekman et al. (2011) conducted several studies examining the malleability of communal goals and beliefs and how these goals and beliefs influence interest in STEM careers. This is another method through which to examine whether participant goals and goal affordance stereotypes rather than participant sex affect participant interest in STEM. In one of their studies, introduction to psychology students were randomly assigned to either read about the typical day of a scientist whose activities were framed as highly collaborative, or about the typical day of a scientist whose activities were framed as highly independent. These conditions were meant to frame STEM careers as either collaborative or individual, and the researchers hypothesized that the framing would effect participants' interest in STEM.

For example, in the collaborative scientist condition, participants read, "Mentor new members of my statistics group in doing data analysis" as an example of what a collaborative scientist would do. In contrast, participants assigned to the independent scientist condition read that the scientist would "do data analysis... and troubleshoot any problems that come up by myself" (Diekman et al. 2011, p. 9). All participants also read about a non-STEM career as a filler, and the presentation of career descriptions was randomized to prevent order effects. The researchers then measured goal affordance by asking the participants to rate on a 7-point scale the degree to which a job as a scientist would fulfill their (communal) goals of helping others. General interest in STEM was measured by asking participants to rate how enjoyable a career as a scientist would be and how positive or negative their impression of a career as a scientist was.

The experimental design was a 2 (Framing: Collaborative or Independent) X 2 (Participant Sex: Male or Female) between-subjects design. The results of the experiment were analyzed to measure the effects of framing on goal affordances, goal endorsement, and career attitudes (i.e., STEM interest). Diekman et al. (2011) found that the framing of the STEM career as collaborative or independent had an effect on participants' goal affordance stereotypes (i.e., their expectations that a science career would fulfill particular career goals). Namely, participants expected that science careers would fulfill communal goals more when they had read about a scientist involved in mentoring versus when they read about a scientist working independently. The researchers also found that, although both men and women endorsed communal goals more than agentic goals, women endorsed communal goals more than men did. The researchers additionally found that women expressed attitudes that were more positive toward the career when the career was framed as collaborative versus when it was framed as independent. Interestingly, framing of the scientist's career did not affect men's career attitudes.

In analyzing their data, Diekman et al. (2011) hypothesized that goal affordance stereotypes cause the effects framing has on career ratings. They performed regression analyses to show they were correct: Framing predicted both perceived communal goal affordances and attitudes toward the career. They also showed that when both framing and communal goal affordances were entered into the analysis as predictors of attitude toward the career, goal affordances, but not framing, predicted career positivity. This is an interesting finding because one would expect, as they first hypothesized, that the mere impact of the way that a career is framed would affect evaluations of a particular career.

By their analysis, Diekman et al. demonstrated that, indeed, the belief about whether the career will afford one's important goals is more important than how the career is described to people.

Diekman et al. (2011) showed that participants rated STEM careers more positively when they perceived these careers as fulfilling communal goals, especially when participants already strongly endorsed communal goals. Based on their results, the researchers concluded that altering perceived goal affordances will lead to changes in STEM career interest. Their finding is significant because it suggests that goal affordance stereotypes are malleable and can affect STEM interest. If STEM careers are presented as fulfilling communal goals, more women may be drawn to them, thus decreasing the gender gap at the highest levels of STEM.

The researchers conducted another study manipulating communal goals, this time through writing tasks designed to activate either communal or neutral goals. Participants were asked either to write about a failure to act communally or to write about the forest floor (neutral goal). After answering their randomly assigned writing prompt, participants were instructed to report their interest in STEM, male-stereotypic careers, and female-stereotypic careers on a 7-point Likert scale. The researchers analyzed the data in a 2 (Participant Sex: Male or Female) X 2 (Goal prime: Communal or Neutral Goal Activation) X 3 (Career Type: STEM, Male-Stereotypic, or Female-Stereotypic) mixed *ANOVA*, with career type as a within-subjects variable while goal prime and participant sex were between-subjects variables. When communal goals were activated, interest in

STEM careers decreased while interest in male-stereotypic and female-stereotypic careers remained relatively stable.

Diekman et al. (2011) conducted several preliminary studies before running the above-mentioned experiments. They began their (2011) research by sending out a mass survey to introductory psychology students in which participants were asked to rate the importance of communal and agentic goals. The researchers analyzed the survey results in a 2 (Participant Sex: Male or Female) X 2 (Goal: Communal or Agentic) ANOVA. Goal was a within-subjects variable, whereas participant sex was a between-subjects variable. Women in the study rated communal goals more highly than did men, and men rated agentic goals slightly higher than women. Their results illustrate that, consistent with Eagly and Karau's (2002) role congruity theory, "gender differences in personal attributes tend to align with the current division of labor" (Diekman et al. 2011, p. 5). In general, communal goals were highly endorsed, indicating that they are highly valued in general.

The next preliminary study Diekman et al. (2011) performed measured participants' explicit goal affordance stereotypes. The researchers instructed introduction to psychology students to rate on a 7-point Likert scale how likely different careers were to fulfill agentic or communal goals. Careers were categorized as either STEM, male-stereotypic but non-STEM, or female-stereotypic. STEM careers included mechanical engineer, computer scientist, aerospace engineer, or environmental scientist; male-stereotypic careers included CEO, dentist, physician, or lawyer; and female-stereotypic careers included social worker, nurse, teacher, education administrator, or human

resources. The researchers performed a 2 (Goal: Communal or Agentic) X 3 (Career Type: STEM, Male-Stereotypic or Female-Stereotypic) X 2 (Participant Sex: Male or Female) mixed *ANOVA* analysis. Participant sex was a between-subjects variable, whereas goal and career type were within-subjects variables. Results showed that STEM careers were perceived as affording significantly fewer communal goals than were other careers, and female-stereotypic careers were perceived as affording significantly fewer agentic goals than were other careers.

In their final preliminary study, Diekman et al. (2011) asked introductory psychology students and STEM majors to complete IATs. Participants had to match words relating to science and words relating to medicine first with the respective categories of science and medicine. Then they had to match words such as "warmth" and "together" with a communal category and words such as "power" and "alone" to an agentic category. After making these initial pairings, participants had to match words to the stereotypic categories "communal/medicine" and "agentic/science" and then to the counterstereotypic categories "communal/science" and "agentic/medicine." Science and medicine were the comparison careers because the researchers wanted to determine the different associations that exist between STEM and male-stereotypic careers. Presumably, it would take participants who subscribed to more traditional goal affordance stereotypes less time to match stereotype-consistent categories (e.g., communal/medicine and agentic/science) than it would to match counterstereotypic categories (e.g., communal/science and agentic/medicine). Diekman et al's results showed that the IATs did indeed reveal stereotypic associations. Moreover, women had stronger stereotypic

associations than men. All of these initial studies conducted by Diekman et al. (2011) provide support for the goal congruity theory. They indicate the importance of goal affordance stereotypes in making career choices and illustrate the consequence of being able to alter these goal affordance stereotypes in order to interest more women in STEM.

Ramsey (2011). Ramsey (2011) conducted four studies measuring and manipulating goal orientation and goal affordance stereotypes. Ramsey's first study involved STEM faculty and undergraduate STEM majors at Big Ten schools completing an online survey. Participants were asked "What personal traits and/or characteristics do you think contribute to success in a science career?" and instructed to respond in either an open-ended manner or a closed-ended manner. In the closed-ended condition, participants were instructed to rate the importance of different traits, including agentic traits (e.g., confident, hardworking, assertive, etc.) and communal traits (e.g., helpful, selfless, supportive, etc.). In the open-ended condition, participants were instructed to list and rate any important traits that came to mind; the responses were then coded as either communal, agentic, or neither.

Ramsey (2011) also measured goal affordance stereotypes, and the extent to which participants associated agentic or communal traits with themselves. She additionally measured participants' success in and attitudes toward STEM, their chosen field. As a measure of their success, students indicated whether they expected their career to be in the same field as their major, and faculty participants indicated how often they had published and how many grants they had been awarded. Participants also rated how satisfied they were with their current career choices, how accepted they felt in their

chosen career choice, and how motivated they felt to continue with their major or field. These were all measures of participants' success in and attitudes toward science.

An analysis of the closed-ended responses showed that participants rated agentic words as more important for success in science than communal words. In the open-ended condition, participants listed more agentic than communal traits, and rated them as more important for careers in science. The participants' goal affordance stereotypes clearly demonstrated a belief that agency goals, as opposed to communal goals, were more strongly associated with science careers.

In general, male participants rated themselves as more agentic than communal, whereas women viewed themselves as equally communal and agentic. Participants' ratings of themselves and career traits were significantly correlated, such that if they considered themselves communal they were more likely to consider communal traits as important for success in science careers. Even though there was no difference in the ratings of success between female and male faculty members, female faculty members reported attitudes toward science that were less positive than male faculty members' attitudes. Faculty participants who rated themselves as more agentic were more likely to consider themselves successful in science and to have positive attitudes toward the discipline. The results of Ramsey's (2011) first study indicate that participants had strong goal affordance stereotypes linking science with agency, and when they considered themselves to be agentic (and thus to be matched with their goal affordance stereotypes) they were more positive about STEM.

In her second study, Ramsey (2011) examined the effects of holding the stereotype that men are better suited for careers in science than women, and investigated how one can alter that stereotype. Introductory psychology students were randomly assigned to a condition that would either increase communal-science associations or increase agentic-science associations. Participants in the communal-science condition read a paragraph emphasizing collaboration within the science discipline and saw a graph indicating that most articles that were published in the top ten science journals were written by five or more collaborative authors. Participants in the agentic-science condition read a paragraph emphasizing the independence of science careers and saw a graph indicating that most articles published in the top ten science journals were written by single authors without collaborators.

Through her pretests, Ramsey (2011) established that this manipulation affected explicit associations but not implicit ones, so she added a second manipulation involving the memorization of word pairs. Participants were randomly assigned to either a counterstereotypic condition in which they were instructed to pair communal words with science and agentic words with humanities, or to a stereotypic condition in which they were instructed to pair agentic words with science and communal words with humanities. Presumably, if participants made stereotypic pairings during the manipulation they would be primed to give faster responses to stereotypic word pairings in the IAT and vice versa.

After these manipulations, Ramsey (2011) measured the participants' sex-science stereotyping levels and identification with science *explicitly* through a questionnaire and *implicitly* through the single category IAT. Sex-science stereotyping is the level to which

the individual associates science with maleness. For this IAT, participants categorized words into the categories “male,” “female,” or “science,” and their response times were recorded. It would be clear to the participants which of these categories the words belonged in. After making these individual pairings, participants were instructed to match words to the category “science/male” and then to the category “science/female.” Participants who had faster response times when matching words to the “science/male” category as opposed to when matching words to the “science/female” category were argued to be displaying an implicit gender-science association. To test implicit associations between the self and science, the categories self and other replaced the categories male and female in the IAT.

Ramsey’s (2011) results showed that women who were in the agentic priming condition at the beginning of the study and who associated science with men on the implicit measures, also tended not to identify themselves with science on the implicit measures. Because implicit associations assess automatic tendencies, Ramsey’s results suggest that awareness of particular goals at a given time can accentuate the effects of stereotypic beliefs on self-identification with science careers. According to Ramsey, her study demonstrated that the association between agentic goals and science is “causally related” (p. 34) to the relationship between sex-science stereotyping and one’s identification with science careers. Her results also showed that increasing associations between communal goals and science weakened the effect. Although goal affordance stereotypes are not necessarily about women being “unfit” for science careers, they indirectly influence such a conclusion by insinuating that women may not possess the

traits important for success in science fields. Based on Ramsey's findings, if the fulfillment of communal goals through science careers was stressed, women would be more interested in science fields and employers would be more open to hiring women for these positions.

Next, Ramsey (2011) developed a pyramidal model of sex stereotyping based on Eagly and Karau's (2002) role congruity theory and Greenwald et al.'s (2002) unified theory. Ramsey explained:

> Strong associations exist between the attributes of gendered traits and the social groups of males and females. Because these traits are more or less important for various roles and behaviors, these sex-traits associations then create expectations of an individual's behavior based on their sex. Thus, a sex stereotype is the product of the sex-traits and traits-behaviors associations. (p. 35)

Based on this model, Ramsey predicted that participants whose sex-science stereotype and science identity are largely consistent with other associations would be more likely to pursue a career that is consistent with their major.

Undergraduate students majoring in both STEM fields and the humanities were recruited to participate in Ramsey's (2011) study. Participants took IATs as a measure of their associations. These IATs differed from the single category IATs used in Ramsey's second study because they involved two pairs of categories (similar to the basic IAT first described in this review). Humanities was used as a comparison for science rather than medicine. Participants also completed explicit measures by filling out questionnaire items. Additionally, participants reported whether they intended to continue in their

chosen discipline and what their post-graduation plans were. At the end of the study, participants were instructed to choose to complete either a science-related or a word-related puzzle. Ramsey hypothesized that participants who showed higher levels of cognitive consistency would be more likely to choose to complete a puzzle that was consistent with their major.

Ramsey's (2011) analysis showed support for her hypothesis that people generally form cognitively consistent patterns of association between the self, sex, traits, and discipline. These associations, consistent with Heider's (1946) balance theory, were between sex-traits-self, discipline-traits-sex, sex-discipline-self, and discipline-traits-self. As an addition to balance theory, each association in the pyramidal model is part of two triangles, which means that the strength of any association may affect the strength of any other association. If any association in the pyramidal model is altered, it may affect other stereotypes. When associations between the self and discipline were involved, there was no evidence that the strength of an association in the triangle depended on the other two associations. People who were already in fields that traditionally were associated with their sex showed a stronger adherence to their pattern of associations than those who were in fields that were not traditionally associated with their sex. Those who showed a stronger adherence to their patterns of implicit associations were more likely to choose a puzzle consistent with their major and to report plans for a career in their major's field. These results suggest that, in order to stimulate more women to enter and continue in STEM fields, a cognitively consistent pattern of associations supporting women's participation in STEM is important. This cognitively consistent pattern involves,

importantly, a balance between beliefs about what traits are required in a certain discipline and what traits one possesses.

Ramsey's (2011) final study sought to determine whether patterns of association could be manipulated in order to increase women's identification with STEM. Undergraduate students from both STEM and humanities majors were randomly assigned to conditions in which they were instructed to complete a memory task. In the counterstereotypic condition, participants memorized 200 word pairs consisting of communal words matched with science and agentic words paired with humanities. In the stereotypic condition, participants memorized 200 word pairs consisting of agentic words paired with science and communal words paired with humanities. In pretests, Ramsey found that these manipulations influenced implicit associations, as measured by an IAT. The participants in Ramsey's study completed implicit and explicit measures for patterns of association, reported their intended careers, and chose between a humanities or a STEM puzzle after completing the memory task.

Ramsey's (2011) final study served to replicate her findings from her third study, and it also showed that the traits-discipline association could be manipulated but not reversed through a memory task. In other words, participants who had been randomly assigned to the counterstereotypic condition still associated STEM with agency and humanities with communality, but they did not associate these categories as strongly as those participants who had been randomly assigned to the stereotypic condition. As the pyramidal model would predict, a change in one association (the traits-discipline association) would affect other associations as well.

Although Ramsey's (2011) manipulation did not affect the relationship between explicit sex-traits and sex-discipline associations, it did affect the implicit associations. For instance, participants in the stereotypical condition associated men with STEM and women with humanities as well as men with agency and women with communality more than those who had been assigned to the conterstereotypical condition. The manipulation had no effect on the relationship between implicit self-discipline and self-traits associations, but it did have an effect on explicit associations. For example, participants who had been assigned to the stereotypic condition associated themselves with agency more when they associated themselves with STEM. The counterstereotypic condition was able to disrupt this association; the participants who had been assigned to this condition did not display a significant relationship between their self-discipline and self-traits associations. The manipulation did increase female STEM majors' cognitively consistent patterns of implicit associations, which suggests that such manipulations increasing associations between communality and science could lead to higher levels of success for women in STEM fields.

Studies that Measured or Manipulated Romantic Goals

Park et al. (2011) recognized that women who display agentic qualities are perceived unfavorably and hypothesized that the pursuance of romantic goals for women may conflict with the pursuance of intelligence goals in STEM. The researchers conducted several studies to test this hypothesis. First, they examined the effects visual primes related to intelligence or romantic goals had on female and male participants. Before the experiment, introductory psychology students reported their interest in

pursuing a degree or career in a STEM field. At the beginning of the experiment, participants viewed and rated images that were related to either romantic desirability or intelligence based on whether they had been assigned to the romantic goal prime condition or the intelligence goal prime condition respectively. After having been primed, the participants completed a questionnaire in which they reported their interest levels in STEM and their preferred academic majors.

The results of Park et al.'s (2011) analysis indicated that female participants who saw the romantic images reported less interest in STEM careers than did women who saw the intelligence images. This effect was not present for male participants. Additionally, women in the romantic goal prime condition reported less preference for STEM majors than did women in the intelligence goal prime condition. Again, this effect was not present for male participants. The researchers also found that women who had been assigned to the romantic goal prime condition reported a greater preference for English and foreign language majors than did women who had been assigned to the intelligence goal prime condition. The results of this first study support the original hypothesis that women are less interested in STEM after being primed with romantic goals as opposed to intelligence goals. This may be due to a perceived conflict between romantic and intelligence goals; women may attempt to resolve this conflict by instead identifying more with traditionally feminine disciplines.

The second study Park et al. (2011) conducted involved a different type of manipulation. The experimental design utilized in this study was based on the goal contagion hypothesis, which states that perceiving the goal pursuits of others activates

those goals in oneself (Aarts, Gollwitzer, & Hassin, 2004). Participants were randomly assigned to conditions in which they either overheard a conversation that was meant to prime a romantic goal or they overheard a conversation that was intended to prime an intelligence goal. The researchers hypothesized that female participants who overheard the conversation priming romantic goals would report less positive attitudes toward STEM fields and less preference for STEM majors than would female participants who overheard the conversation priming intelligence goals. They predicted no such effect for men, and they predicted that the change in STEM interest would be due to perceived conflicts between romantic goals and intelligence goals in STEM. During the experiment, a same-sex experimenter informed participants that he or she was waiting for another participant to come before beginning the study. After leaving to "look for the late participant," a same-sex confederate started a conversation with the experimenter outside the doorway that was about either a recent date or a recent exam, depending on the condition. After having "overheard" this conversation, participants reported their attitudes toward STEM fields and their preferences for different majors.

Park et al. (2011) conducted a multiple regression analysis and found that female participants who overheard the romantic conversation reported less positive feelings toward STEM than did female participants who overheard the intelligence conversation. In contrast with the results of the first study, males in the romantic goal prime condition did not report different attitudes toward STEM compared to females. In fact, female participants who were in the intelligence goal prime condition reported higher levels of favorability toward STEM than did males in the same condition. Another regression

analysis yielded results suggesting that women who overheard the conversation priming romantic goals reported less preference for STEM majors than did women who overheard the conversation priming intelligence goals. The same contrast with study one was evident in this analysis as well. Similar to the results of the first study they conducted, Park et al. (2011) found that women who had overheard the conversation priming romantic goals expressed a greater preference for English and foreign languages majors than did men, whereas there was no sex difference in reported preferences for majors among participants who overheard the conversation priming intelligence goals.

As is evident from this synopsis, the results of Park et al.'s (2011) second study generally confirmed the results of their first study. One key difference between the two studies was that the first involved an explicit prime (viewing images), whereas the second involved an implicit prime (overhearing a conversation). This may have resulted in the finding that men and women in the second study did not differ in their STEM attitudes or preference for STEM majors after overhearing the conversation priming romantic goals. The other significant discrepancy between the first two studies' findings is that women in the second study expressed more favorable attitudes than did men after having overheard the conversation priming intelligence goals. A possible explanation for this discrepancy that Park et al. (2011) presented is that there was a same-sex role model effect like the one Lockwood (2004) reported. Hearing a woman talk about intelligence goals may have enhanced female participants' interest in academics across the board, including in STEM fields.

Park et al. (2011) conducted a study similar to the one in which participants were primed by overhearing a conversation about intelligence or romantic goals, but they switched the conversation about intelligence goals to one on friendship goals in order to determine whether romantic goals are unique and can be differentiated from the more general interpersonal goals. After gathering the data, the researchers again conducted multiple regression analyses. They found that women, but not men, who overheard the conversation priming romantic goals reported less positive feelings toward STEM than did women who overheard the conversation priming friendship goals. They also found that there were no sex differences in STEM attitudes of participants who overheard the romantic conversation, and female participants who overheard the friendship conversation reported more positive attitudes toward STEM. Additionally, women, but not men, who overheard the conversation priming romance goals showed more interest in the arts than did women who overheard the conversation priming friendship goals. Women in the romance condition also reported more positive feelings toward the arts than did men in the same condition. Women, but not men, in the romance condition reported less of a preference for STEM majors than did women in the friendship condition. Women in the romance condition also reported less preference for STEM majors than did men in the same condition, which is parallel to the findings from Park et al.'s first study.

Park et al. (2011) conducted a final study involving a more explicit measure of goal pursuit in which female participants reported on their daily romantic and intelligence goal strivings and activities, in addition to their feelings of attractiveness, desirability and

likability. They based this design on Shah and Kruglanski's (2002) findings that active goals increase the accessibility of ways to achieve those goals and decrease the accessibility of competing goals and ways to achieve those goals. The results of Park et al.'s study indicated that when women were striving to achieve romantic desirability, they reported haven taken part in more romantic activities and reported feeling more desirable. However, they also reported having engaged in fewer math activities. These results suggest that, as women focus on romantic goals, they may spend less time pursuing STEM interests. A possible solution to this problem is to minimize the conflict that women sense when pursuing both romantic and STEM goals.

Conclusions

More research needs to be conducted with goal orientation as an IV and STEM interest as a DV before a solid conclusion as to their effects can be reached. The effect sizes that were available were small enough to call into question the significance of the findings presented in my review; however, the effect sizes were computed from only two studies, so the nonsignificant result could merely be due to a too-small sample size. The literature I reviewed does stand up to my hypothesis that participant sex is not the mediating factor in STEM interest. Instead, the results of the studies reviewed in this analysis indicate that goal orientation and goal affordance stereotypes mediate this relationship. The studies were also in accordance with my prediction that goal affordance stereotypes can be altered in order to raise female participants' interest in STEM.

These findings could potentially change the face of STEM in the future. If the reason women are not entering the highest levels of STEM is due to malleable goal

affordance stereotypes rather than permanent biological sex differences, there is a great possibility for change. In fact, the goal affordances that most people seem to hold may in fact be incorrect; scientists do collaborate and work together to write articles and conduct research. Women may be able to achieve their communal goals as scientists much more easily than they think.

Despite this hopeful message, the literature does have some shortcomings. For instance, the research focusing on communal goals may explain why women choose helping-professions over careers in STEM, but it does not explain the overall preference for the liberal arts. Degrees in the humanities do not lend themselves to the achievement of communal goals. Park et al.'s (2011) research on romantic goals may instead explain this phenomenon; they posit that women may attempt to resolve the perceived conflict between romantic and STEM goals by instead identifying more with traditionally feminine disciplines, such as the humanities. Park et al.'s (2011) study comparing romantic and friendship goals also suggests that romantic goals may be separate from and have an even stronger effect on women than do communal goals in general. More research needs to be conducted on this phenomenon to determine the actual distinction between these two sets of goals.

Although there are many gaps and shortcomings in this literature, I am hopeful that the recent research on goal orientation and goal affordance stereotypes will be used to encourage female participation at the highest levels of STEM. It may not completely explain the inequality between men and women in STEM careers, but it is a part of the story.

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