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EXPLORING SELF-EFFICACY AS A POSSIBLE MODERATOR OF THE KÖHLER DISCREPANCY EFFECT

By

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ABSTRACT

EXPLORING SELF-EFFICACY AS A POSSIBLE MODERATOR OF THE KÖHLER DISCREPANCY EFFECT

By

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Köhler (1926, 1927) found that when performing a taxing physical persistence task, less able participants tried harder when working in a team under conjunctive task demands than when working individually (the *Köhler motivation gains effect*), and that this increase in effort was greatest when there was a moderate discrepancy in coworker ability (the *Köhler discrepancy effect*). A recent investigation (Messé, Hertel, Kerr, Lount & Park, 2002) successfully reproduced both Köhler's overall motivation gain and the Köhler discrepancy effects. In an extension of the successful replication of the Köhler discrepancy effect, the present study investigated 1) how the manipulation of self-efficacy affects motivation gains in conjunctive dyad group performance, 2) whether the Köhler discrepancy effect would be maintained or altered when participants were given either high or low self-efficacy information. Results of this study suggested that participants showed greater motivation gains when they had low self-efficacy rather than high self-efficacy, and the impact of self-efficacy was strongest under a moderate level of perceived discrepancy. Also, the results indicated that the Köhler discrepancy effect was more likely to occur when participants had the low rather than high self-efficacy information. Implications of these results for understanding the Köhler discrepancy effect and directions for future study were discussed.

To my parents, Doo-Ryoung and Jung-Ae, and my wife, Ji-Hyeong,

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

INTRODUCTION

Köhler motivation gain and discrepancy effects

Testing members of a Berlin rowing club, Köhler (1926, 1927) found that members tended to work harder at a demanding physical persistence task when they performed it as part of a team (in dyads or triads) than when they worked at it individually – a phenomenon that later was termed the *Köhler motivation gain effect* (Hertel, Kerr, Scheffler, Geister, & Messé, 2000). Contemporary social psychologists have begun to investigate the processes underlying this effect (e.g., Hertel, Kerr, & Messé, 2000; Messé, Hertel, Kerr, Lount & Park, 2002; Stroebe, Diehl, & Abakoumkin, 1996). Considering the fact that studies on individual's motivation in groups have been focused mainly on group motivation losses (e.g., social loafing; Latané, Williams, & Harkins, 1979), the rediscovery of this work was important in that it – along with another line of motivation gain studies (e.g., social compensation; Williams & Karau, 1991) – helped rekindle interest in group motivation gains.

In Köhler's (1926, 1927) motivation gain study, two features are particularly noteworthy. First, in the group trials, it was virtually impossible for the stronger coworker to continue working at the task after the weaker coworker had stopped. In Steiner's (1972) perspective on task demands, this type of activity can be classified as a *conjunctive task* because, in performing it, a group can do no better than its least capable member.

The second noteworthy feature of Köhler's (1926, 1927) research is that the motivation gains were maximal when the discrepancy between the capabilities of the two dyad members was *moderate* (i.e., when working individually, the weaker member had about 70% of ability as that of the stronger member). In contrast, (perhaps due to coordination problems) motivation losses occurred when group members were nearly equal, and smaller motivation gains were found when members were very discrepant in their capabilities. Later, this phenomenon was termed the *Köhler discrepancy effect* (Hertel, Kerr, Scheffler, et al., 2000).

Inspired by the Köhler's (1926, 1927) seminal work on group motivation gains, several subsequent studies have been conducted. However, these studies have mainly focused on the Köhler motivation gain effect rather than Köhler discrepancy effect. Seven studies (Hertel, Kerr, & Messé, 2000, Experiments 1 and 2; Hertel, Kerr, Scheffler, et al., 2000, Experiments 1 and 2; Lount, Messé, & Kerr, 2000; Messé, et al., 2002, Experiments 1 and 2) consistently found significant motivation gains for weaker coworkers when they performed as a team member under conjunctive task demands, with average performance increases in group compared to individual trials that ranged between 10 and 50 percent. These studies by successfully replicating the Köhler motivation gain effect have given researchers a solid foundation for conducting future research designed to uncover the underlying mechanisms that produce this effect.

Of these contemporary investigations, the study of Messé, et al. (2002) is noteworthy, especially for the Köhler discrepancy effect. In Experiment 2, Messé and his colleagues manipulated discrepancy by having a confederate enact the role of a slightly, moderately, or substantially better coworker. Through this procedure, they found that

knowledge of a partner's ability could produce the Köhler discrepancy effect – i.e., the results showed that the largest motivation gains occurred under moderate discrepancy.

Messé et al. (2002, pp. 936-937) speculated that one or both of two processes might underlie the Köhler discrepancy effect: Indispensability of effort (e.g., Karau & Williams, 2001; Stroebe & Frey, 1982; Vroom, 1964) and social comparison (or goal setting) (e.g., Locke & Latham, 1990; Stroebe, et al., 1996). With regard to indispensability, which derives from the widely accepted Instrumentality X Value approach to explaining people's work activity, a weaker worker's subjective sense of how important his or her performance is to the group's success could be a critical factor in generating the Köhler discrepancy effect. When the discrepancy in ability is very small, a less able coworker could readily perceive that only a little extra effort is necessary to promote the maximum possible group success, given the slightly stronger coworker's presumed capability. When the discrepancy is very large, the much less able coworker would be faced with the realization that he or she could not even begin to approach the very strong partner's potential performance level. Under conjunctive task demands, in which the weaker member sets the limit for team performance, the perceived discrepancy between the likely outcome and what might have been (had the weaker member's ability been closer to that of the more able coworker), would likely lower the weaker worker's motivation to work at the task. Thus, in either circumstance (i.e., if the discrepancy in coworkers' abilities is either slight or very large), the weaker worker's impetus to try harder should be reduced. In contrast, when the discrepancy in ability is moderate, the (somewhat) weaker team member could very likely perceive that a concerted and achievable increase in effort would produce an outcome that is reasonably close to the

maximum possible by their group, given the partner's ability level. Therefore, moderate ability discrepancy would be likely to generate the greatest motivation gain.

In terms of the social comparison or goal-setting explanation, it is assumed that the weaker coworker uses the more able partner's performance as a goal-comparison reference. Therefore, for conjunctive task situations, this explanation always assumes upward social comparison by the weaker coworker. When the discrepancy in ability is very small, this small discrepancy could be considered as an easy goal to be reached, calling for little, if any increased effort. Because of this small goal, people would generate only a small motivation gain. When the discrepancy in abilities is very large, consistent with the idea that unrealistic goals can undermine motivation (Hinsz, 1995), the weaker coworker is likely to reject the much better partner's performance as a viable standard of comparison and, thus, increase effort to a much smaller extent. However, when the difference in ability is moderate, people might consider this performance difference as a realistic and achievable goal and thus increase their effort accordingly.

Messé and his colleagues' (2002) investigation was useful in that it provided convincing evidence that the difference in relative ability underlies the Köhler discrepancy effect. However, further research is needed to identify variables that could moderate the Köhler discrepancy effect. That is, future work needs to explore what factors can contribute differentially to participants' motivation to work harder when they have various discrepancy information. In the present study, I examined the role of self-efficacy, which in general is considered to be a critical variable when people perform a task, as a possible moderator of the Köhler discrepancy effect.

Self-efficacy

Self-efficacy refers to "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). In other words, self-efficacy is confidence in one's own ability to perform behaviors required to produce a desired outcome (Bandura, 1977, 1986). A wide range of empirical evidence has shown that self-efficacy influences the kind of behavior in which a person engages, how much effort he or she expends after the behavior has been initiated, and how long that effort is sustained in the face of obstacles and aversive experiences (e.g., Manning & Wright, 1983).

Two decades of empirical research have generated a great number of studies that demonstrated the positive relationship between self-efficacy and various motivational and behavioral outcomes in clinical (e.g., Bandura, Adams, Hardy, & Howells, 1980), educational (e.g., Lent, Brown, & Hackett, 1994; Schunk, 1995), and organizational settings (e.g., Bandura, 1988; Wood & Bandura, 1989). As more convincing evidence of the relationship between self-efficacy and performance, a recent meta-analysis by Stajkovic and Luthans (1998) found a strong positive relationship between self-efficacy and performance based on 109 studies conducted on work-related tasks and/or in work settings.

Similar to the results of the above studies, which were mainly based on correlational data, the positive relationship between self-efficacy and performance has also been demonstrated in experimental settings in which self-efficacy was directly manipulated (e.g., Bouffard-Bouchard, 1990; Miyake & Matsuda, 2002; Sanna, 1992). For example, Sanna (1992) examined the effects of self-efficacy in the areas of social facilitation and social loafing using a vigilance task. In his Experiment 1, self-efficacy

was manipulated by providing false performance feedback after participants worked on a preliminary task: In the high self-efficacy condition, participants were told that they scored in the upper 80th percentile on established norms for the task. In contrast, in the low self-efficacy condition, participants were told that they scored in the lower 20th percentile on established norms for the task. Using this manipulation, Sanna found that fewer vigilance errors were made by high than low self-efficacy participants. Such findings established that the positive relationship between self-efficacy and task performance could be demonstrated in experimental studies as well as in correlational studies.

However, not all studies supported this positive relationship between self-efficacy and future performance. For example, Stone (1994) found that high self-efficacy led to overconfidence in one's abilities. In his study, instead of high self-efficacy participants contributing more of their resources toward the task performance, they contributed less. Also, high self-efficacy participants were both less attentive and expended less effort than were their low self-efficacy counterparts. Bandura and Jourden (1991) reported similar results. Using normative feedback to induce high or low self-efficacy in a group of participants, they found that the performance of high self-efficacy participants was not better overall, and in fact, over time, higher self-efficacy contributed to decrements in performance. More recently, Vancouver and his colleagues (Vancouver, Thompson, Tischner, & Putka, 2002) manipulated self-efficacy with feedback about past success and found that individuals lowered their effort to a greater extent when they were induced to have high self-efficacy than low self-efficacy. Consistent with Stone's (1994) position, Vancouver et al. (2002) also explained the negative effect of high self-efficacy by

suggesting that it could be a product of complacency. Thus, it would appear that at least in certain circumstances, people seems to try less hard even though they had high self-efficacy, contrary to the position advanced by a predominance of the self-efficacy literature.

As we can see from the previous discussion, self-efficacy can be a significant determinant of how much effort workers put into performing a task. I speculated that this connection between self-efficacy and effort would also be true of work settings in which people performed under conjunctive task demands – for instance, the context that yielded the Köhler motivation gain and discrepancy effects.

Self-efficacy and the Köhler discrepancy effect

In the present study, I examined whether the Köhler discrepancy effect would be altered by varying participants' self-efficacy as well as relative ability information (i.e., the discrepancy in ability between coworkers). To this end, I used a 2 (self-efficacy: low versus high) X 4 (task demand and discrepancy condition: individual no discrepancy control, conjunctive-small discrepancy, conjunctive-moderate discrepancy, conjunctive-large discrepancy) between subjects factorial design. In this study, similar to the Sanna's (1992) manipulation, self-efficacy was varied by giving participants false feedback about their task performance based on the two previous individual trials. Also, consistent with Messé et al.'s (2002) procedure, I manipulated coworker discrepancy by informing participant of their actual performance score and their partner's ostensive performance score (which was calculated based on the participant's performance), as well as giving them comments about the performance difference.

Given the mixed effects of self-efficacy on performance in the literature, as I described in the previous section, it is difficult to predict confidently how the Köhler discrepancy effect would be changed by self-efficacy information. Because of the exploratory nature of the study, I describe possible results in each condition rather than propose specific, omnibus hypotheses. In discussing the possible results in the conjunctive discrepancy conditions, I utilized the Instrumentality X Value explanation, the Goal-comparison explanation and the complacency or overconfidence effects of high self-efficacy which I discussed earlier.

First, for the overall effect of self-efficacy, it is unclear whether high self-efficacy would lead to greater motivation gains than low self-efficacy. Based on the studies (e.g., Sanna, 1992; Stajkovic & Luthans, 1998) which dealt with the beneficial effects of self-efficacy on performance, there is a possibility that participants with high self-efficacy would perform better than participants with low self-efficacy. However, as noted, there also is a possibility that high self-efficacy participants would show a poorer performance than low self-efficacy participants because high self-efficacy participants might feel complacency or overconfidence for their task performance (Stone, 1994; Vancouver et al., 2002) and, as a result, they might not increase their effort substantially. Also, another, related possibility is that low self-efficacy participants might show greater motivation gains than their high self-efficacy counterparts to prove their capability. That is, high self-efficacy participants might not have strong needs to prove their ability if they already had received very favorable performance feedback via the self-efficacy manipulation (i.e., 80^{th} percentile in the total population). In contrast, low self-efficacy participants, given that they did not prove that they are good performers in the initial two individual trials

(i.e., 20th percentile in the total population) might view the upcoming dyad trials as an opportunity to demonstrate their real ability. Therefore, because of the need to prove their ability, low self-efficacy participants might show better performance than high self-efficacy participants.

Second, in the small discrepancy condition, because participants already know their partner's ability is similar to their own (through the discrepancy manipulation after the second trial), they are likely to have an expectation that their partner would end the trial soon after they ended the trial. Also, participants might think that their trial would be over anyway even though they were willing to exert extra effort unless their partner were also willing to put out the same amount of effort. Therefore, participants might not think their effort is particularly instrumental or indispensable for the group's success in this condition. In terms of the Goal-comparison explanation, the goal to be reached is the partner's performance level and participants who are in the small discrepancy condition should set relative low goals. Under this low instrumentality and very small goal-setting, perception of high or low self-efficacy might have little influence on their motivation to reduce this small amount of performance gap. That is, participants might easily keep up with their partner regardless of their self-efficacy because the performance difference is very small. Therefore, I thought there might be no difference in performance between high and low self-efficacy participants when there was a small discrepancy in their capabilities.

Third, the Instrumentality X Value explanation suggests that weaker workers in the large discrepancy condition might not perceive their effort as indispensable because the gap between their performance level and their partner's is too large to achieve an

outcome that comes anywhere near the maximum possible group success. Also, in terms of the Goal-comparison explanation, weaker workers in the large discrepancy condition should perceive approximating their coworker's performance level as an unrealistically high goal and, thus, they would be inclined to reject this standard – a decision that could result in lower effort. Based on these explanations, I thought that low instrumentality and/or unrealistically high goal-setting effect would work to produce lower motivation gains irrespective of self-efficacy level, because, with large discrepancy, participants might perceive the importance of performing well to be very low and/or they might be overwhelmed by the unrealistically high goal that their coworker's performance would impose on them. That is, in this condition, even high self-efficacy participants may doubt their ability to attain the goal of matching their partner's excellent performance despite their expectation of performing well in an absolute sense. Also, low self-efficacy participants might view their expectation of performing relatively poorly in an absolute sense as reinforcing their anticipation that their possible contribution to the group outcome would be disappointing and/or their coworker's performance would be an unrealistically high goal for them. As a result of this consideration, they might think it would be useless to work hard to prove their ability under this very discouraging situation. Thus, similar to the small discrepancy condition, I thought that there might be no performance difference between low and high self-efficacy participants when perceived discrepancy is very large.

In contrast, unlike for the small and large discrepancy conditions, I reasoned that self-efficacy would moderate performance in the moderate discrepancy condition. In this condition, participants would expect that their partner had ability to continue working at

the task moderately longer than they, based on the discrepancy feedback that they were given. Therefore, the conjunctive nature of the group task could lead the weaker members to think that, given their effort was indispensable for the group's success, they could realistically increase their effort to make a marked difference in the outcome. The goal-comparison explanation draws the same conclusion, but for a different reason: Because the participant is presented with a realistic and obtainable goal (i.e., the moderately better performance level of their partner) the participant should increase his/her effort to a greater degree. Furthermore, I thought that this default pattern could be moderated or changed by the addition of the high or low self-efficacy information. First, there is a possibility that beneficial effects of self-efficacy which were described in the previous section, would heighten motivation gains when the discrepancy was moderate. Compared with the small and large discrepancy conditions in which these beneficial effects of self-efficacy were attenuated by the low instrumentality and very modest or unachievable goal-setting, I thought that these effects would not be attenuated because there were high instrumentality and a realistically achievable goal in the moderate discrepancy condition. Therefore, in the moderate discrepancy condition, there is a possibility that participants who had high self-efficacy would show more motivation gains than those who had low self-efficacy.

It also was possible that low self-efficacy participants would show heightened motivation gains in the moderate discrepancy condition. Participants with high self-efficacy might not increase their effort substantially even though they had high instrumentality and a realistic and achievable goal because they might feel complacency or overconfidence about their task performance. Also, as I discussed earlier, because low

self-efficacy participants had reason to prove their ability, they might show bigger motivation gains than high self-efficacy participants. Therefore, combined with the high instrumentality and realistic goal-setting in this condition, low self-efficacy participants might try harder when they believe that good performance could prove their greater capability.

In summary, in the moderate discrepancy condition, there is a possibility that participants who had low self-efficacy would show bigger motivation gains than those who had high self-efficacy because: 1) high self-efficacy participants might feel complacency or overconfidence about their performance and, thus, show a lesser degree of effort exertion than low self-efficacy participants; and 2) low self-efficacy participants are likely to consider dyad trials as an opportunity to prove their ability and might work harder than high self-efficacy participants under moderate performance discrepancy, when they had realistic expectations that trying harder would matter and/or doing better was a realistic goal.

To investigate these possibilities, I conducted an experiment that independently manipulated self-efficacy and discrepancy information.

Chapter 2

METHOD

Participants

One hundred and ninety four female undergraduate students at Michigan State University participated in this study to partially satisfying a psychology course research requirement. Because there were considerably more women in the department subject pool, for ease of recruitment, only female students participated in this study. Two female experimenters conducted all sessions.

Design

The experiment utilized a 2 (self-efficacy: low versus high) X 4 (task demand and discrepancy condition: individual no discrepancy control, conjunctive-small discrepancy, conjunctive-moderate discrepancy, conjunctive-large discrepancy) between subjects factorial design. Sessions were conducted with up to four participants. Each session was randomly assigned to one of the eight experimental conditions. The (performance) dependent variable was the difference in time that a participant persisted in holding up a weight between the first and the second trials for a given arm – i.e., Trial 3 – Trial 1, Trial 4 – Trial 2, averaged across the two arms.

Experimental Task

The experiment used a modified version of the persistence task that was used in Messé, et al. (2002). Participants were instructed to hold a 3.19 lb. weight horizontally above a thin cord that was strung between metal bars for as long as they felt comfortable in doing so. When participants lowered their arm to the point that their hand hit the cord,

this action activated a key on a computer that recorded that the trial was over, as well as the time (in seconds) that participants had persisted at the task. To prevent using their other arm to support their performing arm, participants were told that they needed to press and hold down the "Control" key on the computer keyboard with their free hand during each trial.

Procedure

On the date of their experiment, up to four female participants arrived for their session. Prior to the start of their actual participation, the experimenter made sure that none of the participants had any disabling arm, shoulder, or back injuries. After bringing them into the preparation room, the experimenter explained and demonstrated the task. They were told that they would perform this task over a series of trials (the exact number of which was not disclosed).

After demonstrating the task, the experimenter told participants that other students were taking part in the experiment at the same time in another building, and the computers located in their own lab rooms were connected to both each other and to computers being used in the other laboratory in next building. To reinforce this cover story, the experimenter pretended to make a phone call to the other laboratory in which she asked how many participants were there. She then "repeated" out loud a number that, when added to the participants her own laboratory, made an even number (greater than four) of participants, total, for the sessions. For example, if there were one or three actual participants, the "conversation" revealed that there were three more subjects in the other laboratory. Also, if there were two or four actual participants, the "conversation" revealed that there were four more subjects in the other laboratory. This procedure accomplished

two goals. First, for a few of the dyad sessions there was only one student signed up. This meant that without such deception, it would not be possible to complete all of the dyad conditions. With other supposed participants in another lab, students were led to believe that they would not be completing the experimental tasks alone. Second, when participants in the dyad conditions complete the tasks on the computer, the program tells them the name of their partner. So if students knew all the other participants in their session, they would see through this deception. By telling them that other students in a different lab were also participating in this study, they would be more likely to believe that their experimental partner really existed.

After the phone call, participants were placed in separate lab rooms and sat down in front of the computers that ostensibly were connected with each other. The experimenter left the lab room, so from then on, all instructions, task trials, and questionnaires were administered via the computer. First, participants were asked to take off any bracelets and watches that they were wearing and place them in the black paper bag located in the desk for that purpose. This procedure was included to ensure that the participants could not time themselves or wear something that would interfere with task performance. Then, the task was explained in more detail by the computer, including calling to the participants' attention that a video camera was located to the side of the keyboard. It was explained that the camera would be monitoring a participant's activities to ensure, for example, that she was pressing the Control button with her other hand (which are not supposed to be used for task performance on a particular trial). The camera's angle was low so that only a participant's hands could be viewed. (To see the verbatim instructions, refer to Appendix A.)

To increase the meaningfulness of the task, it was explained that the 2-person team could earn money through its performance on the persistence task. One such team would be randomly picked at the end of the experiment and would receive five cents for every second of the total group performance (up to a maximum of $ 50). Moreover, to further increase interest in doing well, computer instructions informed participants that we were having a little competition between students taking part in this experiment at the University of Michigan and those performing it here at Michigan State. Then they were told that we would compute the average Total Score for each school, and award the winning persons from the school with the stronger teams an additional 15%. In addition, we reminded every participant that even if she were not picked, her good performance at this task could possibly benefit other MSU students.

After performing the first and second trial as individuals, participants' self-efficacy was manipulated by giving them fictitious information about the likelihood of performing well during the upcoming trials accompanied via a chart of a Likert-type scale which indicated their chance of doing well (for an example, refer to Figure 2.1, and Appendix B).

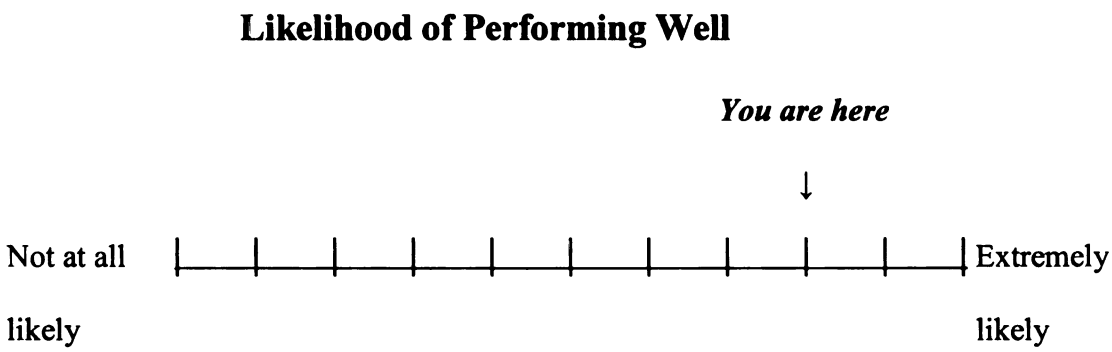


Figure 2.1 An Example of High Self-efficacy Manipulation

In the low self-efficacy conditions, participants were given the following information: "The computer has compared your performance on the previous two trials with data which were collected earlier (approximately 849 previous female participants in 6 studies). Based on our comparisons, the computer has calculated that if you work hard, the likelihood that you will perform well during the upcoming trials is **20%**. In other words, it **is not very likely** that you can perform well during the upcoming trials." In the high self-efficacy conditions, participants were given the following information: "The computer has compared your performance on the previous two trials with data which were collected earlier (approximately 849 previous female participants in 6 studies). Based on our comparisons, the computer has calculated that if you work hard, the likelihood that you will perform well during the upcoming trials is **80%**. In other words, it **is very likely** that you can perform well."

After giving the self-efficacy information, Participants in the conjunctive dyad conditions were told that for the remainder of the trials the computer would randomly choose their partner from the current participants and informed them of their partner's name. Actually, this name was pre-programmed to be chosen randomly from the four pre-selected names (i.e., Anne Roberts, Erin Anderson, Susan Turner, and Steph Taylor).

Then, the discrepancy information was manipulated by presenting each participant's actual performance score, her partner's ostensible performance score (which was calculated based on the participant's score), and comments about their performance difference. Before the manipulation, the computer screen acknowledged that the computer received these performance data and comments from experimenter via a LAN

connection. Then, the screen showed the box which contained information about the participant's performance score (in seconds) and their partner's performance score (in seconds) averaged across the two individual trials. Below this information, there was another box which contained the experimenter's ostensible comments about these scores. In the small discrepancy condition, partner's score was calculated by multiplying the participant's real performance data by 1.05, and the participant was told that the two of them had performed just about the same. In the moderate discrepancy condition, partner's score was calculated by multiplying the participant's real performance data by 1.42, and the participant was told that the coworker had done moderately better than she had. In the large discrepancy condition, partner's score was calculated by multiplying the participant's real performance data by 2.05, and the participant was told that the coworker had done substantially better than she had. The reason why the value 1.42 was used to create the artificial partner's performance data in the moderate condition was to give the participant the belief that her ability was 70% as good as her partner's, which was the performance discrepancy that Köhler found associated with the greatest motivation gain. The levels of small and large discrepancies were similarly selected based on Köhler's original findings. However, I gave slight variation in the discrepancy scores to make the feedback more realistic (i.e., 1.05 for the small discrepancy condition instead of 1.00; 2.05 for the large discrepancy condition instead of 2.00). To see an example of the discrepancy manipulation, refer to Appendix C.

After these manipulations, participants in the conjunctive dyad conditions received information about how the remaining trials (i.e., 3rd and 4th trial) would be conducted. Participants were informed that for the next few trials they would be

following a somewhat different procedure than before. During these trials they would be paired with their partner at the task to create a two-women team. Each participant would receive the same score. That score would be the time that the person whose arm dropped first had lasted. They were told that during the trials two boxes would appear on the screen. Each box would have one of the team member's names in it. The two boxes would remain green as long as both persons' arm remained above the string. As soon as one person's arm touched the string, her corresponding box would turn red (on both computer screens). This change would signal the end of the trial and the other person should lower her arm. As described earlier, the participants were led to believe this partner would be in a booth either next to (or near) them or in the other lab. In actuality the (fictitious) partner's box would never turn red. Thus, real participant always would be the one who quit first. Also, participants were informed that for the next few trials we are interested in obtaining both group scores and the identity of the person who ended a trial by hitting the string first. For this reason, the equipment has been wired so that the master-computer could record and save both the group score for each trial and which person ended the trial. Therefore, the experimenter would know how well the team had performed and which group member ended each trial. The computer program followed this procedure for two dyad trials, one with participant's dominant arm and one with the non-dominant arm.

In the individual no discrepancy condition, participants performed four trials, receiving either low or high self-efficacy information after Trial 2 according to the condition to which they had been assigned, but not any discrepancy information (since these participants never had a partner). To hold the rest time constant across conjunctive

and individual conditions during the manipulation of discrepancy, participants in the individual condition had to wait a comparable amount of time between trials as it took participants in the dyad conditions to receive instructions and rest.

Before each trial, participants answered a question about the pre-trial self-efficacy on a 9-point scale: "How well do you think you can perform in the upcoming trial?"(1 = not very well, 9 = very well). Also, before the third and fourth trial in all conjunctive dyad conditions, participants answered a question on performance expectation: "How likely is it that you will do as well or better than your partner?"(1= very likely I will do less well, 9 = very likely I will do better).

After each trial, participants completed a short questionnaire comprised of five scales: "How much effort did you put into this last trial?"(1 = not very much, 9 = very much), "How much did you enjoy performing on the last trial?"(1 = not very much, 9 = very much), "How important was it to you to perform well in the last trial?"(1 = not at all, 9 = extremely), "During the last trial, how well do you think that you performed?"(1 = not very well, 9 = very well), "How much were you satisfied on the last trial?" (1 = not very much, 9 = very much). In addition, after third and fourth trial, participants in the conjunctive dyad conditions answered an additional question: "How large of a gap did you think there was between you and your partner's performance on the last trial?"(1 = very small, 9 = very large).

After the fourth trial of the persistence task, in all conditions participants answered manipulation check questions. After participants completed this final task, the experimenter debriefed, thanked, and dismissed them.

Chapter 3

RESULTS

Manipulation checks

In order to ascertain if the manipulation of self-efficacy was successful, participants were asked their likelihood of performing well, based on the scale which was presented to them between the second and third trial (7-point scale; 1 = Much less well than average, 4 = Average, 7 = Much more than average). Differential levels of self-efficacy were successfully manipulated: Participants in the high self-efficacy condition responded that they had above average likelihood ($M = 5.39$, $s = 1.28$), whereas participants in the low self-efficacy condition reported having a below average likelihood ($M = 1.97$, $s = 1.07$). The mean difference between these two conditions was significant ($F(1, 193) = 405.87$, $p < .001$).

For a discrepancy manipulation check, participants in dyad conditions were asked to indicate just what information they had received about the performance difference between them and their partners (5-point scale; 1 = My partner had performed substantially worse than I did, 2 = My partner had performed moderately worse than I did, 3 = We had performed about the same, 4 = My partner had performed moderately better than I did, 5 = My partner had performed substantially better than I did). As an indication of successful discrepancy manipulation, all participants responded with a 3, 4, or 5 because they always were the weaker members of a team. Also, the percentages whose response exactly matched the performance discrepancy information that they had received for the manipulation were very high: 80.4% for the small discrepancy condition;

82.0% for the moderate discrepancy condition; and 94.2% for the large discrepancy condition. It should be noted that some participants might have misinterpreted the discrepancy between their score and their partner's score: Participants in the small discrepancy condition might choose option 4 because their partner's score was always a little bit higher than their score even though they were told that they had performed about the same. In the same vein, some participants in the moderate and large condition might have depended more on their subjective perceptions of the discrepancy scores provided than on the given statements. In addition, Newman-Keuls pairwise post-hoc tests revealed that the means in all three conditions were significantly different from one another (Small discrepancy, $M = 3.22$, $s = .46$; Moderate discrepancy, $M = 4.18$, $s = .39$; Large discrepancy, $M = 4.92$, $s = .33$; $p < .05$). Therefore, the discrepancy manipulation also was successful.

In order to test whether self-efficacy and discrepancy manipulations were independent, a 2 (self-efficacy: low versus high) X 3 (discrepancy: conjunctive-small, conjunctive-moderate, conjunctive-large) ANOVA was conducted on each manipulation question. For the self-efficacy manipulation question, the main effect of self-efficacy was significant ($F(1, 147) = 286.64$, $p < .001$), while neither the main effect of discrepancy nor the interaction effect of these two variables was (both $Fs < 1$). For discrepancy manipulation question, the main effect of discrepancy was significant ($F(2, 147) = 235.22$, $p < .001$), while neither the main effect of self-efficacy nor the interaction effect of these two variables was (both $Fs < 1$). Thus, results indicate that participants did not perceive the manipulation of one variable differently in each condition of another variable because the interaction effect was not significant in either analysis.

Performance measures

As mentioned earlier, participants performed a persistence task by holding up one of their arms as long as possible for four trials, alternating between their dominant and non-dominant arms. In order to ascertain and later adjust for fatigue effects in later trials, and to test whether there was any differential influence of self-efficacy, a 2 (self-efficacy: low versus high) X 2 (trial block: first two trials vs. last two trials) X 2 (performing arms: dominant vs. non-dominant) analysis of variance (ANOVA) with repeated measures on the last two factors was conducted on performance scores in the individual control condition. The trial block factor simply contrasts the first two trials (i.e., Trial 1 and 2) with the last two trials (i.e., Trial 3 and 4), while the performing arms factor compares two trials in which participants used their dominant arm (i.e., Trial 1 and 3) with two trials in which they used their non-dominant arm (i.e., Trial 2 and 4).

A significant trial block main effect emerged ($F(1, 39) = 8.59, p < .01$) indicating that participants experienced effort reducing fatigue, boredom, etc. Participants in the individual control condition persisted longer in the first two trials with each arm (M = 74.26s, s = 43.91) than in their last two trials with each arm (M = 62.28s, s = 29.25).

There was also a significant performing arms main effect ($F(1, 39) = 26.10, p < .001$), indicating that these participants persisted longer with their dominant arms (M = 73.26s, s = 35.36) than with their non-dominant arms (M = 63.28s, s = 35.67). However, the trial block X performing arms interaction was not significant ($F < 1$), which suggested that the fatigue effect was similar across arms (i.e., this result provided the evidence that one arm did not fatigue faster than the other arm). Finally, there were no main or interaction effects with the self-efficacy factor, all Fs < 1, suggesting that the

observed fatigue effects were comparable for low or high self-efficacy condition. Therefore, I concluded that different fatigue corrections for low and high self-efficacy conditions were not necessary in the conjunctive dyad conditions.

Based on the above analysis, as in past studies (e.g., Messé et al., 2002), scores on the third and fourth trial were corrected for fatigue in order to analyze the performance of the participants in the conjunctive dyad conditions. First, the scores from the second trial of each arm were subtracted from the first trial of each arm in the individual condition. By averaging these individual difference scores, two means were generated: 12.02s for Trial 1 – Trial 3 and 11.94s for Trial 2 – Trial 4. The average of these two means (M = 11.98s, s = 25.99) reflected the fatigue effect. Second, to correct fatigue, I added this final mean to the performance scores of the third and fourth trial in each conjunctive dyad condition.

It should be mentioned that to correct for fatigue in this study, I did not utilize an individual control condition in which no self-efficacy information was provided, because I wanted to correct fatigue by using individual control conditions that were most similar to the experimental conditions in this study. However, to determine whether providing self-efficacy information (vs. providing no such information) had any effect on the magnitude of the fatigue effect, I compared the fatigue correction in the individual control condition of a previous study (Messé, Kerr, & Seok, in preparation) with the individual control condition of this study. The previous study (Messé et al., in preparation) was identical to the present one in all but one respect—viz., introduction of the self-efficacy manipulation between Trial 2 and Trial 3. To test whether there was any trial block or performing arms effect, a 2 (trial block) X 2 (performing arms) analysis of

variance (ANOVA) was conducted on the performance data in this condition. In this analysis, both variables were repeated measure variables. The trial block factor simply contrasts the first two trials with the last two trials while the performing arms factor compares participants' dominant versus non-dominant arm. A significant trial block main effect emerged ($F(1, 18) = 11.37, p < .01$) indicating that those in the individual control condition persisted longer in the first two trials with each arm ($M = 82.00$s, $s = 33.68$) than on their last two trials with each arm ($M = 65.50$s, $s = 25.45$). There was also a significant performing arm main effect ($F(1, 18) = 6.17, p < .05$) indicating that these participants persisted longer with their dominant arms ($M = 78.13$s, $s = 30.60$) than with their non-dominant arms ($M = 69.37$s, $s = 27.13$). However, the trial block X performing arms interaction was not significant ($F < 1$), which suggested that the fatigue effect was similar across arms. Besides the similarity of the pattern of fatigue data, it is noteworthy that the overall fatigue effect observed in the present study (viz. 11.98s) was not significantly different from the corresponding effect observed in the study of Messé et al. (in preparation) (viz. $M = 82.0$s $- 65.5$s $= 16.5$s, $s = 21.33$), $t(58) < 1$. These results indicate that the magnitude of the fatigue effect was comparable when participants received either no self-efficacy information (i.e., Messé et al., in preparation) or received (high or low) self-efficacy information (i.e., the present study)

Fatigue corrected scores were analyzed separately for Trial 3, Trial 4 and the average of these two trials. This was done because there was a difference in believability of discrepancy manipulation between before Trial 3 and before Trial 4. That is, even though participants had already received the manipulation on discrepancy information before Trial 3, their believability was likely to be maximal in Trial 4 because they now

(after Trial 3) had confirming evidence that their partner was better at the task. Moreover, past work (Messé et al., 2002) suggested the Köhler discrepancy effect was more likely to occur in Trial 4 than in Trial 3.

The second trial – first trial (i.e., Corrected Trial 3 – Trial 1; Corrected Trial 4 – Trial 2; the average of these two scores) difference in how long each participant persisted at the task for each arm was used as the index of performance change (loss or gain). Therefore, any score above zero represents a motivation gain because the result of the fatigue correction equation eliminates fatigue and arm differences. All of the following analyses on the conjunctive dyad conditions were based on these corrected data.

The primary focus of this study was to examine whether self-efficacy had differential effects in each conjunctive dyad condition. In order to examine whether the trial factor interacted with either the self-efficacy or discrepancy factors, I conducted a 2 (self-efficacy: low versus high) X 3 (discrepancy: conjunctive-small, conjunctive-moderate, conjunctive-large) X 2 (trial: T3 – T1 vs. T4 – T2) analysis of variance, with repeated measure on the last factor. The results revealed that there was a significant main effect of the trial factor ($F(1, 147) = 18.43$, $p < .001$) indicating that participants' performance increases were greater when they worked in a dominant arm trial (M = 40.29s, s = 36.10) than in a non-dominant arms trial (M = 27.56s, s = 33.97). However, this trial factor did not interact with either the self-efficacy or discrepancy factors (all Fs < 1). However, given the fact that there was a qualitative difference in the amount of information participants had about their partner's likely ability when beginning Trial 3 vs. Trial 4, I also did a trial by trial analysis, besides analyzing the average score of the last two trials.

First, in order to test whether self-efficacy had differential effects on each conjunctive dyad condition across the third and fourth trials, a 2 (self-efficacy) X 3(discrepancy) ANOVA was performed on the fatigue corrected overall difference score [{(Trial 3 – Trial 1) + (Trial 4 – Trial 2)} / 2]. Means for all conditions on these overall difference scores are presented in Figure 3.1. Results revealed a significant main effect of self-efficacy, $F(1, 147) = 5.10, p < .05$, while the main effect of discrepancy ($F(2, 147) = .01$, *ns*) was not significant. However, the interaction effect of these variables was marginally significant ($F(2, 147) = 2.59, p < .08$). Because it was of particular theoretical interest to determine if perceived self-efficacy moderated the relationship between inter-member ability discrepancy and motivation, planned contrast tests were also conducted to examine whether self-efficacy had differential effect in each discrepancy condition. The results revealed that, as predicted, those in the moderate discrepancy condition responded

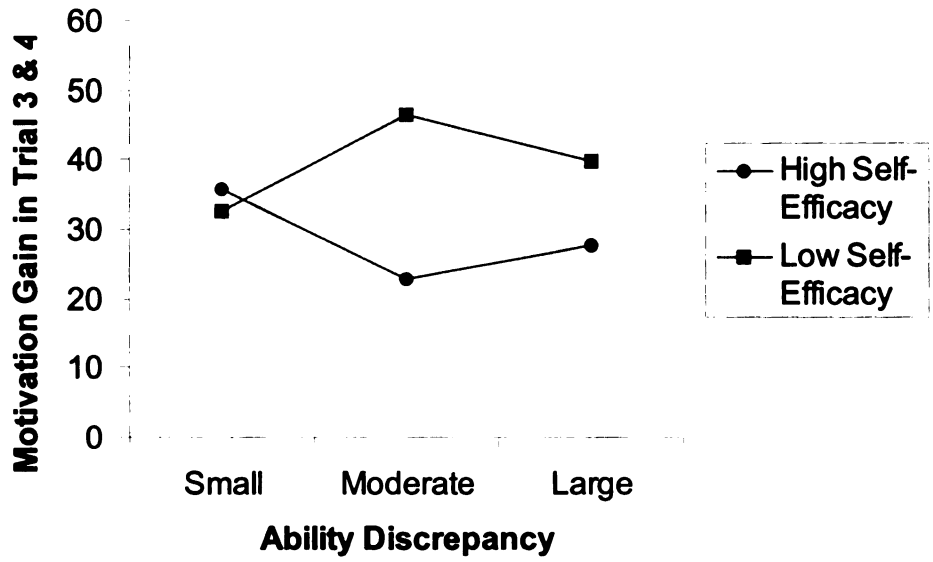


Figure 3.1 Motivation Gain for the Average of Trial 3 and 4 by Condition (Line graph).

differently to the self-efficacy information, compared with the small and large discrepancy conditions: When participants were given moderate ability discrepancy, low self-efficacy participants (M = 50.90s, s = 51.16) significantly outlasted high self-efficacy participants (M = 27.35s, s = 31.07; $t(147) = 2.81$, $p < .01$), while those in the small and large discrepancy conditions did not show similar performance differences (both ts < 1.46).

Second, a 2 (self-efficacy) X 3(discrepancy) ANOVA was performed on the fatigue corrected Trial 3 – Trial 1 scores. Means for all conditions on the Trial 3 – Trial 1 scores are presented in Figure 3.2. Results revealed a marginally significant main effect of self-efficacy, $F(1, 147) = 3.02$, $p < .09$, while neither the main effect of discrepancy ($F(2, 147) = .04$, *ns*) nor the interaction effect of these variables ($F(2, 147) = 1.38$, *ns*) was significant. Planned contrast tests were conducted to examine whether self-efficacy had differential effect on each discrepancy condition. Similar to the results on the overall

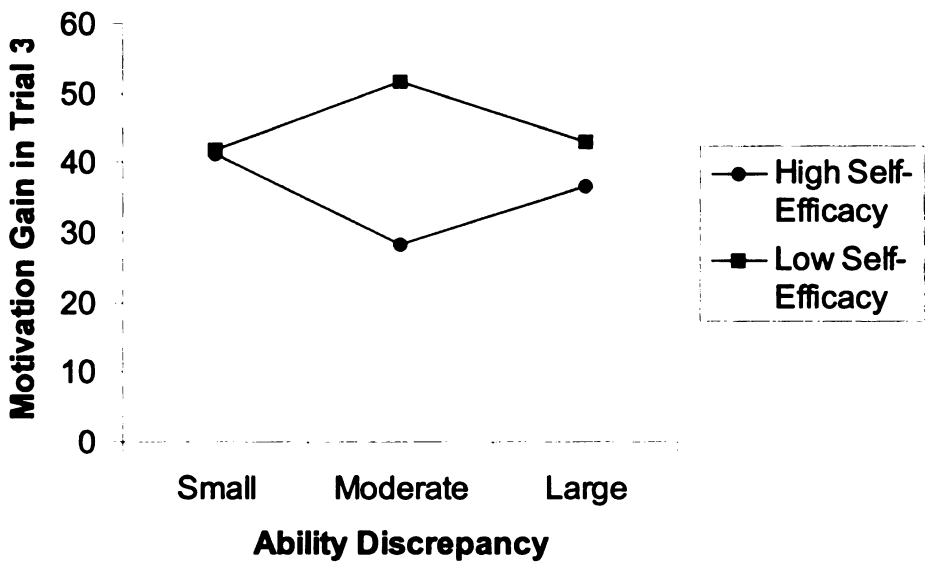


Figure 3.2 Motivation Gain for Trial 3 by Condition (Line graph).

difference scores, these results revealed that those in the moderate discrepancy condition responded differently to the self-efficacy information compared with the small and large discrepancy condition: When participants were given moderate ability discrepancy, low self-efficacy participants (M = 56.29s, s = 56.59) significantly outlasted high self-efficacy participants (M = 32.85s, s = 37.88; $t(147) = 2.30$, $p < .05$) but those in the small and large ability discrepancy conditions did not show any performance difference (both ts < 1).

As stated earlier, participants may have been more certain about the superiority of their partner for Trial 4 than Trial 3 because they had received feedback that their partner had outperformed them in Trial 3. In order to test whether self-efficacy had differential effects on each discrepancy condition under the more realistic situation, a 2 (self-efficacy) X 3(discrepancy) ANOVA was performed on the fatigue corrected Trial 4 – Trial 2 scores. Means for all conditions on the Trial 4 – Trial 2 scores are presented in Figure 3.3. Results revealed a significant main effect of self-efficacy, $F(1, 147) = 4.53$, $p < .05$, while, once again, the main effect of discrepancy ($F(2, 147) = .07$, *ns*) was not significant. However, in this analysis, the interaction effect of these variables was marginally significant ($F(2, 147) = 2.94$, $p < .06$). Planned contrast tests were conducted to examine whether self-efficacy had a differential effect across discrepancy conditions. Similar to the results of the overall difference scores and Trial 3 – Trial 1 scores, those in the moderate discrepancy condition responded differently to the self-efficacy information compared with the small and large discrepancy condition in Trial 4: When participants were given moderate ability discrepancy, low self-efficacy participants (M = 45.50s, s = 51.03) significantly outlasted high self-efficacy participants (M = 21.85s, s = 31.64;

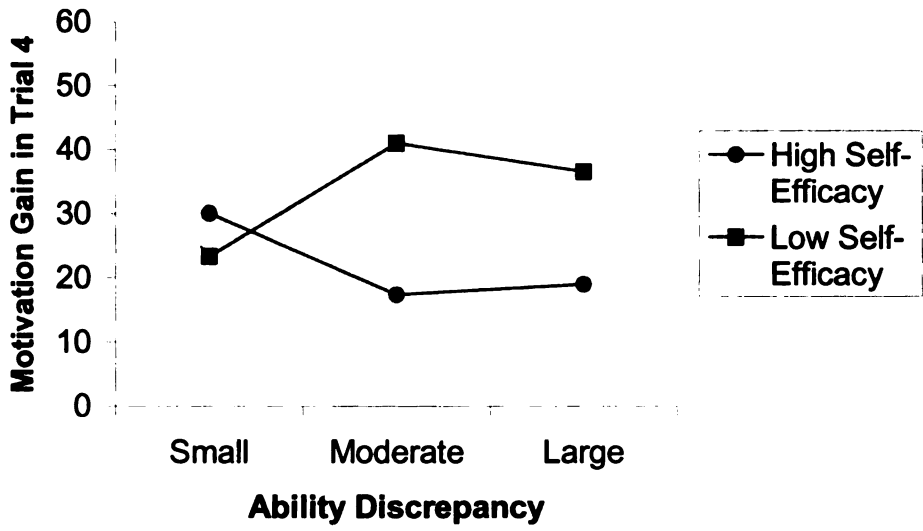


Figure 3.3 Motivation Gain for Trial 4 by Condition (Line graph).

$t(147) = 2.50, p < .05$) but those in the small discrepancy condition did not show any performance difference ($t < 1$). Different from the previous results, in the large discrepancy condition, however, low self-efficacy participants lasted 17.56s longer than high self-efficacy participants; this difference was marginally significant ($t(147) = 1.90, p = .06$).

Previous research (e.g., Messé et al., 2002) suggested that among those given no self-efficacy feedback but well aware of the discrepancy between themselves and their partner, discrepancy in ability and motivation are characterized by an inverted-U function. To examine the moderating effect of self-efficacy information on this function, I decomposed the 3-level discrepancy factor into two orthogonal trend contrasts. The contrast weights for the test of linear trend were (-1, 0, +1), whereas the contrast weights for the quadratic trend were (-1, +2, -1). Then I redid the 2 (self-efficacy) X 3 (discrepancy) ANOVAs with the latter factor decomposed into the two trend contrasts.

The analysis of the overall difference scores resulted in a marginally significant self-efficacy X quadratic interaction effect ($t(147) = 1.87, p = .06$). As Figure 3.1 shows, low self-efficacy participants showed inverted-U shape trend (as found by Messé et al. with no self-efficacy feedback) while high self-efficacy participants showed an opposite, U-shaped trend. Also, a non-significant self-efficacy X linear interaction effect on the overall difference scores ($t(147) = 1.30, p = .20$) suggested that it would be appropriate to interpret the results as more consistent with a quadratic pattern than a linear pattern. The only effect of interest to emerge from parallel analyses of separate examinations of the last two trials was a marginally significant self-efficacy X linear interaction on the Trial 4 – Trial 2 difference score ($t(147) = 1.85, p = .07$), indicating that low self-efficacy participants showed increasing linear trend and high self-efficacy participants showed decreasing linear trend as the discrepancy become larger (see Figure 3.3).

In addition, to investigate whether there were significant motivation gains on these difference scores from the baseline mean of zero, I conducted t-tests for all conjunctive dyad conditions. First, I examined the overall fatigue corrected difference score. The overall difference scores showed significant motivation gains in all conjunctive dyad conditions. Means and 95% confidence intervals for all conditions are presented in Figure 3.4. When participants received the low self-efficacy information, the mean of the conjunctive-small discrepancy condition ($M = 32.57$s, $s = 18.37$) was significantly greater than the baseline mean of zero in the individual control condition, $t(65) = 11.41, p < .001$, as were the corresponding means in the conjunctive-moderate discrepancy condition ($M = 46.37$s, $s = 51.16$), $t(63) = 5.84, p < .001$, and the conjunctive-large discrepancy condition ($M = 39.80$s, $s = 25.66$), $t(64) = 9.98, p < .001$.

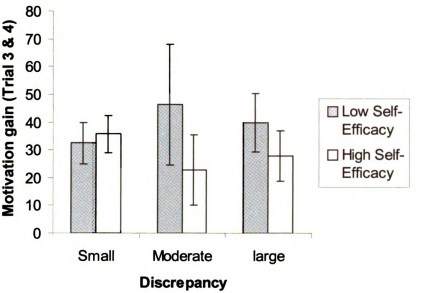


Figure 3.4 Motivation Gain for the Average of Trial 3 and 4 by Condition (Bar graph).

The mean for participants who received high self-efficacy feedback in the conjunctive-small discrepancy condition (M = 35.72s, s = 16.32) was significantly greater than the baseline mean of zero in the individual control condition, $t(64) = 14.08$, $p < .001$, as were the corresponding means in the conjunctive-moderate discrepancy condition (M = 22.82s, s = 31.07), $t(65) = 4.73$, $p < .001$, and the conjunctive-large discrepancy condition (M = 27.77s, s = 22.95), $t(66) = 7.78$, $p < .001$.

Second, I examined the fatigue corrected Trial 3 – Trial 1 scores. Means and 95% confidence intervals for all conditions are presented in Figure 3.5. When participants received low self-efficacy feedback, the mean of the conjunctive-small discrepancy condition (M = 41.82s, s = 24.80) was significantly greater than the baseline mean of zero in the individual control condition, $t(65) = 10.85$, $p < .001$, as were the corresponding

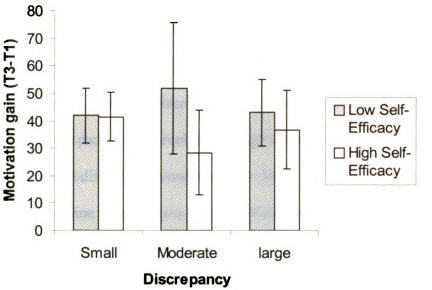


Figure 3.5 Motivation Gain for Trial 3 by Condition (Bar graph).

means in the conjunctive-moderate discrepancy condition (M = 51.77s, s = 56.59), $t(63)$ = 5.89, $p < .001$, and the conjunctive-large discrepancy condition (M = 43.06s, s = 29.41), $t(64) = 9.42$, $p < .001$. When participants received high self-efficacy information, the mean of the conjunctive-small discrepancy condition (M = 41.38s, s = 21.33) was significantly greater than the baseline mean of zero in the individual control condition, $t(64) = 12.48$, $p < .001$, as were the corresponding means in the conjunctive-moderate discrepancy condition (M = 28.32s, s = 37.88), $t(65) = 4.81$, $p < .001$, and the conjunctive-large discrepancy condition (M = 36.57s, s = 36.16), $t(66) = 6.50$, $p < .001$.

Finally, the fatigue corrected Trial 4 – Trial 2 difference scores in the conjunctive dyad conditions also showed significant motivation gains. Means and 95% confidence intervals for all conditions are presented in Figure 3.6. The mean for participants who received low self-efficacy information in conjunctive-small discrepancy condition (M =

23.32s, s = 22.97) was significantly greater than the baseline mean of zero in the individual control condition, $t(65) = 6.53$, $p < .001$, as were the corresponding means in the conjunctive-moderate discrepancy condition (M = 40.98s, s = 51.03), $t(63) = 5.17$, $p < .001$, and the conjunctive-large discrepancy condition (M = 36.54s, s = 26.06), $t(64) = 9.02$, $p < .001$. When participants received the high self-efficacy information, the mean in the conjunctive-small discrepancy condition (M = 30.06s, s = 20.32) was significantly greater than the baseline mean of zero in the individual control condition, $t(64) = 9.52$, $p < .001$, as were the corresponding means in the conjunctive-moderate discrepancy condition (M = 17.32s, s = 31.64), $t(65) = 3.52$, $p < .01$, and the conjunctive-large discrepancy condition (M = 18.98s, s = 38.97), $t(66) = 3.13$, $p < .01$.

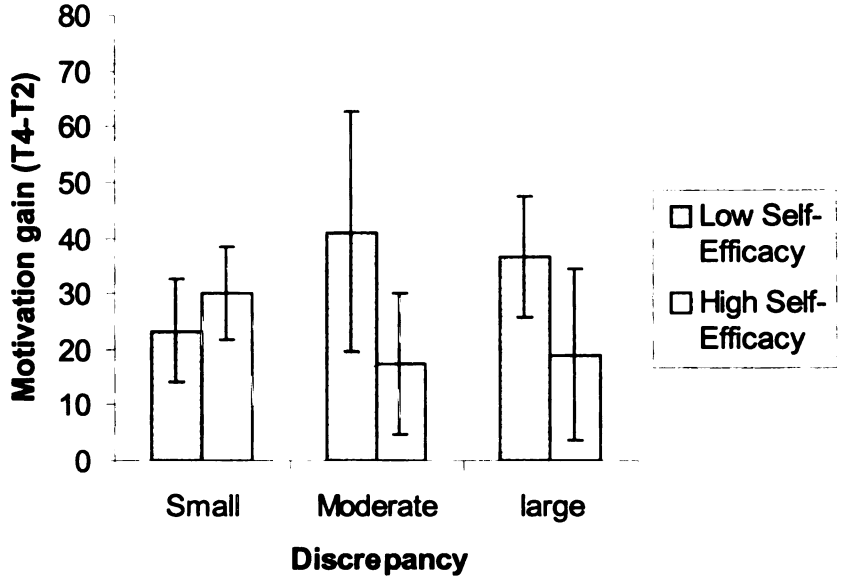


Figure 3.6 Motivation Gain for Trial 4 by Condition (Bar graph).

These findings are consistent with the results of previous studies (e.g., Hertel et al., 2000; Messé et al., 2002) which found significant motivation gains under conjunctive task demands compared with the zero baseline of the individual control condition.

In summary, the preceding analyses suggested the following conclusions. First, overall, participants showed greater motivation gains when they had low self-efficacy compared to when they had high self-efficacy. Second, across the three performance scores (third trial, fourth trial, and combined trials), the effect of self-efficacy consistently was strongest under a moderate level of performance discrepancy. Combined with the trend analyses which were summarized earlier, this result provides evidence that the Köhler discrepancy effect is moderated by self-efficacy. Third, in the analysis of performance in Trial 4 in which participants had more believability on feedback, the result revealed that low self-efficacy participants also showed greater motivation gain than high self-efficacy participants when their relative ability discrepancy was large, even though this effect did not quite reach conventional statistical significance ($p = .06$). This last result suggests the possibility that low self-efficacy participants would show more motivation gains than high self-efficacy participants once they passed a certain discrepancy threshold and were confident of their partner's superiority.

Subjective experience

As noted earlier, participants subjectively rated several aspects of their experience before and/or after each trial. The subjective rating of self-efficacy was administrated before each trial. In addition, questions on effort, enjoyment of the task, perceived importance of own performance, evaluation of their performance and satisfaction were

asked after each trial. Participants also were asked about performance expectation before Trial 3 and 4, and the question on perceived discrepancy was asked after Trial 3 and 4.

In the following analyses, I used the relative difference score (RDS) for the six questions that were administered for all 4 trials. This score was computed by subtracting the sum of ratings in the first two individual trials (i.e., Trial 1 and 2) – before the self-efficacy and discrepancy manipulations were administered – from the sum of ratings in the last two dyad trials (i.e., Trial 3 and 4) – after the manipulations were administered. Thus, this RDS reflected the change in subjective ratings from before to after participants received the self-efficacy and discrepancy manipulations. Because I used a 9-point scale, the possible range of RDS score was from –16 to +16. For the two questions which were asked only before or after Trial 3 and 4 (because the questions were partner-related), I used the average of these ratings for analysis. The possible range of this average score was from 1 to 9. All means and standard deviations on these questions are presented in Table 3.1.

To examine the question on the subjective rating of self-efficacy, which asked how well they thought they could perform in the upcoming trial, a 2 (self-efficacy) X 3(discrepancy) ANOVA was conducted on the relevant RDS. The results revealed that the main effect of self-efficacy was significant ($F(1, 147) = 10.97, p < .01$), while the main effect of discrepancy and interaction of these two variables were not significant (both $Fs < 1.16$). In contrast to the low self-efficacy condition in which participants felt less self-efficacious in the last two dyad trials compared with the first two individual trials ($M = -1.00$, $s = 2.46$), in the high self-efficacy condition participants reported that they felt more self-efficacious in the last two trials compared with the first two trials (M

Table 3.1

Means and Standard Deviations of Subjective Ratings

	Self-efficacy					
	Low			High		
	Discrepancy					
Measures	Small	Moderate	Large	Small	Moderate	Large
Differences of Subjective Ratings in the (Dyad) Group and in the Individual Trials (RDS)						
Self-efficacy	-.35 (2.12)	-1.54 (2.59)	-1.16 (2.59)	.36 (2.27)	.35 (1.44)	-.04 (2.65)
Effort	1.00 (2.08)	.83 (1.81)	1.68 (1.82)	.68 (2.46)	.62 (2.61)	.33 (2.62)
Enjoyment	-.85 (2.98)	-1.50 (2.11)	-1.00 (2.93)	.36 (2.45)	-1.96 (2.58)	-1.37 (2.31)
Importance	1.96 (2.75)	.58 (2.47)	1.60 (2.58)	.60 (3.03)	.19 (2.88)	.26(2.38)
Evaluation	-.54 (2.97)	-1.63 (2.75)	-1.28 (2.59)	1.32 (2.82)	-1.08 (3.16)	-1.19 (2.68)
Satisfaction	-.27 (2.78)	-1.38 (2.16)	-1.52 (3.23)	.80 (2.69)	-2.12 (3.25)	-1.44 (3.09)
Average Scores of Subjective Ratings in the Trial 3 and 4						
Expectation.	5.04 (1.32)	4.27 (1.96)	3.98 (2.01)	5.30 (1.00)	4.44 (1.54)	4.46 (2.08)
Discrepancy	5.19 (1.44)	6.58 (1.35)	6.80 (1.13)	4.64 (1.25)	6.54 (1.09)	6.69 (1.44)

Note. RDS (Relative Difference Score) indicated the change in subjective ratings after participants received the self-efficacy and discrepancy manipulations.

= .22, s = 2.17). It should be noted that participants in the high self-efficacy and large discrepancy condition (M = -.04, s = 2.65) felt about the same level of self-efficacy in the last two trials as they felt in the first two trials, perhaps because the positive belief in their absolute competence was offset by the large, negative discrepancy in ability between themselves and their partners.

For the question which asked how much effort they put into the last trial, a 2 (self-efficacy) X 3(discrepancy) ANOVA was conducted on the relevant RDS. Results revealed a marginally significant main effect of self-efficacy (F(1, 147) = 2.93, p < .09), while the main effect of discrepancy and interaction of these two variables were not significant (both Fs < 1). The marginally significant main effect of self-efficacy indicated that participants in both the low and high self-efficacy condition put out more effort in the last two dyad trials compared to their first two individual trials, but the amount of their perceived effort was tended to be somewhat greater when they had low self-efficacy (M = 1.17, s = 1.92) than when they had high self-efficacy (M = .54, s = 2.54).

To examine whether there was any difference in task enjoyment between conditions, a 2 (self-efficacy) X 3 (discrepancy) ANOVA was conducted on the relevant RDS. The results revealed that the main effect of discrepancy was significant (F(2, 147) = 4.30, p < .05), while the main effect of self-efficacy and interaction of these two variables were not significant (both Fs < 1.68). Examination of means suggested that participants in all discrepancy condition perceived less enjoyment in the last two dyad trials compared to their first two individual trials, but the level of their perceived task enjoyment differed by the discrepancy conditions. To examine whether the means in each discrepancy conditions were significantly different from each other, a Newman-Keuls

pairwise post-hoc test was conducted. This test result revealed that those in the moderate discrepancy condition (M = -1.74, s = 2.35) perceived significantly less enjoyment on the task than those in the small discrepancy condition (M = - 0.25, s = 2.77, $p < .05$). Also, those in the large discrepancy condition (M = -1.19, s = 2.61) perceived less enjoyment on the task than those in the small discrepancy condition (M = - 0.25, s = 2.77), but the significance was marginal ($p < .07$). There was no reliable difference between the moderate and large discrepancy conditions.

For the question, that asked about the importance of performing well after each trial, a 2 (self-efficacy) X 3 (discrepancy) ANOVA was conducted on the relevant RDS. The results revealed that the main effect of self-efficacy was significant ($F(1, 147) = 5.61, p < .05$), while the main effect of discrepancy and interaction of these two variables were not significant (both $Fs < 1.41$). In the low self-efficacy condition, participants reported that they felt it was more important to perform well in the last two trials than the first two (M = 1.40, s = 2.64) to a greater degree than participants in the high self-efficacy condition did (M = .35, s = 2.74). It would be worthwhile to discuss why low self-efficacy participants perceived their performance to be more important compared to high self-efficacy participants. As discussed earlier, when participants received the high self-efficacy information, supposedly based on the performance in the first two individual trials, they might have experienced feelings of complacency or overconfidence, which could contribute negatively to task performance. Therefore, they might not have any additional need to prove their ability because they already had received very favorable feedback. As such, the dyad trials would be less important to them. On the other hand, the participants who received low self-efficacy information, based on feedback about the first

two individual trials, might have experienced a feeling of failure, and realize that there was something wrong with their task performance. With such personal and social uncertainty about their ability, participants might have perceived the upcoming (dyad) trials as a "second-chance" opportunity to prove their ability. Such an orientation could have served to heighten the importance of these new work periods.

To explore the question of the evaluation of their performance, which asked how well they thought that they performed during the last trial, a 2 (self-efficacy) X 3 (discrepancy) ANOVA was conducted on the relevant RDS. The results revealed a marginally significant main effect of self-efficacy ($F(1, 147) = 3.30, p = .07$) and a significant main effect of discrepancy ($F(2, 147) = 5.99, p < .01$), while the interaction of these two variables did not reach statistical significance ($F < 1.34$). The marginally significant main effect of self-efficacy suggested that the tendency to perceive their performance as successful in the last two trials, compared to the first two trials was weaker when participants had low self-efficacy ($M = -1.13, s = 2.78$) than high self-efficacy ($M = -.35, s = 3.08$). Also, the significant main effect of discrepancy suggested that those in the small discrepancy condition ($M = .37, s = 3.02$) showed a more positive evaluation on their performance in the last two trials compared to the first two trials, but those in the moderate ($M = -1.34, s = 2.95$) or large ($M = -1.23, s = 2.61$) discrepancy condition showed a negative evaluation on their performance in the last two trials compared to the first two trials. The mean differences between the small and moderate or large discrepancy conditions were significant ($t(99) = 2.88, p < .01$; $t(101) = 2.89, p < .01$, respectively). There was not a significant difference between the moderate and large discrepancy conditions ($t < 1$). This pattern of result suggested that those in the small

discrepancy condition did not perceive the performance result of quitting earlier than their partner as indicating that they had failed.

For the question that asked about participants' satisfaction with their task performance after each trial, a 2 (self-efficacy) X 3 (discrepancy) ANOVA was conducted on the relevant RDS. The results revealed that the main effect of discrepancy was significant ($F(2, 147) = 7.21, p < .01$), while neither the main effect of self-efficacy nor interaction of these two variables was significant (both $Fs < 1.23$). The significant main effect of discrepancy suggested that those in the moderate ($M = -1.76$, $s = 2.78$; $t(99) = 3.65, p < .001$) and large ($M = -1.48$, $s = 3.13$; $t(101) = 2.98, p < .01$) discrepancy condition felt more dissatisfaction with their task performance on the last two trials than the first two trials, but, if anything, those in the small ($M = 0.25$, $s = 2.76$) discrepancy condition felt more satisfaction in the last two trials compared to the first two trials.

For the performance expectation question, which asked how likely participants thought it was that they would do as well or better than their partner before each dyad trial (i.e., before the Trial 3 and 4), a 2 (self-efficacy) X 3(discrepancy) ANOVA was performed on the average score of trial 3 and 4. Results revealed a significant main effect of discrepancy ($F(2, 147) = 4.65, p < .05$), while the main effect of self-efficacy and interaction of these two variables were not significant (both $Fs < 1.23$). The significant effect of discrepancy suggested that those in the small discrepancy condition ($M = 5.17$, $s = 1.17$) reported a higher expectation of good performance than those in the moderate ($M = 4.36$, $s = 1.74$; $t(99) = 2.75, p < .01$) and large discrepancy conditions ($M = 4.23$, $s = 2.04$; $t(101) = 2.85, p < .01$). There was not a reliable difference between the moderate and large discrepancy conditions ($t < 1$).

For the question which asked about the perceived discrepancy between their performance and the performance of their partner after each dyad trial (i.e., after the Trial 3 and 4), a 2 (self-efficacy) X 3(discrepancy) ANOVA was conducted on the average score of Trial 3 and 4. The analysis revealed that the main effect of discrepancy was significant ($F(2, 147) = 30.93, p < .001$), while the main effect of self-efficacy and interaction of these two variables were not significant (both $Fs < 1.29$). A significant main effect of discrepancy suggested that those in the small discrepancy condition ($M = 4.92, s = 1.37$) reported significantly smaller perceived discrepancy than those in the moderate ($M = 6.56, s = 1.21$; $t(99) = 6.38, p < .001$) and large discrepancy conditions ($M = 6.74, s = 1.29$; $t(101) = 6.95, p < .001$). There was no mean difference between the moderate and large discrepancy conditions ($t < 1$). This last result suggested that participants perceived about the same size of discrepancy once they had realized a certain amount of discrepancy.

Chapter 4

DISCUSSION

Implications of the present study

The results of this study suggested that participants showed greater motivation gains when they had low self-efficacy than when they had high self-efficacy; and, this effect was strongest under a moderate level of perceived discrepancy. However, given the fact that there were significant motivation gains in all the high self-efficacy conditions as well as all the low self-efficacy conditions, it would be more accurate to say that low self-efficacy participants exerted extra effort when they had a moderate discrepancy (and, to a lesser degree, when they had a large discrepancy) rather than saying that high self-efficacy impaired task performance in this condition. Therefore, one implication for the literature on self-efficacy that the present results provide is that these findings should not be taken to indicate that high self-efficacy is a detrimental factor of task performance. Rather, the results suggest that low self-efficacy could have motivating effects on task performance.

There are likely to be a few reasons why high self-efficacy participants did not work as hard as low self-efficacy participants, or alternately, why low self-efficacy participants showed extra effort, particularly in the moderate discrepancy condition. First, high self-efficacy participants must have perceived the high self-efficacy feedback as a success. As indicated by previous studies (Bandura & Jourden, 1991; Stone, 1994; Vancouver et al., 2002), this feeling of success might have elicited complacency for their previous performance and/or overconfidence in their future success at the task. This

conclusion is consistent with the result of the analysis of the question that asked participants to report their self-efficacy level before the third trial. Because this question was administered after the manipulation of self-efficacy and before the third trial, participants' ratings were not affected by the performance results of the third trial. In this analysis, participants who had received the high self-efficacy manipulation thought that they could perform significantly better ($M = 5.92$, $s = 1.63$) than participants who had received the low self-efficacy manipulation ($M = 5.35$, $s = 1.63$), $t(151) = 2.19$, $p < .05$. This favorable expectation might have caused complacency or overconfidence in high self-efficacy participants. Therefore, there is a possibility that participants with high self-efficacy might not have worked very hard in subsequent (dyad) trials, even though, as the weaker dyad member, they still had high level of instrumentality and a realistic and achievable goal in the moderate discrepancy condition.

Second, whether participants put an extra effort in the conjunctive dyad trials might hinge upon the participants' perceived importance of performing well on these trials. High self-efficacy participants might not have as strong a need to prove once again their ability – to themselves, to the experimenter, to their partner – because they already had received very favorable and public performance feedback. This "warm glow of success" might have caused them to think that demonstrating good performance on the dyad trials was less important and/or necessary. Hence, they might not have as much reason to expend maximum effort. On the other hand, low self-efficacy participants were led to believe that they did not prove themselves to be good performers in the initial two trials. Given this, it is reasonable to expect that they would view the upcoming dyad trials a "second-chance" opportunity to prove their ability to themselves, the experimenter,

and/or their partner. Therefore, low self-efficacy participants might have perceived that the task performance in the dyad trials was more important to them, and, given this chance, they expended greater to show they were, in fact, better at the task than their original performance had indicated. This interpretation was supported by their responses to the question that asked about the importance of performing well. Compared to the initial two trials, those in the low self-efficacy condition perceived that it was significantly more important for them to perform well in the latter two trials ($M_{diff.} = .70$, $s = 1.32$; $t(74) = 4.60$, $p < .001$.), while high self-efficacy participants did not share this perception ($M_{diff.} = .17$, $s = 1.37$; $t(77) = 1.13$, *ns*). Also, when I compared these two mean differences, the mean in the low self-efficacy condition was significantly greater than the mean in the high self-efficacy condition ($t(151) = 2.42$, $p < .05$). Moreover, it is reasonable that low self-efficacy participants would actually try hardest in the moderate discrepancy condition, because knowing that their coworker performed only somewhat better than they might suggest to them that they have a realistic chance of improving their performance. In contrast, feedback that they and their partner had performed about the same would provide no evidence that they (on their partner, for that matter) could do better. And, learning that their partner had substantially outperformed them could be taken as a reason to be pessimistic about any chance to show improvement.

Finally, to examine the reason why low self-efficacy participants exerted extra effort especially in the moderate discrepancy condition, it is useful to consider Wright and Kirby's (2001) integrative effort analysis of cardiovascular (CV) responses (e.g., heart rate, systolic blood pressure, diastolic blood pressure) in motivated performance situations. In this analysis, the authors first took the proposition of Obrist (1976, 1981)

that the sympathetic nervous system's influence on the CV system is proportional to effort or task engagement (i.e., Changes in CV responses reflect effort exertion or striving). Then, they utilized and extended Brehm's motivational intensity theory (Brehm & Self, 1989) to specify when people should manifest greater or lesser degrees of effort-related CV response. Through this procedure, Wright and Kirby proposed four effort-related and six ability-related implications, and showed evidence for these implications. Among these, I would like to discuss a few implications which are particularly related to the results of the current study.

First, they demonstrated that sympathetic CV responses (and hence, effort) tended to be greater for low than high ability people where demand is modest (i.e., if it is possible and worthwhile to meet the challenge). Given the fact that the self-efficacy manipulation of the current study includes normative ability information (i.e., 20 or 80 percentile in the total population), it would be plausible to consider low or high self-efficacy participants as seeing themselves as having low or high ability. Also, in terms of the Social comparison/Goal setting explanation, a "possible and worthwhile challenge" could be considered to be a realistic and reachable goal (i.e., moderate discrepancy in conjunctive task demands). Therefore, Wright and Kirby's (2001) result is consistent with the current result in that low self-efficacy participants showed bigger motivation gain than high self-efficacy participants in the moderate discrepancy condition.

Second, Wright and Kirby (2001) demonstrated that sympathetic CV responses (i.e., those associated with effort) were low for both ability groups if demand was particularly high. In other words, when a challenge was especially difficult to meet, effort level became minimal, irrespective of the perceived capacity to perform. This pattern is

also consistent with the current result, which showed no significant performance difference between high and low self-efficacy participants in the large discrepancy condition (although there was marginally significant difference on the Trial 4 – Trial 2 dependent measure).

Third, Wright and Kirby (2001) demonstrated that sympathetic CV responses to a possible challenge were moderated by the perceived importance of success. That is, effort level was proportional to the difficulty of challenge when the importance of success was high enough to make a possible challenge worthwhile, but effort was minimal irrespective of demand when importance of success was sufficiently low. Here, the high efficacy participants put low importance on success and were relatively insensitive to the difficulty of the challenge (i.e., the discrepancy between their own and their partner's ability). But low efficacy participants placed a high premium on success. Wright and Kirby's analysis predicts that a) low efficacy/ability people should show greater effort (compared to their high efficacy/ability counterparts), and b) they should increase effort as the degree of challenge increases. However, c) very high levels of difficulty could be seen as challenges that were impossible to overcome, and d) it would be at this point that people would reduce their effort. This was essentially the pattern of results that occurred in the current study.

An important research question addressed in this study was whether the Köhler discrepancy effect would be maintained or altered by the high or low self-efficacy information. In the Results section, a marginally significant self-efficacy X quadratic interaction was described. When participants received the high self-efficacy information (i.e., they perceived that they are a good performer and the experimenter and her partner

knew this), they tended to exert less effort as discrepancy increased from small to moderate, but they tended to put out slightly more effort when discrepancy increased from moderate to large. The Pattern was a (non-significant) U-shaped function. Considering this pattern, it is clear that there was no hint of the inverted-U Köhler discrepancy effect when participants had high self-efficacy. On the other hand, when participants received low self-efficacy information (i.e., they perceived that they are a poor performer and the experimenter and her partner knew this), they consistently worked harder in the higher discrepancy condition. By Trial 4, the combined Moderate + Large discrepancy conditions differed marginally ($t(147) = 1.91, p < .06$) from the Small discrepancy condition. And overall, the quadratic, inverted-U trend was marginally significant ($t(147) = 1.87, p < .07$) for these participants (compared to the high self-efficacy participants). Thus, in the low self-efficacy condition, we observed the basic inverted U-shape pattern that Köhler originally found, with a drop in effort between moderate and large discrepancy but one that was somewhat less dramatic than had been found in other studies (viz. Messé et al., 2002).

It is also useful to discuss the results of this study in terms of the impression management concerns. Previous studies (Hertel, Kerr, Scheffler, et al., 2000; Kerr, Messé, Park, & Sambolec, under review; Lount et al., 2000) suggested that impression management concerns might be a basis for generating motivation gains. Recently, Kerr and his colleagues (Kerr et al., under review) tested a few theoretical possibilities (i.e., indispensability of effort, social comparison/goal setting and impressions management explanation) involved in motivation gain paradigm by systematically varying the nature of the performance feedback and identifiability of the weaker performer. In their results,

motivation gains decreased as the availability of performance-relevant information to one's partner decreased; compared with their Full and End-of-trial feedback conditions (in which participant's status as the less capable group member was immediately evident as soon as a participant quit), participants in their Delayed feedback condition (who could know only who failed first but not when their partner failed) showed attenuated (but still significant) motivation gain. More interestingly, participants in the No feedback condition (in which no one could tell who quit first or how long either had persisted) did not show any motivation gain, even though they were aware that one of them was indispensable to their team's success. Thus, merely knowing that one person – the "weaker link" – was responsible for how well or poorly the team did (without being able to identify who this "weaker link" was) was not sufficient information to generate motivation gains. Kerr and his colleagues speculated that this result could stem from the impression management concerns; it might be more crucial for participants to avoid being known to be the weaker member rather than actually being the weaker member. In the present study, participants may have been concerned with managing a favorable impression to two targets (i.e., the experimenter and their partner). They were told that the experimenter would know who quit first and also, they could expect that their partner would see their results on her computer screen (and, since the trial ended as soon as the participant quit, it was evident to all who quit first). If participants' concern was in maximizing group scores, participants might have felt equal amount of indispensability in each self-efficacy condition. However, if the participants' goal was to create a favorable (or avoid an unfavorable) impression among others (i.e., proving their capabilities) rather than maximizing group score, we would expect to see more motivation gains under

conditions where participants had low self-efficacy (i.e., low ability). Also, this impressions management motive might be greater in the moderate or large discrepancy conditions because participants might have viewed these as contexts where one could realistically prove their capabilities. Outlasting another person of equal ability would not enhance one's reputation. Thus, the current results – that the strongest motivation gain occurred in the moderate (and possibly large) discrepancy condition when participants had low self-efficacy – are consistent with the interpretation of the findings of previous studies that impression management could play a role in generating the Köhler effects.

In addition to the impression management explanation, some motivation gain researchers (e.g., Hertel et al., 2000; Kerr et al., under review; Messé et al., 2002, in preparation) have considered the Instrumentality X Value (i.e., indispensability of effort) explanation and the Social comparison (or Goal-setting) explanation as plausible and useful explanations of the Köhler motivation gain effects, as I already described in the introduction. Recently, to examine the Köhler discrepancy effect under different task demands, Messé and his colleagues (Messé et al., in preparation) manipulated relative ability discrepancy (i.e., small, moderate and large discrepancy between a participant and her partner) under conjunctive or additive task demands.

The investigators expected greater motivation gains in the conjunctive than additive task condition because they thought both indispensability and social comparison processes would additively contribute to produce performance gains in the conjunctive task condition while only social comparison would contribute to gains in the additive task condition.

As expected, the results revealed that participants showed significant motivation gains in both task conditions compared to the individual control condition, but those in the conjunctive condition showed significantly greater motivation gains than those in the additive condition. Also, as Köhler originally found, there was a clear pattern of inverted-U in the conjunctive task condition (but not the additive task condition) when participants' actual perception of the discrepancy between their own and their partner's past task performance was the independent variable. These results suggest that both indispensability and social comparison processes are working additively under the conjunctive task demands to generate both Köhler effects.

Based on these results, it could be useful to think about whether participants in the present study were affected to a different degree by indispensability or social comparison processes, depending on their self-efficacy manipulations. Considering the task demand, it seems that the influences of indispensability are the same for all participants regardless of their self-efficacy information, because the present study was conducted only under the conjunctive task condition – and it is only in this condition that the weaker member is indispensable for dyadic performance. However, different from the influences of indispensability, it seems likely that the impact of a social comparison motive change depending upon the self-efficacy manipulation.

Stroebe and his colleagues (Stroebe, Diehl, Abakoumkin & Arnscheid, 1990) suggested that when task accomplishment is unimportant or not valued by group members, there would be a downward bias in their social comparison process – the more capable members would adjust their goals downward to be more in line with the less capable members. Conversely, if task accomplishment is important or valued by group

members, the bias should be in the opposite direction – that is, those performing less well should set goals closer to the performance levels of the more capable group members. As I discussed earlier, low self-efficacy participants considered the dyad trials as more important than high self-efficacy participants. The higher importance perception of low self-efficacy participants might have led them to engage more in upward social comparison than high self-efficacy participants. As a result of this difference in social comparison tendency, those who had low self-efficacy should have showed bigger motivation gains to reduce the performance discrepancy between them and their partner. Since they always were the less capable dyad members, the high self-efficacy participants who placed less importance on good task performance in the dyad trial may simply have settled for their own, lower performance level as an acceptable goal.

Limitations and Directions for Future Research

There are some limitations in this study that are worthwhile to discuss, particularly as possible directions for future research. First, to manipulate large discrepancy, participants received a partner's score that was twice as good as their own. This level was chosen to mirror prior manipulations (e.g., Messé et al., 2002). However, there may be ambiguity or differences across people in the concept of unachievable discrepancy. How large does an actual discrepancy have to be for it to be perceived by the weaker worker as large enough subjectively to be viewed as creating a situation where additional effort is perceived as being far from optimally useful and /or appropriate? In the Wright and Kirby's (2001) analysis, they demonstrated that participant's perception of this threshold depends upon the importance of success. That is, as the importance of success increases, the range of perceived achievable performance

increases. Maybe this connection is why there was a non-significant and modest drop in effort by the low self-efficacy participants in the large discrepancy condition of the present study, compared to the reliable quadratic trend in Messé et al.'s (2002) study, where self-efficacy information was not provided (i.e., where it was uncertain). That is, getting low self-efficacy (i.e., own ability) information (in the present study) may have increased the importance of good performance relative to those (in Messé et al., 2002) who received no self-efficacy feedback. This speculation suggests that one might have to use a much higher "High" discrepancy to replicate the full inverted-U function among participants who consider good performance very important.

Second, the results of this study for the low self-efficacy participants were similar to those in a previous study (Messé et al., 2002) which replicated the Köhler discrepancy effect. Besides the explicit self-efficacy (i.e., own ability) feedback in the present study (vs. the absence of any such feedback in Messé et al., as noted above), another potentially important difference between these two studies was whether participants could see each other during performing the persistence task. Participants in Messé et al.'s (2002) study performed the task with their partner (i.e., a confederate) in the same room – so they could watch each other – while the participants in the present study briefly met one another before they performed the task (i.e., at a point, when they did not know who their partner would be) and they performed the task without seeing each other. With these differences in the experimental settings in mind, I compared the results of the low self-efficacy participants in the present study with the Messé et al.'s (2002) to examine how the self-efficacy feedback and the face-to-face interaction might have affected task performance. In order to examine whether there were differences in motivation gains

between these two studies and whether there were overall linear trend, overall quadratic trend or study X quadratic interaction, I conducted contrast analyses in which 3-level discrepancy factor was decomposed into linear and quadratic trends. These comparisons are presented in the Figure 4.1 and 4.2 (The Figure 4.1 utilized the average scores of Trial 3 and 4, and the Figure 4.2 utilized the scores of Trial 4). Because there was no difference on the scores of Trial 3 between these two studies, I do not present the results of the Trial 3. As presented in the Figure 4.1, for the average scores of Trial 3 and 4, the participants in the Messé et al.'s (2002) study showed greater overall motivation gains than the low self-efficacy participants in the present study, but this difference was only marginal ($t(119) = 1.84, p < .07$). Also, while there was no significant overall linear trend ($t < 1$), an overall quadratic trend was marginally significant ($t(119) = 1.80, p < .08$). Similarly, for the scores of Trial 4, which are presented in the Figure 4.2, the same pattern was found, but the effects were stronger. As was with the average scores, the participants of the Messé et al.'s (2002) study showed greater overall motivation gains than the low self-efficacy participants of the present study ($t(119) = 4.33, p < .001$). Also, an overall quadratic trend was significant ($t(119) = 2.49, p < .05$) while an overall linear trend was not ($t < 1$). In addition, study X quadratic interactions for both dependent variables (i.e., the average scores of Trial 3 and 4, and the scores of Trial 4) were not significant (both ts < 1.22). In summary, 1) the motivation gain was greater in Messé et al.'s (2002) study, although the same inverted-U pattern basically occurred in both the studies, as well as in Köhler's original research. These results are consistent with this possibility that direct concerns with impression management in the face-to-face group could have produced bigger motivation gains (i.e., extra effort exertion). 2) As presented in both figures, the

participants in the Messé et al.'s (2002) study showed greater performance decreases from the moderate to large discrepancy condition compared to the low self-efficacy participants of the present study. Perhaps the visual feedback of an unfatigued, high discrepancy partner that the procedure afforded participants in Messé et al.'s (2002) study convinced them that it was unrealistic to attempt to match her level of performance.

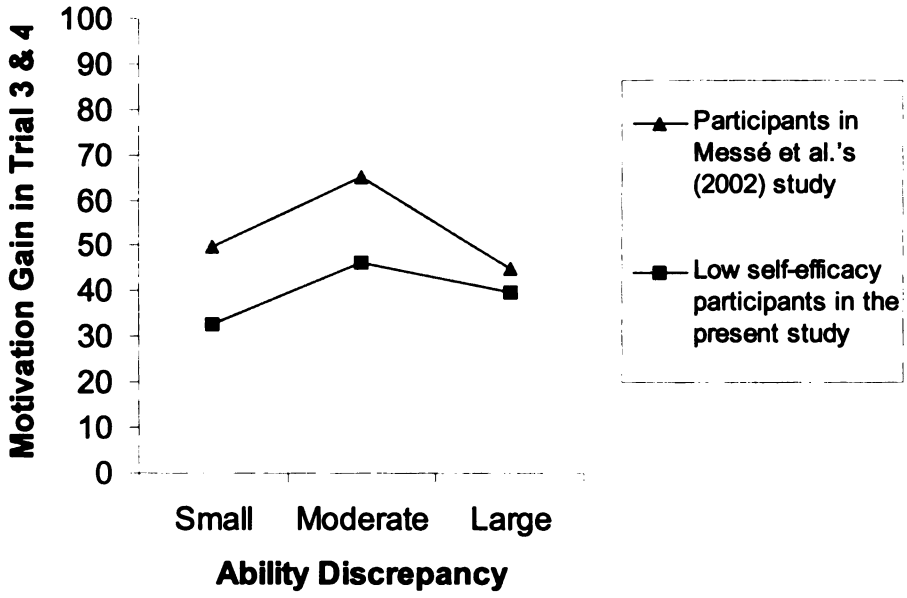


Figure 4.1 Comparison Between the Present Results of Low Self-efficacy Participants and Messé et al.'s (2002) Results (Motivation Gain for the Average of Trial 3 and 4).

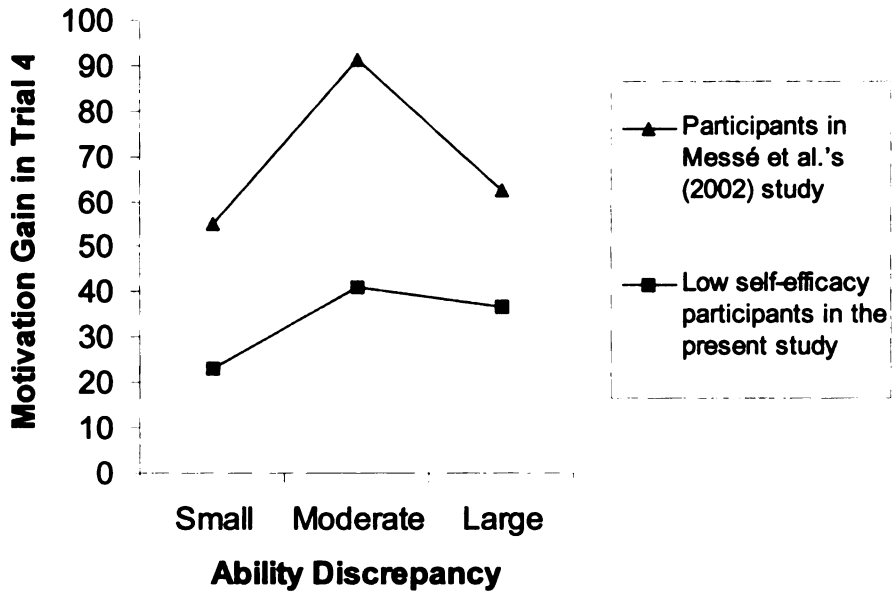


Figure 4.2 Comparison Between the Present Results of Low Self-efficacy Participants and Messé et al.'s (2002) Results (Motivation Gain for Trial 4).

Through the above analyses, I found that the participants who had low self-efficacy in the present study showed similar results to participants who were uncertain about their ability (i.e., Messé et al.'s study). To further compare the results of these two studies, it would be useful to compare the high self-efficacy participants of the current study with participants who did not receive any information on their ability. To do so, I compared the present results of the high self-efficacy participants with the results of the Messé et al.'s (2002) participants by conducting the same contrast analyses, reported above, that I did for the low self-efficacy participants (i.e., contrast analyses on the study main effect, overall linear trend, overall quadratic trend and study X quadratic interaction effect). These comparisons are presented in the Figure 4.3 and 4.4 (The Figure 4.3 utilized the average scores of Trial 3 and 4, and the Figure 4.4 utilized the scores of Trial

4; Again, because there was no difference on the scores of Trial 3 between these two studies, I do not present the results for Trial 3). As presented in the Figure 4.3, for the average scores of Trial 3 and 4, the participants of the Messé et al.'s (2002) study showed greater overall motivation gains than the high self-efficacy participants of the present study ($t(122) = 3.79, p < .001$). Also, while there were no significant overall linear and overall quadratic trends (both ts < 1), a study X quadratic interaction was marginally significant ($t(122) = 1.98, p < .06$). For the scores of Trial 4, which are presented in the Figure 4.4, the same basic results were found. As was the case for the average scores, the participants of the Messé et al.'s (2002) study showed greater overall motivation gains than the high self-efficacy participants of the present study ($t(122) = 6.01, p < .001$). Also, while there were no significant overall linear and overall quadratic trends for the scores of Trial 4 (both ts < 1.52), the study X quadratic interaction was significant ($t(122) = 2.40$, $p < .05$). In summary: 1) similar to the comparison between the participants of Messé et al.'s study and the low self-efficacy participants of the present study, overall motivation gains were greater for the participants of the Messé et al.'s study than the high self-efficacy participants of the present study; and, 2) a significant study X quadratic interaction suggested that the participants of the Messé et al.'s study showed inverted-U pattern while the high self-efficacy participants in the current study showed U-shape pattern. Different from the previous comparison with the low self-efficacy participants, this last result suggested that high self-efficacy participants showed quite different sensitivity to partner discrepancy compared to the participants who were uncertain about their ability. As noted earlier, because the experimental settings of these two studies were different, it is a bit risky to compare the results. Therefore, future work needs to examine

within the same experimental design and procedure whether the Köhler discrepancy effect would be pronounced (i.e., a stronger effect) if face-to-face groups were examined and if the actual large discrepancy in ability more uniformly generates equivalent perceptions in group members.

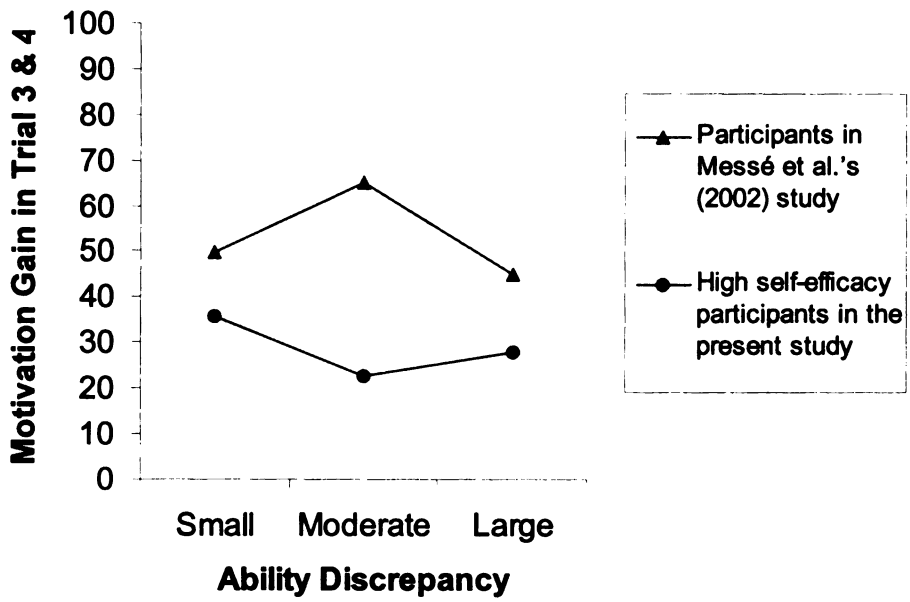


Figure 4.3 Comparison Between the Present Results of High Self-efficacy Participants and Messé et al.'s (2002) Results (Motivation Gain for the Average of Trial 3 and 4).

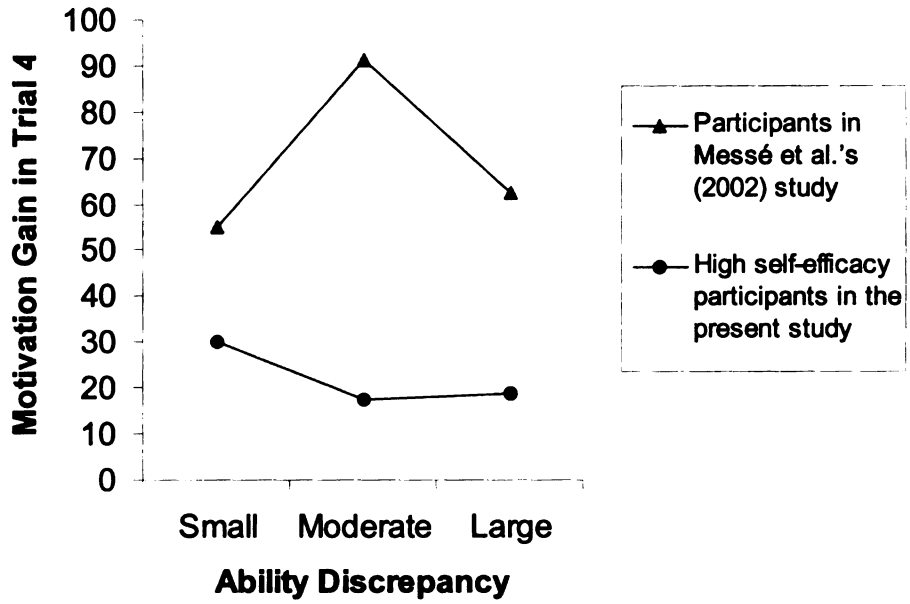


Figure 4.4 Comparison Between the Present Results of High Self-efficacy Participants and Messé et al.'s (2002) Results (Motivation Gain for Trial 4).

In an effort to generalize the present results, it also would be useful to investigate these effects under different task demands and/or in different situations. For example, it would be interesting to examine whether low versus high self-efficacy would elicit different magnitudes of motivation gain in a coactive task in which social comparison and competition motives are thought to be more salient. In addition to this, future work should investigate the effect of self-efficacy on motivation gains with other and more realistic group tasks.

In this study, participant's perception of the importance of performing well was a crucial variable affecting whether or not participants put forth extra effort. Based on these results, it is likely to be fruitful for future work to directly manipulate the importance of performing well as a means of examining how this importance perception could affect the

relationship between discrepancy and performance. To manipulate importance, there are several feasible options. For example, to increase importance, researchers could give participants extrinsic incentives for their good performance or they could give them information that statements linked task performance with some valued personal ability (e.g., IQ). Conversely, to decrease the importance, researchers could use some methods to derogate the task itself (e.g., allege that performance was of little interest to the experimenters).

Chapter 5

CONCLUSION

In this study, I investigated the potential moderation effect of self-efficacy on the Köhler discrepancy effect (i.e., whether the Köhler discrepancy effect would be maintained, enhanced, or diminished depending on the self-efficacy information that participants were given). Self-efficacy on the task was manipulated by giving false feedback about one's percentile rank in the population. Results revealed that participants showed greater motivation gains performing under conjunctive task demands when they had low self-efficacy than high self-efficacy, and that this effect was strongest with a moderate level of perceived discrepancy in own and coworker's ability. Also, the results suggested that the Köhler discrepancy effect seemed to be maintained when participants had low self-efficacy but not when they had the high self-efficacy information. In interpreting the present results, I discussed a number of psychological processes that are likely to be involved in this effect (e.g., complacency or overconfidence of high self-efficacy participants, social comparison or goal comparison, perceived indispensability of effort, participants' perceived importance of task performance, striving to create a favorable impression to others)

Until now, more empirical evidence relevant to identifying the underlying psychological processes for the Köhler's simple motivation gains effect has been accumulated than for the Köhler discrepancy effect. The present study was an attempt to increase our understanding of the latter by examining if self-efficacy moderates the Köhler discrepancy effect. Findings suggested the present research could prove to be the

initial step in a fruitful line of inquiry, particularly if future work pursues some of the interesting clues about the Köhler discrepancy effect that the present study yielded. In addition, future research needs to examine other possible moderating variables and underlying processes that determine the conditions that promote group motivation gains. Once we accumulate such evidence we will have achieved a firmer basis for understanding the nature of the Köhler discrepancy effect and related phenomena.

APPENDICES

APPENDIX A

Instructions on the computer program

Screen 1.

Welcome to the Holding Hands experiment, "*Participant's Name*". Our research is following other research which looks at the persistence of people working at a physical task. In a moment, you will be performing a simple endurance task. Please read through all of these instructions carefully before you begin in order to prepare for this task.

The instructions for performing this task are as follows. First, for your own comfort, please take off all bracelets and watches that you may be wearing. Please place whatever you removed in the black paper bag located to the left of your keyboard. You may do this now.

Screen 2.

At this time, grasp the weight, slipping your hand through the grip provided with your dominant hand. Your dominant hand is usually the hand that you write with. So, if you write with your right hand, your dominant hand is your right hand.

Next, you should see two metal poles near the computer keyboard with a string between them. Move your chair so that the outside of the shoulder of your dominant arm is lined up between the metal poles; you should be sitting so that when you hold your dominant arm straight out in front of you, it is right in the middle of the two metal poles with your wrist over the string.

When a trial begins, you will raise your dominant arm between the two metal bars so that your wrist is between the top of the two poles and your wrist is over the string. The purpose of the task will be to hold your arm out straight with your elbow locked, for as long as you can.

When you are done reading this page, please click NEXT button.

Screen 3.

When you cannot hold your arm up any longer, you may let your arm drop. This motion will bring your wrist down to the string that is attached to a mechanism. This mechanism will press the spacebar on your keyboard. When the spacebar is pressed, your trial will be over.

Again, the goal of this task is to hold your arm up for as long as you can after your trial has begun. During the trial, you must always keep your wrist over the string, your arm straight, and your arm between the two metal poles. In addition, when you bring your wrist down don't do it too fast or with too much force; this could cause damage to the equipment.

While you are performing this task with one arm, you must also keep your other hand on one of the Control buttons located at the bottom of your keyboard (they have a red sticker attached to help you find them). During your trial, if you do not have your non-dominant hand pressing the most accessible Control button, your time will not be recorded and, thus, you will not get credit for the work you do.

When you are done reading this page, please click NEXT button."

Screen 4.

In addition, during each trial, you must remain seated in your chair with both of your feet flat on the ground. You are NOT allowed to use your non-dominant arm to support your dominant arm in any way during the trial. Remember, you must keep the button pressed with your non-dominant hand while you are performing the task. There is a video camera located to the side of the keyboard to make sure all of these rules are followed.

We do want to emphasize that this is a tiring task. The longer you hold the wrist weights up, the more tired your arm will become. WE DO NOT want anyone to hold up their arm so long that they experience undue pain or risk injury to their arm or shoulders. Rather, we expect that as your arm becomes too tired or uncomfortable you will lower it so the mechanism will press the spacebar and end the trial.

We do want to do as well at the persistence task as you can, but only as well as you can do consistent with your own physical well being and comfort. In summary, do your best, but do not attempt to do more than you can do--don't risk injury or undue pain. How well people do at this task depends on a pair of factors--their physical strength and their tolerance for discomfort. People seem to differ a lot on both, and particularly on the latter factor. That is, some people find even a short period of holding up the weight to make them too uncomfortable to continue. Others can hold the weight for quite a while without experiencing noticeable discomfort.

When you are done reading this page, please click NEXT button.

Screen 5.

You can earn money through your performance at the persistence task. Here's how. We will sum up all the scores on all the trials today to come up with a Total Score. Then, at the end of the study, we will randomly pick two persons taking part in the study.

Every person, no matter how well or poorly s/he does, has an equal chance of being picked and winning. We will award the winning persons 5 cents for every point of their Total Scores. Depending upon how well each of the winning persons performs, they could earn up to $50.

As an additional incentive to perform your best, we are having a little competition between students taking part in this experiment at the University of Michigan and those performing it here at Michigan State. We will compute the average Total Score for each school, and award the winning persons from the school with the strongest teams an additional 15%. So even if you are not picked, your good performance at this task will possibly benefit another MSU student.

When you are done reading this page, please click NEXT button.

Screen 6.

OK, we're now ready to begin the first trial.

Before and after each trial, you will be given a few questions. After responding the questions, you will see a countdown (10, 9, 8,etc.). When the countdown gets near the end (around 2 or 1), you should put your wrist above the string, arm straight and elbow locked, and press the Control key with your non-dominant hand. The trial will begin at the end of the countdown (the computer screen will say 'START'). You should continue to keep your arm above the string as long as you can. When your wrist touches the string, it will end the trial.

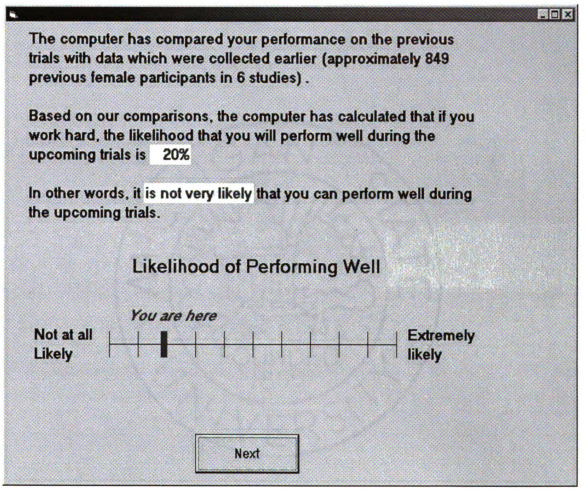
After the trial ends simply follow the instructions on your computer screen. If you have any questions, please ask the experimenter now.

If you understand the instructions and are ready to respond the question and begin the first trial, please click 'NEXT' button. Be ready to start the first trial at the end of the countdown.

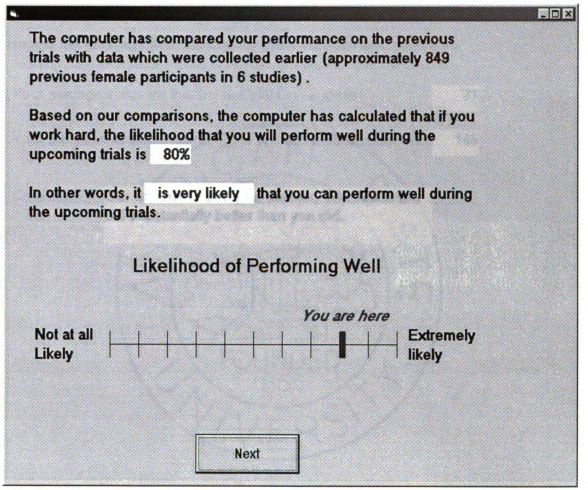
APPENDIX B

Self-efficacy manipulation screen

(Low self-efficacy)



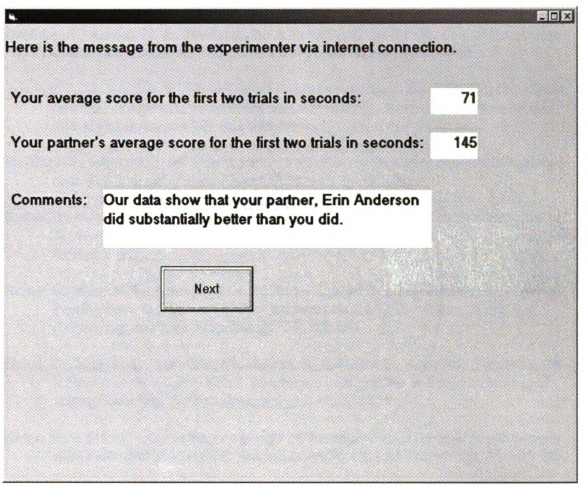
(High self-efficacy)



APPENDIX C

Discrepancy manipulation screen

(An example of the large discrepancy condition)



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