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IS A DIFFERENT PERSPECTIVE HELPFUL?
ASSESSING THE VALIDITY OF PEER RATINGS
OF GOAL ORIENTATION

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By

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IS A DIFFERENT PERSPECTIVE HELPFUL?
ASSESSING THE VALIDITY OF PEER RATINGS
OF GOAL ORIENTATION

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF PSYCHOLOGY

BY

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Abstract

The present study was the first to examine the validity of peer ratings of goal orientation. I examined peer-assessed goal orientation in a collaborative training environment with a complex task. The reliability and structural, convergent, discriminant, and predictive validity of peer ratings were examined. Regarding predictive validity, I examined the incremental contribution of peer ratings above and beyond self ratings in the prediction of skill acquisition and post-training self-efficacy. The results showed that (1) self and peer ratings have similarly high levels of internal consistency, (2) there is little agreement and convergence between self and peer ratings, (3) self and peer ratings have similar structures, and (4) peer ratings provide incremental validity beyond both self ratings and prior performance in predicting future skill acquisition and post-training self-efficacy.

Is a Different Perspective Helpful?
Assessing the Validity of Peer Ratings of Goal Orientation

Goal orientation continues to emerge as a useful construct aiding in the understanding of learning and performance across a number of settings and samples (e.g., Dweck, 1991; Elliot & Dweck, 1998; Fisher & Ford, 1998; VandeWalle, Brown, Cron, & Slocum, 2001). It is formally defined as the goals individuals implicitly pursue in achievement settings (Dweck & Leggett, 1988). First studied using school children in the 1980's, goal orientation research has since been extended to adult populations in a variety of contexts including educational programs (e.g., Brett & VandeWalle, 1999), organizational settings (e.g., VandeWalle, Brown, Cron, & Slocum, 1999), and athletics (e.g., Etnier, Sidman, & Hancock, 2004). Although typically measured through the use of self reports, the limitations of this approach suggest that identifying a different method for measuring goal orientation may be worthwhile.

In general, the self-report approach is advantageous due to its ease of collection as well as the assumption that a person knows more about him or herself than others do. In organizational contexts, the advantages of self-report measures include personal development and improved communication and clarification among members of a workgroup (Carroll & Scheneier, 1982; Cummings & Schwab, 1973). However, because self reports only provide one perspective, a perspective that may be affected by social desirability, exploring the viability of other methods of measurement may be useful.

For example, peer ratings have been utilized as a possible source of valuable information about personality (e.g., Antonioni & Park, 2001) as well as performance (e.g., Conway, Lombardo, & Sanders, 2001). Kolar, Funder, and Colvin (1996) suggest that the reason peer ratings can provide information that can be incrementally useful

beyond self ratings is due to the fact that while the actor is focused on his or her environment, the observer is focused on the actor. In essence, there is a fundamental difference between the perspectives that self and peers provide. Peers report on a person's public self, or the way a person is perceived by others. Self reports, on the other hand, involve a person's private self, which involves internal processes that influence how a person explains his or her own behavior (Mount, Barrick, & Strauss, 1994). Consequently, self reports may or may not reflect how a person's behavior is perceived by others. This line of logic suggests that peer ratings can provide a unique and potentially useful perspective. Nonetheless, despite the fact that peer ratings of personality and performance have been extensively researched and measures of goal orientation have been extensively studied with regards to motivation and performance, little research has examined the usefulness of peer ratings of goal orientation.

Thus, the aim of the present study was to expand the research on goal orientation by examining the reliability and validity of peer ratings of goal orientation. The context of this study involved five hours of training on a complex task spread over two days with a 1-week non-practice interval. On the first day, participants collaborated with a more experienced partner who had already completed 3.5 hours of training. These more experienced partners provided the peer ratings of goal orientation. On the second day of training participants trained individually and completed tests of skill acquisition and post-training self-efficacy. Although I examined several different psychometric properties of the peer ratings of goal orientation, I was particularly interested in their predictive validity especially in regards to their incremental validity beyond self ratings of training outcomes.

Goal Orientation

Current goal orientation research focuses on a three-factor model in which learning orientation is distinguished from performance orientation, with performance orientation further being divided into proving and avoiding dimensions (Elliot & Church, 1997; VandeWalle, 1997). In the literature, learning orientation is also referred to as mastery orientation, and proving and avoiding dimensions have been referred to as performance-approach (or performance-prove) and performance-avoidance orientations. Past research has found these three dimensions of goal orientation to be related to a variety of achievement-related outcomes.[1]

For example, research has found that learning orientation is associated with achievement and performance (e.g., Elliot & Harackiewicz, 1996). A learning orientation involves a focus on improving one's competence by developing new skills—in other words, learning for the sake of learning. Thus, a learning orientation is based on the belief that ability can be changed and improved through effort. Consequently, learning orientation is positively related to intrinsic motivation and enjoyment of the task at hand (e.g., Harackiewicz, Barron, Tauer, & Elliot, 2002). Researchers have also found an increase in effort, the use of learning strategies, and challenge-seeking for individuals with a high learning orientation (Ames & Archer, 1988). Furthermore, learning orientation has been associated with adaptive responses to challenging achievement settings including self-regulation, feedback seeking, self-efficacy, and persistence (Greene & Miller, 1996; Phillips & Gully, 1997; VandeWalle, Cron & Slocum, 2001). Issues of self regulation and self-efficacy are particularly important when dealing with complex tasks which take longer to master and tend to evoke feelings of frustration. Even

individuals who are achievement oriented can become discouraged by initial negative performance feedback and be deterred from exerting their usual effort into pursuing their goals. Thus, it is important to note that learning orientation is related to better self-regulation and better responses to challenges and performance failure (Cron, Slocum, VandeWalle, & Fu, 2005).

In contrast to a learning orientation which stems from the belief that ability is malleable, performance orientations stem from the belief that ability is a fixed attribute and cannot be changed through experiences (Dweck, 1986). Thus, performance orientations involve demonstrating ability through performance more so than developing knowledges and skills. Concerned with looking better than others, individuals with high performance orientations are likely to assess their performance using others similar to them as reference points (Farr, Hoffmann, & Ringenbach, 1993). Thus, performance orientations have been associated with undermined intrinsic motivation and enjoyment in achievement settings (Elliot & Church, 1997; Elliot & Sheldon, 1997).

Current research bifurcates performance goal orientation into proving and avoiding orientations (e.g., Elliot & Harackiewicz, 1996). A proving orientation specifically implies a focus on demonstrating or "proving" one's ability to others. In other words, a high proving orientation is associated with a strong focus on outperforming other people. Although performance orientation, in general, tends to be more negatively viewed in relation to achievement than learning orientation, it is important to note that a proving orientation is still often correlated with performance and achievement because it maintains a strong focus on the demands necessary for high performance (e.g., learning enough to perform well). In fact, recent research advocates

adopting both mastery and proving orientations due to the finding that proving orientation predicts immediate performance and learning orientation predicts sustained interest (Harackiewicz et al., 2002).

An avoiding orientation, on the other hand, implies a focus on avoiding the demonstration of one's *lack* of ability to others. In other words, individuals with a high avoiding orientation are primarily concerned with avoiding looking incompetent. Research shows that an avoiding orientation is associated with a focus on performance scores to the extent that one is unable to immerse themselves in the task itself (Elliot & Harackiewicz, 1996). Because avoiding is also negatively related to optimism and the desire to work hard, it is associated with superficial learning strategies that interfere with focused attention on learning and consequently lead to poor achievement (Elliot & McGregor, 1999). An avoiding orientation is also associated with anxiety about negative evaluation from others and defensive behaviors if participation in the activity could risk demonstration of a low skill level (VandeWalle, 1997).

Self Ratings

Although these three dimensions of goal orientation are typically assessed using self reports, self reports only allow for one, potentially biased first-person perspective. In support of this argument, studies have shown that self reports are affected by social desirability (i.e., response distortion). Social desirability refers to people's tendency to present themselves in a favorable light (Ganster, Hennessey, & Luthans, 1983). Specifically in relation to goal orientation measures, research has found that learning orientation is particularly susceptible to this bias (Button, Mathieu, & Zajac, 1996; Day, Radosevich, & Chasteen, 2003; Tan & Hall, 2005). Thus, social desirability can be

considered a source of construct-irrelevant variance (e.g., contamination; Messick, 1995), threatening the validity of self-report measures of goal orientation. Biases such as social desirability are particularly problematic when self reports are the only mode of measurement. Thus, the need to examine other perspectives aside from self reports is necessary in order to obtain a more reliable, and perhaps more valid measurement of goal orientation than a single self-judgment can provide.

Peer Ratings

Peer ratings of personality have provided an additional perspective to self reports demonstrating high reliability and reasonably high predictive validity for decades (e.g., Smith, 1967). In general, the use of ratings other than self ratings increases the level of methodological sophistication by expanding the network of knowledge about a particular construct. Peer ratings have been used to study a variety of behaviors such as prosocial and antisocial behavior in young children (e.g., Barnett, Burns, Sanborn, Bartel, & Wilds, 2004; Fox & Boulton, 2003), age and gender related patterns of perceptions (e.g., Flannagan & Bradley, 1999; de Guzman, Carlo, Ontai, Koller, & Knight, 2004), and leadership efficacy and effectiveness (e.g., Chemers, Watson, & May, 2000). However, more prevalent in the extant literature, peer ratings have been used to assess personality traits (e.g., Goma-i-Freixnet, Wismeijer, & Valero, 2005; Law, Wong, & Song, 2004). Goldberg (1980) was the first to demonstrate the similarity in structures of self and peer ratings of the five-factor model of personality. Studies utilizing various personality inventories such as the NEO-PI (e.g., Funder, Kolar, & Blackman, 1995), California Q-set (e.g., Funder & Dobroth, 1987), and CPI (Fuhrman & Funder, 1995) have found low to moderate correlations between self and peer ratings suggesting that the two ratings

provide different types of information. For example, McCrae and Costa (1987) demonstrated correlations between self and peer ratings ranging from .25 to .50 across two five-factor personality instruments. With respect to correlations with performance outcomes, Mount et al. (1994) showed that peer ratings of personality not only significantly predicted ratings of job performance, but that peer ratings also accounted for significant variance beyond self ratings (average $\Delta R^2 = .05$).

Some researchers have more closely examined the relative observations of specific personality traits and how this affects the validity of peer ratings (Spain, Eaton, & Funder, 2000). Spain and his colleagues (2000) found that with regard to extraversion-related traits, peer ratings provided higher correlations with behavior than self reports due to the availability of highly visible indicators. However, this finding did not generalize to all traits. In other words, the addition of peer ratings of certain traits (e.g., neuroticism) that did not have as many highly visible indicators did not appreciably improve the prediction of behaviors. This suggests that there are certain traits with which peer ratings are more useful for than others. The present study examined whether the three dimensions of goal orientation possess enough highly visible indicators to yield predictive peer ratings.

In addition to peer ratings of personality, peer ratings are also a common way of evaluation and improvement in organizational settings because peers are usually well-acquainted and aware of each others' typical actions (Yammarino & Atwater, 1997). The increasing use of 360-degree feedback has led to an increased interest in peer ratings in performance contexts. In 360-degree feedback, peer ratings are used to rate individual performance. The value of 360-degree feedback, naturally, is the provision of additional

information beyond ratings from a single source, which has typically been the supervisor (Borman, 1997). Although the construct validity of peer ratings of performance has not been firmly established, the evidence suggests that they do offer different insight into performance than self or even supervisor ratings. This evidence takes the form of relatively low to moderate correlations among performance-related ratings by different sources (Conway & Huffcutt, 1997). Lance, Teachout, and Donnelly (1992) suggest that this is due to the fact that different sources are only exposed to low to moderately overlapping sets of an individual's behavior. Specifically, correlations between self and peer ratings typically have ranged from .05 to .69 with a mean of .36 (Conway & Huffcutt, 1997; Mabe & West, 1982; Harris & Schaubroeck, 1988). Because peer ratings of performance can provide unique information, peer ratings can potentially explain added variance in criteria. Specifically, meta-analytic results examining peer, supervisor, and subordinate ratings of job performance have shown that peer ratings can add incremental validity beyond supervisor ratings, increasing R^2 from .03 to .15 in predicting objective job performance measures (Conway et al., 2001). Thus, there is reason to believe that peer ratings of job performance, which are based on observations almost exclusively in the work environment, would be expected to predict behaviors as well as (or better) than self reports that incorporate observations across a number of different settings.

Despite numerous studies of peer ratings with respect to personality traits and performance, my search of the literature resulted in only one study (Frese, Stewart, & Hannover, 1987) that examined the similarity between self and peer ratings of goal orientation (r = .36, N = 70). As one part of their study, Frese and his colleagues (1987)

used a randomly drawn subsample of participants and asked the participant's peers or friends to complete a goal orientation measure about the participant. Frese and his colleagues used a short scale with only two items to assess unidimensional goal orientation. Furthermore, their measure examined global goal orientation (i.e., trait-like); in other words, it did not involve a specific context (i.e., state-like). Thus, the present study contributed to the very limited study of peer ratings of goal orientation by applying a task-specific, three-dimensional inventory which is in line with today's common conceptualization of goal orientation.

Convergence of Self and Peer Ratings of Goal Orientation

A central issue when studying multirater systems is the convergence between the different rater's ratings. Because I was especially interested in examining the usefulness of peer ratings in predicting future behavior above and beyond self ratings, I did not expect the agreement between self and peer ratings to be particularly high. High agreement would suggest that peer ratings would not add incremental information in the prediction of future behavior beyond self ratings. In fact, low agreement between self and peer ratings is likely due to the different point of views from which the ratings originate, in addition to the different causes to which self and peers may attribute behaviors.

However, despite the potentially low agreement, this is not to say that peer ratings are invalid or will not be useful. There is a large debate in the literature as to the interpretation of rater congruence in multirater systems (e.g., Mersman & Donaldson, 2000). For example, does convergence mean convergent validity? Or does it reflect leniency bias? Perhaps convergence indicates self-awareness. Because of the lack of conclusiveness regarding the meaning of rater congruence, some researchers argue that

the agreement between self and peer ratings is a non-issue and does not act as an indicator of "true score" or "accuracy" (e.g., Bozeman, 1997). Thus, the primary purpose, as well as an advantage, of examining ratings from different perspectives lies in the consequences—or the different evidences for validity—of using the ratings.

Overview of Study & Research Questions

The overall goal of the present study was to assess the validity of peer ratings of goal orientation. I examined peer-assessed goal orientation during the training of a complex task in a collaborative training environment. Because peer ratings of goal orientation were made after collaboration and performance feedback, I also examined the extent to which the skill levels (i.e., prior performance) of the participant and peer as well as their collaborative performance affected goal orientation scores.

First, I explored the reliability and agreement of self and peer ratings of goal orientation by examining the internal consistencies and agreement between the two ratings. To investigate whether prior skill levels of the participant and their peer, as well as their collaborative performance, affected the reliability of peer ratings, I examined internal consistencies and agreement between the two ratings in each of the following subsamples: (a) low, medium, and high skilled participants (before collaboration), (b) low, medium, and high skilled peers (before collaboration), and (c) low, medium, and high performing collaborative partners in terms of their joint performance.

Next, I examined the structural validity of self and peer ratings. The structural aspect of validity refers to the fidelity of the scoring structure (Messick, 1995). In order to examine the structural validity of peer ratings of goal orientation, the similarities between the factor structures of self and peer ratings were examined. Again, to

investigate whether the structural fidelity of ratings of goal orientation were affected by individual skill levels or collaborative performance, I compared factor structures of goal orientation for the different levels (i.e., low, medium, high) of self and peer skill, as well as collaborative performance. The factor structure of goal orientation most supported by the literature is a three-factor model (learning, proving, avoiding) with the three factors correlated with one another (e.g., Elliot & Harackiewicz, 1996; VandeWalle, 1997). I tested this model as well as a three-factor model with uncorrelated factors and a one-factor model for both the self and peer ratings of goal orientation. Figure 1 presents the three factor-analytic models tested.

In order to explore the external aspect of validity for peer ratings of goal orientation, I examined convergent and discriminant evidence, as well as correlations with criterion scores (Campbell & Fiske, 1959; Cronbach & Gleser, 1965; Messick, 1995). In terms of convergent and discriminant evidence, correlations between self and peer ratings were examined in a multitrait-multimethod framework. To examine the extent to which performance was an antecedent of goal orientation, I examined associations between self and peer ratings of goal orientation and self and peer skill levels before collaboration as well as collaborative performance.

Finally, in regards to criterion-related validity, I examined the extent to which self and peer ratings of goal orientation predicted skill acquisition and post-training self-efficacy. Including self-efficacy as a criterion of interest is important considering that self-efficacy plays a large role in training and performance in general, as well as specifically in goal orientation-achievement relationships (Colquitt, LePine, & Noe, 2000). Moreover, I investigated the extent to which peer ratings of goal orientation

incrementally predicted skill acquisition and self-efficacy above and beyond self ratings of goal orientation. Finally, I examined the incremental validity of peer ratings of goal orientation beyond prior levels of performance.

The examination of the validity of peer ratings of goal orientation is important for two reasons. The first contribution this study makes to the literature is the examination of the usefulness of peer ratings of goal orientation in predicting training outcomes. No studies in the extant literature have examined the validity evidence of peer ratings of goal orientation in terms of training performance. Second, investigating whether peer ratings of task-specific measures of goal orientation provide useful information is integral to furthering research on achievement motivation. In general, there is a basic need to expand research paradigms to include multiple levels and perspectives to more thoroughly examine constructs of interest. Therefore, compared to self reports, the addition of peer ratings of goal orientation may better capture construct-relevant variance and with this future research could be able to more wholly examine the role of goal orientation in achievement-related settings.

Method

Participants

Ninety-seven male undergraduate volunteers enrolled in introductory psychology at OU participated in this study for partial fulfillment of a course research requirement. Hardware constraints limited participation to right-handed volunteers. Due to logistical constraints, full random assignment to training conditions was not possible—thus, this study should be considered a quasi-experiment. Bonuses of $80, $60, $40, $20, and $10

were awarded to the top five performers, respectively (participants received a commensurate bonus if their partners earned a bonus).

Performance Task

The performance task was the video game Space Fortress (Donchin, 1989). Space Fortress includes information-processing and psychomotor demands that are present in aviation and other complex tasks (Gopher, Weil, & Bareket, 1994; Hart & Battiste, 1992). Space Fortress involves coordinating mouse and joystick functions. Laboratory rooms were equipped with a table, a computer and monitor, a right-hand joystick, a three-button mouse for the left hand, and two right-handed chair desks. In Space Fortress (Mané & Donchin, 1989), trainees control a space ship's flight path using the joystick and shoot missiles with a trigger on the joystick. A fortress is located center-screen with two concentric hexagons surrounding it. An information panel at the bottom of the screen indicates fortress vulnerability which changes with each missile hit. Friend and foe mines fly in the space surrounding the fortress and are identified by a mine indicator on the information panel. To destroy foe mines, trainees are required to push an "identify friend or foe" mouse button at the appropriate time. Symbols appear on the screen just below the fortress to indicate opportunities to gain bonus points or additional missiles by pushing either a "points" or "missiles" mouse button at the appropriate time. Also, the information panel shows the number of available missiles, a battle score, and component scores based on ship velocity, ship control, and the speed of dispatching mines. The screen displays a total score, which is a composite of the others, along with more detailed performance feedback at the end of each game. For further details, see Arthur et al., 1995.

Measures

Goal orientation. A 17-item scale adapted from Elliot and Church (1997) was used to operationalize the three task-specific goal orientation dimensions. Example items include "I want to learn as much as possible about Space Fortress during this study" (learning), "It is important to me to do well at Space Fortress compared to others in this study" (proving), and "I would prefer to avoid playing Space Fortress in front of someone else because I might perform poorly" (avoiding). Participants responded using a 5-point scale (1 = strongly disagree; 5 = strongly agree). For peer ratings, all of the items were identical with the exception of the subject (e.g., "*My partner* wants to learn as much as possible about Space Fortress during this study", "It is important for *my partner* to do well at Space Fortress compared to others in this study"). See Table 1 for a complete list of items. Elliot and Church (1997) obtained the following internal consistencies for the three goal orientation dimensions: .89 = learning, .91 = proving, .77 = avoiding. I obtained the following internal consistencies for the present study: .92 = learning, .95 = proving, .89 = avoiding.

Self-Efficacy. The self-efficacy scale used in this study was based on sample items from scales used in several previous studies (e.g., Bell & Kozlowski, 2002; Martocchio & Judge, 1997; Nease, Mudgett, & Quiñones, 1999) as well as items developed specifically for this study. The scale consisted of twelve items, including "I can meet the challenges of Space Fortress" and "I am confident that I have what it takes to perform Space Fortress well". Participants responded using a 5-point scale (1 = strongly disagree; 5 = strongly agree). I obtained a coefficient alpha of .80 for this scale.

Procedure

Participation took place on 2 days, 1 week apart, each lasting approximately 2.5 hours. On the first day, participants began by completing an aiming task that allowed them to gain familiarity with the joystick controls before being introduced to Space Fortress. Participants then watched a 17-minute video detailing instructions and optimal strategies for performing Space Fortress. Afterwards, participants performed four 3-minute baseline games of Space Fortress and then watched a 5-minute video reviewing the instructions and optimal strategies. For the rest of the first day, participants were paired with a partner (who had previously completed 3.5 hours of Space Fortress training) and completed two 10-game training sessions of Space Fortress (sessions 1 and 2). The first eight games of every 10-game session were practice and were performed collaboratively, and the last two games were test games and were performed individually. Each game lasted 3 minutes. After working with their partner, participants completed self-report goal orientation measures and goal orientation measures about their partner. Monetary bonuses were based solely on test game performance. One week later, participants returned for a second day of participation and completed a two-game test of skill retention (session 3) followed by three 10-game training sessions (sessions 4, 5, and 6) performed by themselves.

The collaborative protocol used to train participants on Space Fortress was the active interlocked modeling protocol. The active interlocked modeling (AIM) protocol is a dyadic training protocol developed to increase training efficiency over a single trainee design (Shebilske, Regian, Arthur, & Jordan, 1992). The protocol requires trainees to perform each half of a task alternately with a partner who performs the other half. By

focusing training on task components as well as promoting attention control strategies for coordinating the interplay between task components, AIM allows individuals to achieve at least the same level of performance as individuals training alone (Arthur, Day, Bennett, McNelly & Jordan, 1997). Moreover, AIM requires half the amount of hands-on practice. Based on the AIM protocol, participants performed practice games such that one trainee first controlled all functions related to the mouse and their partner controlled all functions related to the joystick. Thereafter, participants exchanged roles after every practice game. Communication between participants during and between practice games was encouraged.

Results

Reliability and Agreement

Table 2 presents the means, standard deviations, and correlations for all study variables. Table 3 presents the internal consistencies of self and peer ratings of goal orientation. These analyses were also broken down to investigate whether the skill level of either of the participants or their collaborative performance affected the internal consistency of ratings of goal orientation. I divided the sample into low, medium, and high skill using a tripartite split. Internal consistencies were compared for each of the following subsamples: (a) low, medium, and high skilled participants (before collaboration), (b) low, medium, and high skilled peers (before collaboration), and (c) low, medium, and high collaborative partners in terms of their joint performance. As shown in Table 3, coefficient alphas of .90 and .93 were obtained for self and peer ratings of learning orientation, respectively, .95 for both self and peer ratings of proving orientation, and .87 and .90 for self and peer ratings of avoiding orientation. The internal

consistencies were relatively similar with no meaningful differences across all of the subsamples (a, b, and c).

In examining the agreement between self and peer ratings of goal orientation, I obtained intraclass correlation coefficients (ICCs) of .25 (CI = –.24-.63) for learning, .29 (CI = –.25-.63) for proving, and .18 (CI = –.34-.48) for avoiding. I also calculated the percent agreement between self and peer ratings for the three dimensions of goal orientation (learning = 22.85%, proving = 22.01%, avoiding = 22.67%). Similar to the results above, the intraclass correlation coefficients for the subsamples revealed no meaningful differences. To summarize, there was high internal consistency but low levels of agreement between self and peer ratings of goal orientation.

Structural Fidelity

To examine the structural fidelity of ratings of goal orientation, I used confirmatory factor analysis to compare the structures of self and peer ratings of goal orientation. Using the statistical software AMOS 5.0 (Arbuckle, 1996), several fit indices were examined to evaluate and compare the fit of the proposed models. I calculated the chi-square/degrees of freedom ratio (χ^2/df); values lower than 5.00 reflect reasonable fit with values closer to 1.00 reflecting better fit (Marsh & Hocevar, 1985). The root mean square error of approximation (RMSEA), which reflects the degree of discrepancy for a model per degree of freedom, was also calculated. Values less than .05 for the RMSEA indicate a close fit, values greater than .05 but less than .08 indicate fair fit, and values greater than .10 indicate unacceptable fit (Browne & Cudeck, 1993; Kline, 1998). Comparative fit and adjusted goodness-of-fit indices (CFI and AGFI, respectively) were also examined. Although there are differences in how these indices are calculated, both

reflect the proportion of variance that is explained by the hypothesized model. For these indices, values greater than .90 indicate acceptable fit. Lastly, in order to minimize the dual threats of Type I and Type II errors, I examined the Root Mean Squared Residual (RMSR) in combination with the CFI and RMSEA. The RMSR is a standardized measure of the average covariance residual (Kline, 1998). Hu and Bentler (1999) indicate that RMSR values less than .09 with CFI values close to .95 or RMSEA values close to .06 suggest a good fit between a model and the observed data.

For both self and peer ratings, I tested three models (see Figure 1). In Model 1, I tested a unidimensional model of goal orientation with all 17 items loading onto one dimension. Expecting Model 1 to be outdated but useful as a comparison, I tested a second model with a three-factor model of goal orientation (learning – 6 items, proving – 5 items, avoiding – 6 items) with the three factors uncorrelated with one another. Model 3, the one most supported in recent goal orientation research, was identical to Model 2 with the exception of correlated factors. Similar to the previous set of analyses, I broke these analyses down based on self skill, peer skill, and collaborative performance. Table 4 displays the factor analysis results for self ratings of goal orientation. Model 3 clearly showed the best fit with several indices indicating acceptable fit for the hypothesized model (RMSEA = 0.08, CFI = 0.93) and several indices approaching levels of acceptable fit, χ^2/df =1.68, RMSR = 0.12, AGFI = 0.75, and GFI = 0.81. Table 5 displays the factor analysis results for peer ratings of goal orientation. Similar to self ratings of goal orientation but not as well, peer ratings fit the 3-factor, correlated factors model of goal orientation best, χ^2/df =2.43, RMSEA = 0.12, CFI = 0.89, RMSR = 0.08, AGFI = 0.71, and GFI = 0.78. In sum, for both self and peer ratings, the indices showed poorer fit for

all of the subsamples compared to the full sample, with no meaningful differences across the subsamples.

Convergent and Divergent Validity

To investigate the convergent and discriminant validity of ratings of goal orientation, I examined ratings in a multitrait-multimethod framework with the three dimensions of goal orientation serving as the traits, and the self and peer ratings serving as the different methods. Table 6 shows these results. Heterotrait-monomethod correlations were larger (r_s = .40 to .69) than monotrait-heteromethod correlations (r_s = .10 to .21), which were greater than the heterotrait-heteromethod correlations, r_s = .08 to .17. Similar to the agreement analyses, little convergence was found between self and peer ratings. These results also reflect a moderate to large degree of method variance.

Performance as an Antecedent of Goal Orientation

To specifically investigate performance as an antecedent of goal orientation, I examined correlations among self and peer ratings of the three dimensions of goal orientation, self skill level before collaboration (i.e., baseline scores), peer skill level before collaboration, and collaborative performance (i.e., average of session 1 and 2 practice scores). These correlations can be found in Table 2. Self skill before collaboration was positively correlated with self (r = .40) and peer (r = .22) ratings of proving. Peer skill was negatively correlated with peer ratings of learning (r = –.21) and avoiding, r = –.25. In terms of collaborative performance, no statistically significant correlations were found across both sessions 1 and 2.

I also conducted regression analyses for each of the three dimensions of goal orientation, with self and peer ratings regressed onto self skill level before collaboration,

peer skill level before collaboration, and the interaction between self and peer skill. Including the interaction term provided an examination of how the discrepancy between the skill level of the self and peers affected goal orientation ratings. In conducting these analyses, I followed the recommendations made by Aiken and West (1991). Separate analyses were conducted for each of the three dimensions of goal orientation for both self and peer ratings (six sets of analyses). I included self and peer skill levels before collaboration in the first step of the moderated multiple regression analyses, and I added the interaction term in a second step. Table 7 shows the results of these regression analyses. With regards to self ratings of goal orientation, there were no statistically significant effects for learning and avoiding orientation. For self ratings of proving, self skill level prior to collaboration yielded a statistically significant and positive contribution, $\beta = .406$, $p < .01$. In other words, the higher the skill levels of a participant at the beginning of training, the higher their self-reported proving orientation. No statistically significant interactions were obtained.

For peer ratings of goal orientation, on the other hand, there were statistically significant effects for all three goal orientation dimensions. With respect to peer ratings of learning, peer skill level before collaboration had a statistically significant negative contribution, $\beta = -.260$, $p < .01$. With respect to peer ratings of proving, self skill before collaboration had a significant positive effect, $\beta = .235$, $p < .05$. Lastly, for peer ratings of avoiding, peer skill before collaboration had a statistically significant negative effect, $\beta = -.255$, $p < .05$. Again, no statistically significant interactions were obtained. To summarize, higher skilled participants rated themselves higher and were likewise rated

higher by their peers on proving orientation. Furthermore, higher skilled peers rated participants as lower on learning and avoiding dimensions.

Predictive Validity of Peer Ratings

To investigate the predictive validity of peer ratings of goal orientation, correlations between self and peer ratings of goal orientation and training outcomes were examined. As shown in Table 2, self ratings of learning and proving orientation were significantly and positively correlated with skill acquisition and post-training self-efficacy scores. Peer ratings of learning and proving were also positively correlated with skill acquisition and post-training self-efficacy. Neither self nor peer ratings of avoiding were significantly correlated with either skill acquisition or self-efficacy.

To further examine the extent to which peer ratings of goal orientation predicted future skill acquisition, I used the SAS MIXED procedure (SAS, 1996) which allowed me to examine both the main effects of goal orientation scores on skill acquisition as well as their effects on the skill acquisition growth curves. Skill acquisition was operationalized using test scores from the second day of training—the average of the two test-game scores from training sessions 3, 4, 5, and 6. In terms of growth curves, I examined both linear and quadratic trends. I performed these analyses in two steps. In the first step, I tested the linear (session) and quadratic (session*session) effects. I also included main effects for both the self and peer ratings of goal orientation dimensions. In the second step, I tested the interactions between the goal orientation ratings and the session and session*session terms. In other words, it was in this second step that I examined the extent to which the skill acquisition growth curves differed as a function of goal orientation scores. I only tested interactions for the goal orientation scores found to

be statistically significant in the first step. The results of these analyses are shown in Table 8.

In the first step, there were significant linear (B = 1554.43, $p < .001$) and quadratic (B = –204.56, $p < .001$) trends for session. There were also positive main effects for both self (B = 494.02, $p < .01$) and peer (B = 410.25, $p < .05$) ratings of proving. However, in the second step, both of these main effects were no longer significant, but there were significant interactions between peer ratings of proving and both the session (B = 377.59, $p < .05$) and the session*session terms, B = –67.12, $p < .05$. These interactions are shown in Figure 2. The significant linear interaction effect is evident such that participants with high peer ratings of proving had a steeper growth curve compared to participants with low peer ratings of proving. The quadratic interaction effect is also evidenced in the figure such that participants with high peer ratings of proving achieved their maximum level of skill, or asymptote, faster than participants with low peer ratings of proving. This is shown by the earlier plateau of Space Fortress scores for participants with high peer ratings of proving. I also conducted the aforementioned analyses with prior performance (i.e., test scores at the end of the first day of training) included in the first step. These results are shown in Table 9. These analyses indicated similar results such that peer ratings of proving still had statistically significant linear and quadratic effects on skill acquisition even when I controlled for prior performance.

To examine the effects of self and peer ratings of goal orientation on post-training self-efficacy, I conducted hierarchical regression analyses. Table 10 shows these results. In the first step of the regression analyses, I included prior performance, in other words,

the average of the last two games of Space Fortress performed on the first day of training. I added self ratings of goal orientation in the second step and peer ratings of goal orientation in the third step. Results indicated that self ratings of learning had a significant effect on post-training self-efficacy, $\beta = .276$, $p < .01$. In addition, peer ratings of learning ($\beta = .279$, $p < .05$) and avoiding ($\beta = -.219$, $p < .05$) predicted post-training self-efficacy. In fact, self ratings provided incremental validity predicting post-training self-efficacy above and beyond prior performance ($\Delta R^2 = .106$, $p < .01$), and peer ratings provided incremental validity above and beyond prior performance and self ratings, $\Delta R^2 = .082$, $p < .01$.

Discussion

The extant literature regarding achievement motivation and training have revealed goal orientation to be an important variable related to training outcomes. However, despite research demonstrating self reports of goal orientation to be a perspective susceptible to socially desirable responding, no studies have examined other methods for measuring goal orientation. Additionally, because previous research using peer ratings of personality have shown peer ratings to have incremental value in predicting performance, the overall goal of the present study was to examine the validity of peer ratings of goal orientation, particularly their predictive validity. Specifically, the present study makes an important contribution to the study of goal orientation by demonstrating the usefulness of peer ratings of goal orientation in predicting performance and self-efficacy in the context of a complex task, above and beyond self ratings and prior levels of performance.

The present study's findings enrich the goal orientation and training literatures with four main conclusions: (1) self and peer ratings have similarly high levels of internal

consistency, (2) there is little agreement and convergence between self and peer ratings, (3) self and peer ratings have similar structures, and (4) peer ratings provide incremental validity beyond both self ratings and prior performance in predicting future skill acquisition and post-training self-efficacy. With regards to the reliability of peer ratings of goal orientation, instead of dismissing rater disagreement as measurement error, it might be useful to examine *why* raters who observe the same performance sometimes give quite dissimilar ratings (Murphy, Cleveland, Skattebo, & Kinney, 2004). The low levels of agreement between self and peer ratings of goal orientation found in the present study could be due to a number of factors, one of which is a lack of rater training (Christiansen, Wolcott-Burnam, Janovis, Burns, & Quirk, 2005) such that peers were not trained on how to rate their partner's goal orientation. Furthermore, peers were not well-acquainted and had no prior exposure to one another. However, peer ratings of goal orientation were internally consistent and predicted training outcomes. Therefore, the low agreement may be an indication of the two methods measuring different facets of the goal orientation construct or even different constructs altogether. Past research on ratings of personality (e.g., McCrae & Costa, 1987) and performance (e.g., Conway & Huffcutt, 1997) have also found low to moderate correlations between self and peer ratings, suggesting that the two sources indeed provide different types of information. In this study, participants may have been consumed by the requirements of the complex task, or even influenced by their training intentions as opposed to their actual efforts when making self ratings of goal orientation. Peers, on the other hand, may have been better able to focus on the actor and rate individual differences with a less biased perspective (or at least not with the same biases). It is important to note that peer ratings of proving

(which predicted skill acquisition) were affected by participant's skill level, but they provided incremental validity in predicting skill acquisition beyond the participant's demonstrated skill. Thus, peer ratings may have captured an aspect of ability or motivation that self reports did not reflect. Self ratings, on the other hand, could have been influenced by a number of other factors unrelated to ability or motivation such as social desirability. In other words, peer ratings may be influenced by a participant's actions during training whereas self ratings may be influenced by the participant's intentions, which may or may not reflect the participant's actual behaviors.

With regards to the validity of peer ratings of goal orientation, structural and external aspects of validity were examined. A three-factor, correlated factors model of goal orientation best fit both self and peer ratings with individual skill levels of the participants and collaborative performance not significantly affecting the fit indices. However, it is worth mentioning that the factor analysis results in the present study do not directly correspond with past goal orientation studies, such that the correlations among dimensions of goal orientation were greater in the present study compared to past studies. Correlations between learning and proving for self and peer ratings in this study were .50 and .69 respectively, whereas other studies typically yielded correlations between .07 and .31 (e.g., Day et al., 2003; Elliot & Church, 1997; Vandewalle, 1997). This discrepancy may have been a result of the performance-focused context of this study. Researchers of goal orientation suggest that the nature or context of the task being performed may determine which dimensions of goal orientation are most helpful in terms of motivation and performance (Harackiewicz, Barron, & Elliot, 1998; Steele-Johnson, Beauregard, Hoover, & Schmidt, 2000). With regards to the present study, participants were

performing a complex task and receiving continuous feedback on their performance. In addition, there were monetary incentives for achieving high levels of performance. Thus, the performance demands of this context may have been particularly salient to participants, exacerbating the correlation between learning and performance dimensions of goal orientation. In other words, when performing complex tasks such as Space Fortress, both learning and proving orientations are important for acquiring skill because learning orientations promote the resilience required during challenging tasks and proving orientations promote a focus on performing well.

Specifically with regards to the usefulness of goal orientation in predicting skill acquisition, proving appeared to have the strongest statistically significant effect. Both self and peer ratings of proving demonstrated positive effects on skill acquisition during the second day of training. Previous research has shown proving orientations to be highly related to performance (e.g., Elliot & Church, 1997). Moreover, in settings where objective performance is sought, as opposed to learning or creativity, proving orientations may be particularly useful because participants focus on what is needed to perform well. Learning orientations, on the other hand, may foster deeper information processing which yields less direct impact on achievement and performance (Day et al., 2003).

Limitations and Future Research

Given the relative uniqueness of the laboratory task used and the sampling of only college males, generalizations regarding the usefulness of peer ratings of goal orientation based on these findings should be made with caution. In particular, the low levels of agreement between self and peer ratings of goal orientation warrant future research. Using different tasks and different samples in future research is needed. For example,

peer ratings have yet to be comparatively examined in other cultures (Atwater, Waldman, Ostroff, Robie, & Johnson, 2005). Future research should also tap other populations and involve other contexts (e.g., sports, business). In addition, because participants used in the present study had little prior exposure to one another and did not have formal training on how to rate each other, future research might want to examine the consequences of well-acquainted participants and rater training on the validity of peer ratings of goal orientation. Lastly, due to the complex nature of studies that involve peer ratings, as well as the need to establish the general properties of peer ratings first, the present study isolated the research question to the examination of the reliability and validity of a more experienced peer's ratings of his partner's goal orientation. Future research should examine the psychometric properties of the less experienced partner's ratings and ratings from equally experienced persons.

With regards to the predictive validity of peer ratings on post-training self-efficacy, although there is a substantial amount of research showing that self-efficacy is correlated with performance, it is important to note that past research has demonstrated that self-efficacy is highly correlated with past performance (e.g., $r = .38$; Stajkovic & Luthans, 1998). Past studies have also found that the predictive potential of self-efficacy generally deteriorates when prior performance is controlled (e.g., Ackerman, Kanfer, & Goff, 1995; Mitchell, Hopper, Daniels, George-Falvy, & James, 1994; Richard, Diefendorff, & Martin, 2006). Thus, there is a debate in the literature as to whether self-efficacy is simply a surrogate for actual levels of ability or skill. However, Kozlowski and his colleagues (2001) have suggested that self-efficacy is a particularly important variable related to complex skill acquisition because the unique effects of self-efficacy

beyond prior performance may reflect the self-regulatory resilience when tasks become challenging. In other words, when it comes to complex tasks or transfer tasks that are more challenging, the predictive validity of peer ratings of goal orientation on self-efficacy may be of particular import because they reflect more than prior performance—they also reflect a trainee's resilience and self-regulation in the face of challenges. Thus, longitudinal future research is needed that includes other skill-based outcomes aside from skill acquisition such as tests of long-term retention and transfer (Kraiger, Ford, & Salas, 1993). Future research should also include other outcomes such as declarative knowledge, mental models, and attitudes such as motivation to continue learning (e.g., Hicks & Klimoski, 1987). In other words, the present study is only a first step to examining the usefulness of peer ratings of goal orientation. Future research that includes a wider variety of criterion measures is needed to better examine the stability of peer ratings of goal orientation as a predictor of training outcomes and achievement in general.

Finally, to further the validation of peer ratings of goal orientation, it would also be prudent to closely examine the process models of complex skill training and performance to determine whether task-specific goal orientation measures are capturing the theoretical processes engaged by participants during training. Thus, it may be useful to obtain qualitative data on ratings of goal orientation from both the self and peer perspectives. Asking raters for reasons behind their ratings and feedback on the rating process may help researchers obtain a better working knowledge of (a) why self and peer reports have little convergence and (b) why peer ratings predict training outcomes beyond self ratings. Lastly, an examination of the items comprised in the goal orientation scale might also show certain items to be more predictive of training and achievement

outcomes than others, thus, an item analysis may shed light on the specific factors of peer ratings of goal orientation that more strongly account for the predictive utility. The types of information gleaned from rater feedback and item analysis would add to the understanding of goal orientation and could lead to developing scales that better predict achievement-related behaviors.

Implications

Even bearing these limitations in mind, I believe that the results obtained in the present study have some notable implications for training and achievement motivation research. The utility of multiple perspectives on a trainee's achievement motivation has not been studied in the past. Thus, the addition of peer reports enriches the knowledge about the goal orientation construct and suggests that peers capture a different aspect of achievement motivation that affects learning and performance. Although prior performance affected peer ratings of proving, the utility of peer ratings in predicting training outcomes beyond prior performance suggests that the peer perspective may capture motivational factors that are particularly important with regards to the training of a complex task. Prior performance is generally believed to be the best predictor of future performance, although the predictive validity of peer ratings of goal orientation in predicting training outcomes beyond self ratings provides evidence for using multiple perspectives when examining individual differences. Because observers may take different factors into account and may perceive training motivations such as goal orientation differently from actors, incremental information can be garnered from multiple perspectives.

With regards to practical implications, a primary implication would be the implementation of peer reports of goal orientation and/or other individual differences related to training motivation. Because peer reports are predictive of training outcomes, peers could be asked to provide ratings early in training. Not only could peer ratings of goal orientation be used to enhance trainability assessments (i.e., identifying the persons most capable of mastering the training content; Robertson & Downs, 1989), but peer ratings could also be utilized to provide feedback for developmental purposes (e.g., Mount et al., 1994). Providing another perspective can not only serve to further validate one's self image, but may also serve to inform trainees of their tendencies and inclinations, as viewed by their peers, during training.

In conclusion, this study contributes to the burgeoning research on goal orientation and achievement motivation by expanding the measurement of goal orientation to peer ratings. The present study showed peer ratings to be an internally consistent measurement of goal orientation that predicted skill acquisition and self-efficacy above and beyond self ratings and even prior performance. However, because of the lack of convergence found between self and peer reports of goal orientation, it is difficult to comment on the extent to which peer ratings of goal orientation actually reflect goal orientation or really some other construct related to achievement motivation. Therefore, more research is needed to better understand what information peer ratings specifically reflect and why they have predictive validity. Hopefully, the present study opens the door for future research regarding peer ratings of goal orientation, as well as peer ratings in general, particularly in terms of predicting training outcomes.

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Footnotes

[1]Some researchers (e.g., Elliot & McGregor, 2001; Elliot & Thrash, 2001; Pintrich, 2000) have examined a four-dimensional model of goal orientation where, in addition to performance orientation, learning orientation is also bifurcated into approach and avoidance dimensions.

Table 1

Goal Orientation Items

Goal Orientation	Self Ratings	Peer Ratings
Proving	It is important to me to do better at Space Fortress than the other participants in this study.	It is important to my partner to do better at Space Fortress than the other participants in this study.
	My goal in this study is to get a better score at Space Fortress than most of the other participants.	My partner's goal in this study is to get a better score at Space Fortress than most of the other participants.
	I am striving to demonstrate my ability at Space Fortress relative to other participants in this study.	My partner is striving to demonstrate his ability at Space Fortress relative to other participants in this study.
	I am motivated by the thought of outperforming other participants at Space Fortress.	My partner is motivated by the thought of outperforming other participants at Space Fortress.
	It is important to me to do well at Space Fortress compared to others in this study.	It is important to my partner to do well at Space Fortress compared to others in this study.
Learning	I want to learn as much as possible about Space Fortress during this study.	My partner wants to learn as much as possible about Space Fortress during this study.
	It is important to me to understand the Space Fortress game as thoroughly as possible.	It is important to my partner to understand the Space Fortress game as thoroughly as possible.
	I hope to gain a broader and deeper knowledge of Space Fortress when he is done with this study.	My partner hopes to gain a broader and deeper knowledge of Space Fortress when he is done with this study.
	I want to completely master the Space Fortress game.	My partner wants to completely master the Space Fortress game.
	I prefer to practice strategies for playing Space Fortress that arouse my curiosity, even if they are difficult for me to learn.	My partner prefers to practice strategies for playing Space Fortress that arouse his curiosity, even if they are difficult for him to learn.
	I like strategies for playing Space Fortress that really challenge me so that I can learn something new about the game.	My partner likes strategies for playing Space Fortress that really challenge his so that he can learn something new about the game.
Avoiding	I often think to myself, "What if I do badly at Space Fortress?"	My partner often thinks to himself, "What if I do badly at Space Fortress?"
	I worry about getting low scores at Space Fortress.	My partner worries about getting low scores at Space Fortress.
	My fear of getting low scores at Space Fortress is often what motivates me.	My partner's fear of getting low scores at Space Fortress is often what motivates him.
	I just want to avoid doing poorly at Space Fortress.	My partner just wants to avoid doing poorly at Space Fortress.
	It is important to me that I don't look stupid playing Space Fortress.	It is important to my partner that he doesn't look stupid playing Space Fortress.
	I would prefer to avoid playing Space Fortress in front of someone else because I might perform poorly.	My partner would prefer to avoid playing Space Fortress in front of someone else because he might perform poorly.

Table 2

Means, Standard Deviations, and Correlations for all Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Learning	3.16	0.98	---																		
2. Proving	3.34	1.11	.50	---																	
3. Avoiding	2.34	1.01	.37	.35	---																
4. PR Learning	2.78	0.97	.21	.24	.16	---															
5. PR Proving	3.18	0.96	.10	.20	.10	.69	---														
6. PR Avoiding	2.70	0.94	.08	.10	.09	.49	.43	---													
7. Self skill before collaboration	–1598.26	946.88	.14	.40	–.08	.17	.22	–.01	---												
8. Peer skill before collaboration	1452.14	1699.11	–.06	–.13	.11	–.21	–.16	–.25	.00	---											
9. Session 1 practice (CP)	909.30	1178.84	.06	.08	–.02	–.13	.03	–.24	.56	.62	---										
10. Session 1 test	224.43	1434.10	.25	.38	–.02	.19	.27	–.02	.75	.07	.61	---									
11. Session 2 practice (CP)	1527.85	1338.40	.05	.04	–.06	–.05	.09	–.16	.46	.56	.88	.59	---								
12. Session 2 test	704.93	1460.48	.19	.27	–.03	.18	.24	.02	.66	.09	.64	.87	.68	---							
13. Session 3 (1-week retention test)	412.29	1253.47	.22	.39	.07	.17	.22	–.03	.67	.12	.58	.83	.61	.85	---						
14. Session 4 practice	947.71	1520.19	.32	.36	.08	.21	.28	.03	.65	.08	.57	.81	.61	.87	.88	---					
15. Session 4 test	1458.70	1690.26	.30	.36	.01	.17	.27	.03	.60	.02	.54	.79	.57	.86	.82	.93	---				
16. Session 5 practice	1202.59	1743.37	.33	.41	.02	.21	.29	.08	.67	.07	.55	.73	.60	.74	.76	.88	.85	---			
17. Session 5 test	1782.17	1843.94	.20	.36	–.02	.19	.30	.05	.58	.11	.55	.73	.58	.78	.76	.87	.88	.87	---		
18. Session 6 practice	1044.43	1909.24	.36	.40	.02	.18	.30	.11	.63	.03	.46	.65	.49	.61	.68	.77	.72	.91	.77	---	
19. Session 6 test	2010.35	1825.86	.24	.32	–.03	.12	.23	.02	.61	.05	.54	.78	.55	.81	.81	.89	.90	.86	.90	.78	---
20. Post-training self-efficacy	3.50	0.64	.41	.35	.13	.36	.31	–.02	.42	–.16	.20	.48	.27	.53	.50	.61	.59	.60	.58	.54	.59

Note. PR = peer ratings. CP = collaborative performance. Practice = average of eight games. Test = average of two games. All tests are two-tailed. $r > |.17| = p < .10$; $r > |.20| = p < .05$; $r > |.32| = p < .001$. $N = 97$.

Table 3

Internal Consistencies of Self and Peer Ratings of Goal Orientation

	Learning Orientation				Proving Orientation				Avoiding Orientation			
	Self	CI	Peer	CI	Self	CI	Peer	CI	Self	CI	Peer	CI
Self skill												
Low	0.88	.80-.93	0.92	.87-.96	0.92	.87-.96	0.93	.88-.96	0.88	.80-.93	0.88	.79-.93
Med	0.92	.87-.96	0.89	.92-.94	0.90	.84-.95	0.92	.87-.96	0.89	.82-.94	0.89	.81-.94
High	0.87	.79-.93	0.95	.91-.97	0.96	.96-.98	0.97	.95-.99	0.81	.68-.90	0.94	.90-.97
Peer skill												
Low	0.89	.82-.94	0.94	.90-.97	0.92	.87-.96	0.97	.94-.98	0.78	.64-.88	0.91	.86-.95
Med	0.90	.84-.95	0.91	.85-.95	0.95	.91-.97	0.95	.91-.97	0.83	.84-.95	0.85	.88-.96
High	0.90	.84-.95	0.93	.88-.96	0.96	.94-.98	0.93	.88-.96	0.92	.87-.96	0.91	.86-.95
Collaborative Perf												
Low	0.90	.83-.95	0.93	.88-.96	0.90	.83-.95	0.94	.90-.97	0.80	.66-.89	0.90	.84-.95
Med	0.89	.81-.94	0.93	.89-.96	0.95	.93-.98	0.96	.93-.98	0.89	.82-.94	0.91	.85-.95
High	0.90	.84-.95	0.93	.89-.96	0.96	.94-.98	0.95	.92-.97	0.88	.80-.93	0.89	.81-.94
Overall	0.90	.86-.93	0.93	.91-.95	0.95	.93-.96	0.95	.93-.97	0.87	.82-.90	0.90	.87-.93

Note. Values are coefficient alphas (α).

Table 4

Factor Analysis Results for Self Ratings of Goal Orientation

Model	χ^2	χ^2/df	RMSEA	RMSR	CFI	AGFI	GFI
1) 1 FACTOR	602.65	5.06	0.20	0.27	0.59	0.33	0.81
2) 3 FACTORS, UNCORR	256.04	2.15	0.11	0.42	0.89	0.71	0.77
Low self skill	199.06	1.67	0.14	0.24	0.81	0.54	0.65
Med self skill	211.09	1.77	0.16	0.63	0.78	0.52	0.63
High self skill	222.25	1.87	0.17	0.37	0.77	0.50	0.61
Low peer skill	185.28	1.56	0.13	0.45	0.82	0.57	0.67
Med peer skill	183.76	1.54	0.13	0.33	0.84	0.56	0.66
High peer skill	247.50	2.08	0.18	0.55	0.76	0.45	0.57
Low collaborative skill	185.28	1.56	0.13	0.45	0.82	0.57	0.67
Med collaborative skill	246.69	2.07	0.18	0.37	0.73	0.48	0.60
High collaborative skill	222.63	1.87	0.17	0.56	0.80	0.47	0.59
3) 3 FACTORS, CORR	195.22	1.68	0.08	0.12	0.93	0.75	0.81
Low self skill	194.24	1.67	0.15	0.17	0.81	0.53	0.65
Med self skill	162.35	1.40	0.11	0.14	0.89	0.57	0.67
High self skill	202.90	1.75	0.15	0.15	0.81	0.52	0.64
Low peer skill	155.70	1.34	0.10	0.13	0.89	0.61	0.71
Med peer skill	170.30	1.47	0.12	0.16	0.87	0.57	0.67
High peer skill	220.12	1.90	0.17	0.16	0.81	0.46	0.59
Low collaborative skill	155.70	1.34	0.10	0.13	0.89	0.61	0.71
Med collaborative skill	236.39	2.04	0.18	0.24	0.74	0.47	0.60
High collaborative skill	191.95	1.66	0.14	0.15	0.85	0.50	0.62

Note. RMSEA = root mean square error of approximation. RMSR = standardized root mean squared residual. CFI = comparative fit index. AGFI = adjusted goodness-of-fit index. GFI = goodness-of-fit index.

Table 5

Factor Analysis Results for Peer Ratings of Goal Orientation

Model	χ^2	χ^2/df	RMSEA	RMSR	CFI	AGFI	GFI
1) 1 FACTOR	698.36	5.87	0.22	0.19	0.60	0.32	0.47
2) 3 FACTORS, UNCORR	367.51	3.09	0.15	0.40	0.83	0.65	0.73
Low self skill	214.40	1.80	0.16	0.30	0.78	0.52	0.63
Med self skill	271.03	2.28	0.20	0.28	0.69	0.46	0.58
High self skill	373.43	3.14	0.26	0.60	0.69	0.42	0.55
Low peer skill	338.64	2.85	0.24	0.54	0.68	0.38	0.52
Med peer skill	244.30	2.05	0.18	0.44	0.74	0.49	0.60
High peer skill	275.28	2.31	0.20	0.22	0.68	0.50	0.61
Low collaborative skill	338.64	2.85	0.24	0.54	0.68	0.38	0.52
Med collaborative skill	261.04	2.19	0.19	0.49	0.76	0.49	0.61
High collaborative skill	330.68	2.78	0.24	0.30	0.64	0.42	0.55
3) 3 FACTORS, CORR	281.58	2.43	0.12	0.08	0.89	0.71	0.78
Low self skill	191.63	1.65	0.14	0.12	0.82	0.54	0.65
Med self skill	252.05	2.17	0.19	0.13	0.72	0.47	0.60
High self skill	320.07	2.76	0.23	0.12	0.74	0.44	0.57
Low peer skill	303.29	2.62	0.23	0.14	0.73	0.40	0.54
Med peer skill	205.78	1.77	0.16	0.10	0.81	0.52	0.64
High peer skill	253.41	2.19	0.19	0.10	0.72	0.51	0.63
Low collaborative skill	303.29	2.62	0.23	0.14	0.73	0.40	0.54
Med collaborative skill	229.93	1.98	0.18	0.14	0.81	0.52	0.63
High collaborative skill	303.09	2.61	0.23	0.11	0.68	0.43	0.57

Note. RMSEA = root mean square error of approximation. RMSR = standardized root mean squared residual. CFI = comparative fit index. AGFI = adjusted goodness-of-fit index. GFI = goodness-of-fit index.

Table 6

Multitrait-Multimethod Matrix for Self and Peer Ratings of Goal Orientation

		Self			Peer		
		Learning	Proving	Avoiding	Learning	Proving	Avoiding
Self	Learning	---					
	Proving	**.53*** **	---				
	Avoiding	**.41*** **	**.40*** **	---			
Peer	Learning	<u>.21</u>*	.24*	.17	---		
	Proving	.10	<u>.20</u>*	.11	**.69*** **	---	
	Avoiding	.08	.10	<u>.10</u>	**.49*** **	**.43*** **	---

Note. **Bolded correlations** are heterotrait monomethod values (divergent validities). <u>Underlined correlations</u> are monotrait heteromethod values (convergent validities). Plain correlations are heterotrait heteromethod values (divergent validities). *$p < .05$; ***$p < .001$.

Table 7

Summary of Regression Analyses Examining Performance as an Antecedent of Goal Orientation

Model	β	R^2	Δ R^2
Self ratings of GO			
Learning			
1. Self skill before collaboration	0.145		
Peer skill before collaboration	–0.071	0.026	
2. Self skill × peer skill	0.108	0.038	0.012
Proving			
1. Self skill before collaboration	0.406**		
Peer skill before collaboration	–0.130	0.176***	
2. Self skill × peer skill	0.033	0.177***	0.001
Avoiding			
1. Self skill before collaboration	–0.055		
Peer skill before collaboration	0.042	0.005	
2. Self skill × peer skill	–0.098	0.015	0.010
Peer ratings of GO			
Learning			
1. Self skill before collaboration	0.189†		
Peer skill before collaboration	–0.260**	0.091*	
2. Self skill × peer skill	–0.186†	0.126**	0.034†
Proving			
1. Self skill before collaboration	0.235*		
Peer skill before collaboration	–0.129	0.065*	
2. Self skill × peer skill	–0.123	0.080*	0.015
Avoiding			
1. Self skill before collaboration	0.014		
Peer skill before collaboration	–0.255*	0.062*	
2. Self skill × peer skill	–0.159	0.087*	0.025

Note. β = standardized regression coefficients in the final model. R^2 = proportion of variance accounted for in the dependent variable by the set of predictors in the regression equation. ΔR^2 = incremental variance accounted for by the additional step in the regression equation. †$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$. $N = 97$.

Table 8

Summary of the SAS MIXED Results for Skill Acquisition

Model	B_1	B_2	df
1. Intercept	–936.02***	–936.08***	1, 90
Session	1554.43***	1554.46***	1, 285
Session*session	–204.56***	–204.56***	1, 285
Learning	203.27	203.17	1, 90
Proving	494.02**	291.41	1, 90
Avoiding	–245.62	–245.50	1, 90
PR Learning	–95.67	–95.62	1, 90
PR Proving	410.25*	16.22	1, 90
PR Avoiding	–160.07	–160.10	1, 90
2. Session*proving		192.15	1, 285
(Session*session)*proving		–33.90	1, 285
Session*PR proving		377.59*	1, 285
(Session*session)*PR proving		–67.12*	1, 285

Note. PR = peer ratings. B_1 = unstandardized regression coefficients in the initial model. B_2 = unstandardized regression coefficients in the final model. df = degrees of freedom in final model. *$p < .05$; **$p < .01$; ***$p < .001$.

Table 9

Summary of the SAS MIXED Results for Skill Acquisition Controlling for Prior Performance

Model		B	df
1.	Intercept	–925.01***	1, 89
	Session	1550.03***	1, 285
	Session*session	–204.56***	1, 285
	Prior performance	1236.37***	1, 89
	Learning	74.08	1, 89
	Proving	0.42	1, 89
	Avoiding	–55.76	1, 89
	PR Learning	–122.29	1, 89
	PR Proving	–263.06	1, 89
	PR Avoiding	–25.42	1, 89
2.	Session*proving	192.20	1, 285
	(Session*session)*proving	–33.90	1, 285
	Session*PR proving	378.60*	1, 285
	(Session*session)*PR proving	–67.12*	1, 285

Note. Prior performance = average of two test games performed at the end of the first day of training (session 2). PR = peer ratings. B = unstandardized regression coefficients in the final model. df = degrees of freedom in final model. *$p < .05$; **$p < .01$; ***$p < .001$.

Table 10

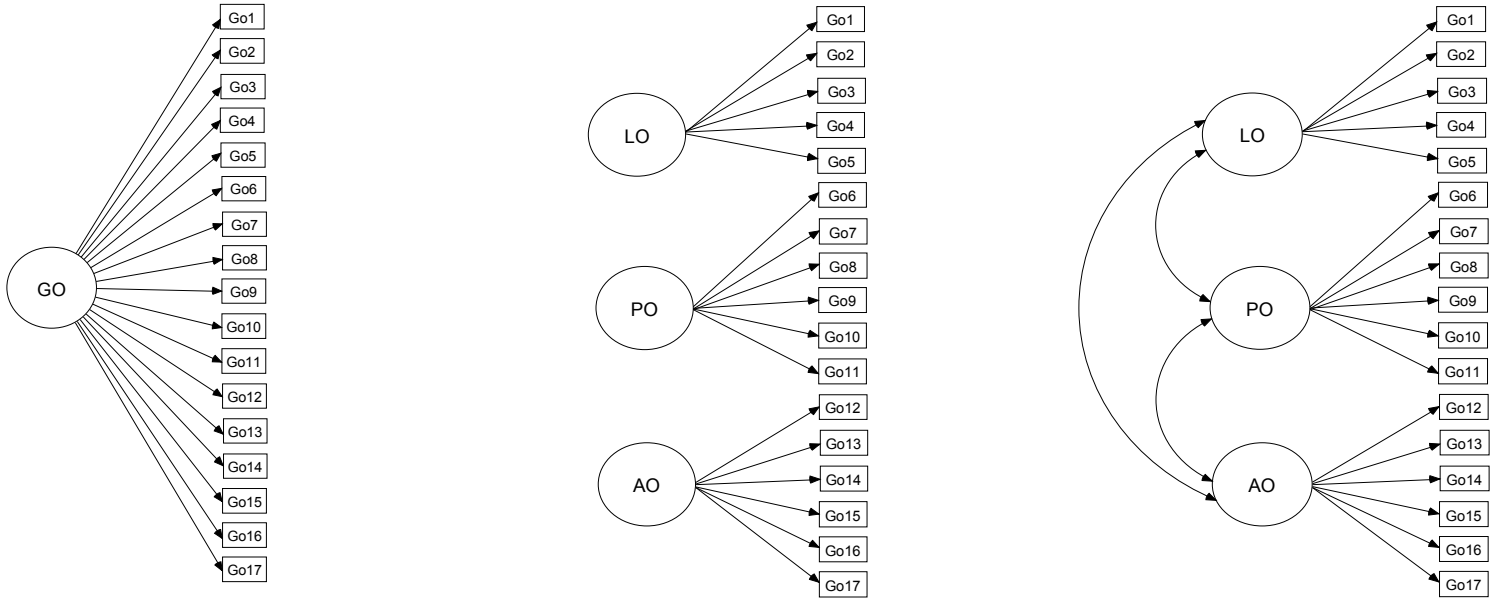
Summary of the Multiple Regression Analyses for Post-training Self-efficacy

Model	β	R^2	ΔR^2
Post-training self-efficacy			
1. Prior performance	0.401***	0.282***	
2. Self ratings of:			
Learning	0.276**		
Proving	0.045		
Avoiding	–0.027	0.388***	0.106**
3. Peer ratings of:			
Learning	0.279*		
Proving	0.082		
Avoiding	–0.219*	0.470***	0.082**

Note. Prior performance = average of two test games performed at the end of the first day of training (session 2). β = standardized regression coefficients in the final model. R^2 = proportion of variance accounted for in the dependent variable by the set of predictors in the regression equation. ΔR^2 = incremental variance accounted for by the additional step in the regression equation. *$p < .05$; **$p < .01$; ***$p < .001$. $N = 97$.

Figure 1.

Three Factor Analytic Models of Goal Orientation



Model 1 Model 2 Model 3

Note. GO = goal orientation. LO = learning orientation. PO = proving orientation. AO = avoiding orientation.

Figure 2.

Effects of Peer Ratings of Proving on Skill Acquisition

