Self-Confidence and Baseball Performance: A Causal Examination of Self-Efficacy Theory

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Using path analytic techniques, the causal relationships in Bandura’s model of self-efficacy were examined in a field setting. Male intercollegiate and interscholastic baseball players \((N = 53)\) completed self-report measures over a nine-game period during the baseball season. Perceptions of self-efficacy, competitive state anxiety, effort expenditure, and objective hitting performance were measured. Moderate support for Bandura’s model was found in that higher performances predicted stronger percepts of efficacy in six games, and lower levels of somatic and cognitive anxiety were associated with stronger self-efficacy beliefs in seven games. In turn, stronger self-efficacy predicted greater effort in six games and higher hitting performance in five games. Results are discussed in relation to the ecological validity of previous causal examinations of self-efficacy theory, as well as the utility of self-efficacy theory as a framework for investigating the self-confidence-performance relationship.

Key words: competitive state anxiety, effort, path analysis

Over the past three decades, the construct of self-confidence has received an enormous amount of attention from sport science researchers. Indeed, self-confidence is one of the most frequently cited psychological factors thought to affect athletic performance and has been called the most critical cognitive factor in sport (Feltz, 1984; Gill, 1986). A considerable amount of the research on self-confidence has examined its relationship with motor performance. In general, support has been found for the notion that self-confidence is related to motor skill performance, including athletic performance. For example, one of the most consistent findings revealed by this research is that successful elite athletes report greater self-confidence than do less successful elite athletes (Gould, Weiss, & Weinberg, 1981; Highlen & Bennett, 1979, 1983; Mahoney & Avener, 1977).

Though the construct of self-confidence has been conceptualized in a number of ways, perhaps the most extensively used conceptualization in sport and motor performance research is Bandura’s (1977) self-efficacy theory (Feltz,
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1988a). Bandura (1986) defines self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). According to Bandura (1986), the construct of self-efficacy is more concerned with one's judgment of performance potential given one's skills rather than with the sheer number of skills one possesses. Thus, although self-confidence is generally perceived as a more global trait, self-efficacy is a situation-specific form of self-confidence in which individuals believe that they can do whatever needs to be done in a specific situation.

In brief, self-efficacy theory states that when the necessary skills and appropriate incentives are present, self-efficacy will predict actual performance. Moreover, self-percepts of efficacy determine choice of activities, effort expenditure, and persistence, as well as thought patterns and emotional reactions during actual and anticipated encounters with the environment (Bandura, 1986). In turn, self-percepts of efficacy are based on four principal sources of information: performance accomplishments, vicarious experiences, verbal persuasion, and emotional arousal. Bandura (1986) asserts that performance accomplishments provide the most influential source of efficacy information because they are based on actual mastery experiences. According to Bandura (1977), self-efficacy operates as a common cognitive mechanism for mediating the effects of these sources of information on performance.

Research has typically supported Bandura's (1977) predictions of the effects of various sources of efficacy information on perceived efficacy and performance. Performance accomplishments (Feltz, Landers, & Raeder, 1979; McAuley, 1985), vicarious experiences (George, Feltz, & Chase, 1992; Gould & Weiss, 1981; McCullagh, 1987), verbal persuasion (Feltz & Riessinger, 1990; Fitzsimmons, Landers, Thomas, & van der Mars, 1991; Ness & Patton, 1979), and emotional arousal (Feltz, 1982, 1988b; Feltz & Mugno, 1983) have been shown to be associated with self-percepts of efficacy and motor performance. However, the correlational design of the majority of studies has not permitted inferences to be made with regard to causality or direction of the self-efficacy–performance relationships.

In an effort to ascertain the existence and direction of a causal relationship between self-efficacy and performance, Feltz (1982) used path analytic techniques to examine the predictions of Bandura's self-efficacy model in a study of back-diving performance. Results revealed a reciprocal cause and effect relationship between self-efficacy and diving performance, providing support for Bandura's model. However, contrary to Bandura's model, performance exerted a greater influence on self-efficacy than self-efficacy exerted on performance. Moreover, in contrast to Bandura's assertion that self-efficacy is the most powerful predictor of performance, the direct effect of previous performance on future performance was even stronger than the effect of self-efficacy on performance. Based on these findings, Feltz proposed a respecified model, including previous performance and self-efficacy as dual predictors of motor performance. Subsequent research in motor performance has provided considerable support for the respecified model (e.g., Feltz, 1988b; Feltz & Mugno, 1983; Fitzsimmons et al., 1991).

Taken together, the previous research indicates that Bandura's (1977) model of self-efficacy has some utility for predicting motor performance in controlled settings. However, the extent to which self-efficacy predicts performance under variable, dynamic conditions found in many sport settings remains unclear. This
uncertainty can be traced to several limitations in the research. First, studies have typically employed "closed skills," allowing subjects to exert a great degree of control over their performance. Although some sport settings are similar (e.g., archery, diving), many sports are characterized by open skills that are much more unpredictable and less controllable (e.g., tennis, basketball). As suggested by Feltz (1988b), the interrelations of self-efficacy and performance may best be understood under variable performance conditions. It is, therefore, unclear whether the network of relations found in previous self-efficacy research can be generalized to open skill tasks.

Second, with the exception of a few studies (e.g., Gayton, Matthews, & Burchstead, 1986; Lee, 1982; McAuley & Gill, 1983), the research has examined the self-efficacy–performance relationship in "artificial" sport settings. That is, athletic performance has not been examined in an actual competitive situation. Though this is not a weakness of the previous research per se, it is a limiting factor if Bandura's (1977) model of self-efficacy is to be used to explain or predict competitive, athletic performance. Research examining self-efficacy and athletic performance in actual competitive situations is needed before findings can be generalized to competitive sport environments.

Finally, self-efficacy research has typically employed nonathletes or inexperienced subjects. The relationship between efficacy expectations and performance among experienced athletes has received very little attention. Thus, prior research has not addressed potential differences in the cognitions of athletes and nonathletes in relation to the generation and resiliency of efficacy expectations. For example, one's experience with a task may mediate the impact of a superior or poor performance on efficacy beliefs. Experienced performers may understand that performances will fluctuate to some extent and, thus, may not weigh a particular performance too heavily in terms of efficacy expectations. Novices, on the other hand, must rely on only a few mastery experiences for efficacy information. Therefore, fluctuations in performance may lead to greater modifications of self-efficacy beliefs.

In an effort to take a first step toward addressing the limitations of prior research, the present study investigated the network of relationships hypothesized by Bandura's (1986) self-efficacy theory using an actual sport setting over a period of time and using experienced athletes. A conceptual model was proposed that tested the interrelations among competitive anxiety, self-efficacy, effort, and athletic performance (see Figure 1). Based on previous research (Feltz, 1982, 1988b; Feltz & Mugno, 1983; McAuley, 1985), anxiety and past performance accomplishments were expected to exert direct effects on self-efficacy. Self-efficacy, in turn, was hypothesized to predict effort, and both self-efficacy and effort were hypothesized to predict subsequent performance. Finally, performance was expected to directly influence subsequent efficacy beliefs.

Method

Subjects and Design

Subjects (N = 53) were 25 collegiate baseball players from two universities competing in the Big Ten Conference, and 28 high school baseball players from two teams competing in a Connie Mack summer league. College players ranged
in age from 19 to 22 years ($M = 20.7$), and high school players ranged from 16 to 18 years ($M = 17.3$).

Subjects completed self-efficacy, anxiety, and effort questionnaires on 9 successive game days scheduled over a 3-week period. Questionnaire responses for each game were combined across teams to form a single unit of analysis, referred to as a wave. Nine total waves were analyzed, thus permitting the network of relationships proposed by Bandura’s model to be examined over time.

**Self-Report Measures**

*Competitive Anxiety.* Subjects’ somatic and cognitive anxiety associated with competition was measured using the Competitive State Anxiety Inventory-2 (CSAI-2), a 27-item self-report measure developed by Martens, Burton, Vealey, Bump, and Smith (1990). Minor modifications were made to make the instrument items specific to hitting. For example, the statement, “I am concerned about this competition,” was modified to, “I am concerned about my hitting in this competition.” Subjects indicated how they felt just prior to hitting using a Likert-type scale, ranging from 1 (*not at all*) to 4 (*very much so*), on 9 somatic and 9 cognitive anxiety questions. Each anxiety score could range from 9 to 36. The internal consistency of the modified CSAI-2 across the nine waves was found to be satisfactory, with reliability coefficients ranging from .79 to .92 for the cognitive anxiety subscale, and .70 to .88 for the somatic anxiety subscale.

*Hitting Self-Efficacy.* Strength of baseball hitting self-efficacy was assessed by asking subjects how certain they were of their ability to hit a pitched ball in fair territory. Subjects responded to four hitting situations that varied in degree of difficulty, and ranged from putting the ball in play one time in four
at-bats to putting the ball in play four times in four at-bats. Response options ranged from 0 (very uncertain) to 100 (very certain). Following Bandura’s (1977) recommendations, efficacy strength was calculated by summing the certainty ratings and dividing by four, the total number of contact percentage situations. This method allowed hitting self-efficacy scores to range from 0 to 100% certainty.

**Effort Scale.** Subjects were asked to indicate how much effort they exerted while hitting during each game. Subjects responded to the question, “How much effort did you put into hitting in today’s game?” Responses were indicated on a scale divided into intervals of 10 percentage points, ranging from 0 to 100% effort.

**Performance Measure**

**Hitting Performance.** Objective performance was measured by calculating each subject’s contact percentage by game over the nine-game period. Contact percentage was calculated by dividing the number of times a player hit a pitched ball fairly into the field of play by the total number of at-bats. Contact percentage was used as the hitting performance measure because it is more within each hitter’s control. Traditional batting performance measures (e.g., batting average, on-base percentage) reflect the outcome of the play, which is influenced by the hitter and the opposing players. Contact percentage, on the other hand, represents the batter’s performance regardless of the performance of other players. Hitting performances could therefore range from .000 to 1.000.

**Procedure**

A verbal explanation of the study was presented to all players, and informed consent was obtained from those players who volunteered to participate. Parental permission was obtained for those subjects under the age of 18. On each game day, subjects completed the hitting self-efficacy questionnaire just prior to the start of the game, and they completed the CSAI-2 and effort scale immediately following the conclusion of the game. Competitive anxiety was measured retrospectively in an effort to assess players’ perceptions of anxiety as close in time to performance as possible (Feltz & Mugno, 1983). Martens, Vealey, and Burton (1990) and Hanin (1986) have found retrospective assessments of anxiety using the CSAI-2 to possess adequate reliability. In addition to questionnaire responses, contact percentage was calculated following each game.

For college players, questionnaires were placed in subjects’ lockers prior to each game, and subjects completed the hitting efficacy questionnaire approximately 15–20 min before the start of the game. To ensure anonymity, questionnaires remained in each player’s locker during the game and were completed and placed in a sealed box at the conclusion of the game. Questionnaires were removed from the box after all players had vacated the locker room.

High school players completed the questionnaires while sitting in the dugout, approximately 15–20 min prior to each game. After completing the hitting efficacy scale, the questionnaires were placed in a box until the completion of the game, at which time the remaining items were completed and the questionnaires were collected. This protocol was followed over nine consecutive games for each team.
Treatment of the Data

Prior to conducting the path analysis, differences in the relationships among independent and dependent variables for college and high school players were examined using z tests to determine whether the two groups could be combined for subsequent analysis. Correlation coefficients were computed by wave and group for each independent variable relative to the dependent variable it was predicting. Each coefficient was then transformed to a Fisher Z statistic so that the differences between the correlation coefficients of college and high school players could be tested (Glass & Hopkins, 1984).

The data from the two groups were then either combined or analyzed separately using path analytic techniques. This analysis examined the fit of the hypothesized model to the data. Multiple regression equations were written for each of the hypothesized relationships presented in Figure 1, and standardized path coefficients were calculated for each path in the model.

The hypothesized model was compared to a fully recursive model, which contained all possible paths to each dependent variable (see Figure 2). The fully recursive model represented all the variance that could be explained by the independent variables in the model. The hypothesized and fully recursive models were compared using two techniques. First, a chi-square goodness-of-fit statistic was computed (Pedhazur, 1982). Nonsignificant chi-square values would indicate that the data fit the proposed theoretical model, thus providing a more parsimonious explanation of the data. The larger the probability associated with the chi-square, the better the fit of the model to the data. Second, a Q coefficient was computed because the chi-square test is affected by sample size (Pedhazur, 1982). The Q coefficient represents the ratio of the variance explained by the

![Figure 2 — Fully recursive model of the network of interrelations among anxiety, self-efficacy, effort, and performance.](image-url)
hypothesized model relative to that explained by the fully recursive model. $Q$ can vary from 0 to 1, with values close to 1 indicating that the hypothesized model explains nearly all of the explainable variance in the dependent variables.

**Results and Discussion**

The results are presented in two sections. First, differences between college and high school players are examined in terms of overall scores on all variables and in terms of the relationships between independent and dependent variables. Second, results of the path analysis for the hypothesized and full models are presented. The alpha level for all analyses was set at .05; however, actual $p$ values are given when available so that significance levels can be reported more accurately.

**Group Differences**

**Somatic and Cognitive Anxiety.** Anxiety was assessed in terms of its cognitive and somatic components. Overall, perceived cognitive anxiety ($M = 16.61, SD = 4.30$) was higher than perceived somatic anxiety ($M = 13.31, SD = 3.01$). A paired $t$ test revealed that this difference was statistically significant, $t(52) = 7.70, p < .001$. In addition, one-way ANOVAs conducted on the cognitive and somatic anxiety scores of the two groups aggregated across the nine games revealed that the somatic anxiety reported by college players ($M = 12.23, SD = 1.60$) was significantly less than that of high school players ($M = 14.27, SD = 3.62$), $F(1, 51) = 6.70, p < .01$. The two groups did not differ on aggregated cognitive anxiety. These findings are consistent with prior research in that experienced athletes have been shown to exhibit lower levels of somatic anxiety during performance than less experienced athletes (Fenz, 1975; Mahoney & Avener, 1977). The means and standard deviations for all variables in the study are presented in Table 1.

**Self-Efficacy.** The strength of self-efficacy beliefs for putting the ball in play was also quite high ($M = 84.68, SD = 13.61$), ranging from 73.54 to 94.57 on a 100-point scale. However, when comparing the two groups on self-efficacy aggregated across the nine games, college players reported significantly higher percepts of efficacy ($M = 91.41, SD = 10.12$) than did high school players ($M = 78.66, SD = 13.65$), as indicated by a one-way ANOVA, $F(1, 51) = 14.63, p < .001$. The skill level of the athletes is likely responsible for the difference in efficacy scores, as highly skilled athletes have been shown to use only the upper portion of confidence scales (Feltz, Bandura, & Lirgg, 1989; Vealey, 1986).

**Effort.** Subjects reported exerting a relatively great amount of effort while hitting. On a 10-point scale, effort ratings aggregated across the nine games ranged from 4.75 to 10.00 ($M = 8.51, SD = 1.36$). A one-way ANOVA indicated a significant group difference in aggregate ratings of effort, $F(1, 51) = 9.96, p < .003$. College players reported exerting more effort while hitting ($M = 9.09, SD = 0.71$) than high school players reported ($M = 7.99, SD = 1.60$). Given the group differences in efficacy scores, these findings are not surprising. Research has shown that individuals with a strong sense of efficacy exert greater effort in the face of obstacles; whereas, those who are less efficacious exert less effort (Brown & Inouye, 1978; Weinberg, Gould, & Jackson, 1979).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Wave 1</th>
<th>Wave 2</th>
<th>Wave 3</th>
<th>Wave 4</th>
<th>Wave 5</th>
<th>Wave 6</th>
<th>Wave 7</th>
<th>Wave 8</th>
<th>Wave 9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>College players</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Anxiety</td>
<td>18.17</td>
<td>5.97</td>
<td>15.90</td>
<td>3.97</td>
<td>15.91</td>
<td>4.21</td>
<td>15.91</td>
<td>3.62</td>
<td>15.78</td>
</tr>
<tr>
<td>Somatic Anxiety</td>
<td>13.22</td>
<td>3.14</td>
<td>12.57</td>
<td>2.98</td>
<td>11.73</td>
<td>2.90</td>
<td>12.09</td>
<td>3.26</td>
<td>11.13</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>86.77</td>
<td>13.62</td>
<td>92.00</td>
<td>9.19</td>
<td>91.70</td>
<td>10.16</td>
<td>91.70</td>
<td>12.01</td>
<td>94.57</td>
</tr>
<tr>
<td>Effort</td>
<td>8.89</td>
<td>1.37</td>
<td>8.85</td>
<td>1.09</td>
<td>8.89</td>
<td>1.88</td>
<td>8.39</td>
<td>1.78</td>
<td>9.39</td>
</tr>
<tr>
<td>Hitting Performance</td>
<td>.807</td>
<td>.190</td>
<td>.841</td>
<td>.223</td>
<td>.890</td>
<td>.189</td>
<td>.908</td>
<td>.161</td>
<td>.871</td>
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<tr>
<td><strong>High school players</strong></td>
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</tr>
<tr>
<td>Cognitive Anxiety</td>
<td>18.50</td>
<td>3.75</td>
<td>17.94</td>
<td>6.01</td>
<td>17.22</td>
<td>5.47</td>
<td>16.30</td>
<td>5.89</td>
<td>17.53</td>
</tr>
<tr>
<td>Somatic Anxiety</td>
<td>13.89</td>
<td>3.85</td>
<td>14.61</td>
<td>6.20</td>
<td>13.67</td>
<td>6.01</td>
<td>14.00</td>
<td>5.08</td>
<td>15.21</td>
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<tr>
<td>Self-Efficacy</td>
<td>73.54</td>
<td>16.65</td>
<td>77.50</td>
<td>17.75</td>
<td>78.03</td>
<td>16.02</td>
<td>83.07</td>
<td>11.95</td>
<td>82.02</td>
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<tr>
<td>Effort</td>
<td>8.06</td>
<td>1.12</td>
<td>7.06</td>
<td>2.19</td>
<td>8.00</td>
<td>1.63</td>
<td>8.47</td>
<td>1.74</td>
<td>8.40</td>
</tr>
<tr>
<td>Hitting Performance</td>
<td>.816</td>
<td>.254</td>
<td>.843</td>
<td>.223</td>
<td>.858</td>
<td>.273</td>
<td>.850</td>
<td>.270</td>
<td>.748</td>
</tr>
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</table>
**Hitting Performance.** Overall, players’ contact percentage was quite high ($M = .825, \text{SD} = .140$). On average, college players’ hitting performances ($M = .847, \text{SD} = .100$) tended to be higher than high school players’ performances ($M = .805, \text{SD} = .168$). However, a one-way ANOVA indicated that this difference was not statistically significant, $F(1, 51) = 1.22, p > .05$. The tendency for college players to outperform their younger counterparts is consistent with self-efficacy theory (Bandura, 1977), in that higher self-efficacy beliefs are associated with lower levels of anxiety, higher effort expenditure, and greater performance. However, the task for college players was probably more difficult than for high school players given that college pitchers were probably more skilled. This task difference may have mitigated against finding statistically significant differences in hitting performance.

Group differences among the relationships between independent and dependent variables across the nine waves were examined via $z$ tests. One hundred seventeen pairs of correlation coefficients were examined, and four significant differences were found. However, when the analysis was adjusted for multiple comparisons using the Bonferroni correction (Miller, 1966), none of the correlation coefficients differed significantly. Thus, because no consistent differences between the two groups in the relationships among dependent and independent variables were found, data from college and high school players were combined for the path analysis.

**Path Analysis**

The results of the path analysis are presented according to the dependent variables in the model. Table 2 presents path coefficients for the hypothesized model. Path coefficients for the fully recursive model are presented in Table 3.

**Self-Efficacy.** The initial portion of the model illustrates the hypothesis that past performance experiences and anxiety would be significant predictors of self-efficacy. Moreover, past hitting performance was hypothesized to be positively related to self-efficacy, whereas anxiety was expected to be negatively related to self-efficacy. Results of the path analysis revealed support for these hypotheses. The cognitive anxiety–self-efficacy path coefficients were significant in Waves 2 ($\beta = -.424$) and 4 ($\beta = -.488$), and were marginally significant in Waves 3 ($\beta = -.394$) and 6 ($\beta = -.351$). Moreover, somatic anxiety predicted self-efficacy in Waves 1 ($\beta = -.440$), 7 ($\beta = -.462$), and 8 ($\beta = -.597$). As predicted, both cognitive and somatic anxiety were found to be negatively related to self-efficacy. These findings emphasize the importance of assessing cognitive anxiety in addition to physiological anxiety. Players’ perceptions of cognitive anxiety predicted self-efficacy just as strongly and consistently as perceptions of somatic anxiety. In similar research, Feltz (1988b) and Feltz and Mugno (1983) found that subjects’ perceptions of anxiety were better predictors of self-efficacy than were physiological indices of anxiety. Taken together, these findings suggest that one’s cognitive appraisal of arousal may provide stronger efficacy information than arousal level per se.

Strong support was found for the influence of past performance on efficacy beliefs. Significant past performance–self-efficacy path coefficients were found in Wave 2 ($\beta = .496$), Wave 3 ($\beta = .344$), Wave 5 ($\beta = .459$), Wave 6 ($\beta = .518$), Wave 7 ($\beta = .394$) and Wave 9 ($\beta = .635$). All significant paths were in
Table 2  Path Coefficients for the Hypothesized Model

<table>
<thead>
<tr>
<th>Path</th>
<th>Wave 1</th>
<th>Wave 2</th>
<th>Wave 3</th>
<th>Wave 4</th>
<th>Wave 5</th>
<th>Wave 6</th>
<th>Wave 7</th>
<th>Wave 8</th>
<th>Wave 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Hit→SE</td>
<td>.040</td>
<td>.496***</td>
<td>.344**</td>
<td>.229</td>
<td>.459***</td>
<td>.518***</td>
<td>.394***</td>
<td>.188</td>
<td>.635***</td>
</tr>
<tr>
<td>Cog→SE</td>
<td>-.116</td>
<td>-.424**</td>
<td>-.394*</td>
<td>-.488**</td>
<td>-.223</td>
<td>-.351*</td>
<td>-.015</td>
<td>.129</td>
<td>-.120</td>
</tr>
<tr>
<td>Som→SE</td>
<td>-.440**</td>
<td>.155</td>
<td>-.146</td>
<td>.114</td>
<td>.069</td>
<td>.048</td>
<td>-.462**</td>
<td>-.597**</td>
<td>-.195</td>
</tr>
<tr>
<td>SE→Effort</td>
<td>.436***</td>
<td>.313*</td>
<td>.372**</td>
<td>.106</td>
<td>.393**</td>
<td>.210</td>
<td>.278*</td>
<td>.414**</td>
<td>.227</td>
</tr>
<tr>
<td>SE→Hit</td>
<td>.449**</td>
<td>.339*</td>
<td>.310*</td>
<td>.225</td>
<td>.379**</td>
<td>.290</td>
<td>.091</td>
<td>.349**</td>
<td>.113</td>
</tr>
<tr>
<td>Effort→Hit</td>
<td>.103</td>
<td>-.083</td>
<td>.087</td>
<td>.142</td>
<td>.296*</td>
<td>.047</td>
<td>-.177</td>
<td>.210</td>
<td>.284</td>
</tr>
</tbody>
</table>

Note. Past Hit = previous hitting performance; Cog = cognitive anxiety; Som = somatic anxiety; SE = self-efficacy; Hit = hitting performance.

*p < .10. **p < .05. ***p < .01.
Table 3  Path Coefficients for the Fully Recursive Model

<table>
<thead>
<tr>
<th>Path</th>
<th>Wave 1</th>
<th>Wave 2</th>
<th>Wave 3</th>
<th>Wave 4</th>
<th>Wave 5</th>
<th>Wave 6</th>
<th>Wave 7</th>
<th>Wave 8</th>
<th>Wave 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Hit–SE</td>
<td>0.040</td>
<td>0.496***</td>
<td>0.344**</td>
<td>0.229</td>
<td>0.59***</td>
<td>0.518***</td>
<td>0.394***</td>
<td>0.188</td>
<td>0.635***</td>
</tr>
<tr>
<td>Cog–SE</td>
<td>-0.116</td>
<td>-0.424**</td>
<td>-0.394</td>
<td>-0.488**</td>
<td>-0.223</td>
<td>-0.351**</td>
<td>-0.015</td>
<td>0.129</td>
<td>-0.120</td>
</tr>
<tr>
<td>Som–SE</td>
<td>-0.440**</td>
<td>0.155</td>
<td>-0.146</td>
<td>0.114</td>
<td>0.069</td>
<td>0.048</td>
<td>-0.462**</td>
<td>-0.597**</td>
<td>-0.195</td>
</tr>
<tr>
<td>Past Hit–Effort</td>
<td>-0.044</td>
<td>-0.364</td>
<td>-0.199</td>
<td>0.066</td>
<td>-0.297</td>
<td>-0.242</td>
<td>-0.078</td>
<td>-0.113</td>
<td>-0.504</td>
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<tr>
<td>Cog–Effort</td>
<td>-0.006</td>
<td>0.179</td>
<td>0.069</td>
<td>0.229</td>
<td>0.070</td>
<td>-0.303</td>
<td>0.428*</td>
<td>0.210</td>
<td>0.109</td>
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<tr>
<td>Som–Effort</td>
<td>-0.125</td>
<td>0.004</td>
<td>-0.211</td>
<td>-0.094</td>
<td>-0.208</td>
<td>-0.080</td>
<td>-0.576*</td>
<td>-0.344</td>
<td>-0.096</td>
</tr>
<tr>
<td>SE–Effort</td>
<td>0.381</td>
<td>0.581**</td>
<td>0.385*</td>
<td>0.165</td>
<td>-0.93**</td>
<td>0.218</td>
<td>0.209</td>
<td>0.327</td>
<td>0.590*</td>
</tr>
<tr>
<td>Past Hit–Hit</td>
<td>-0.249</td>
<td>0.423*</td>
<td>0.129</td>
<td>0.327*</td>
<td>0.028</td>
<td>-0.298</td>
<td>0.322</td>
<td>-0.041</td>
<td>-0.340</td>
</tr>
<tr>
<td>Cog–Hit</td>
<td>0.345**</td>
<td>0.327</td>
<td>0.248</td>
<td>-0.149</td>
<td>-0.073</td>
<td>-0.430*</td>
<td>-0.453</td>
<td>-0.378</td>
<td>-0.040</td>
</tr>
<tr>
<td>Som–Hit</td>
<td>-0.455**</td>
<td>-0.403*</td>
<td>-0.404</td>
<td>-0.276</td>
<td>-0.243</td>
<td>0.039</td>
<td>0.431</td>
<td>0.017</td>
<td>0.028</td>
</tr>
<tr>
<td>SE–Hit</td>
<td>0.386**</td>
<td>0.198</td>
<td>0.212</td>
<td>0.028</td>
<td>0.317</td>
<td>0.361*</td>
<td>-1.09</td>
<td>0.243</td>
<td>0.366</td>
</tr>
<tr>
<td>Effort–Hit</td>
<td>0.061</td>
<td>0.011</td>
<td>0.065</td>
<td>0.154</td>
<td>0.251</td>
<td>-1.174</td>
<td>0.051</td>
<td>0.206</td>
<td>0.193</td>
</tr>
</tbody>
</table>

Note. Past Hit = previous hitting performance; Cog = cognitive anxiety; Som = somatic anxiety; SE = self-efficacy; Hit = hitting performance.

*p < .10. **p < .05. ***p < .01.
the predicted direction, with stronger previous hitting performances associated with higher percepts of hitting efficacy. Consistent with Bandura’s (1977) theory, previous performance was a stronger and more consistent predictor of self-efficacy than was cognitive or somatic anxiety.

The lack of significant past performance–self-efficacy paths in Waves 1, 4, and 8 may have been due to temporal issues associated with sport performance. Prior performances consisted of each player’s average contact percentage for the most recent game, and self-efficacy measures were completed just prior to each game. Typically, games were played every 2 or 3 days. This protocol allowed a considerable amount of time to elapse between each game. The time span between games may have allowed other factors to influence players’ self-efficacy beliefs. For example, the potential effects of a poor hitting performance may have been offset by physical or mental practice. Perhaps players were able to maintain their percepts of hitting efficacy based on positive feedback from hitting practice (mastery experiences) or from cognitive strategies designed to circumvent the debilitating effects of poor performances.

Contextual factors may also have influenced self-percepts of efficacy, such as the opposing pitcher or team, or whether a player’s team won or lost a previous game. This possibility is illustrated by examining the contextual factors associated with various games across the nine waves. For example, after reporting very strong efficacy beliefs in Wave 4 and winning their respective games, high school players’ self-efficacy expectations dropped for Waves 5, 6, and 7, when they faced their toughest competition. This decrease occurred despite strong hitting performances in Waves 4 and 6. Conversely, after winning in Wave 7 despite extremely poor hitting performances, high school players’ self-efficacy beliefs rose to their highest level in Wave 8. This increase in self-efficacy may be attributed to the weak opponent (pitching) each team faced in Wave 8. Thus, opponent’s ability may have been a more salient source of efficacy information than previous hitting performance.

Certainly these findings suggest that contextual factors may contribute to individuals’ appraisals of efficacy beliefs. Future sport research should examine whether contextual factors mediate the influential effects of the efficacy information on efficacy beliefs. In doing so, it may be possible to determine whether a specific source of efficacy information may be more salient or influential in a given situation.

Effort. Bandura (1986) contends that judgments of efficacy are a major determinant of one’s effort expenditure. The second part of the model hypothesized that self-efficacy would be the only predictor of effort. Results revealed that self-efficacy was at least a marginally significant predictor of effort in six of the nine waves. As seen in Table 2, the self-efficacy–effort path coefficients were significant in Waves 1 ($β = .436, p < .01$), 3 ($β = .372, p < .05$), 5 ($β = .393, p < .05$), and 8 ($β = .414, p < .05$) and were marginally significant in Waves 2 ($β = .313, p < .10$) and 7 ($β = .278, p < .10$). All nine paths were in a positive direction, indicating that stronger percepts of efficacy were predictive of higher effort expenditure while hitting.

To test the possibility that variables other than self-efficacy affected effort exertion while hitting, the fully recursive model across all nine waves (which regressed effort on previous performance, anxiety, and self-efficacy) was compared to the hypothesized model. The chi-square goodness-of-fit test resulted in
a nonsignificant value, $\chi^2 (36, n = 38) = 3.11, p > .05$, suggesting that the hypothesized model adequately explained the relationships among the variables. However, the $Q$ coefficient was only .21, suggesting that much of the variance was left unexplained.

An examination of the full model paths revealed that with the exception of one wave, self-efficacy was the only predictor of effort (see Table 3). Somatic anxiety ($\beta = -.576, p < .10$) and cognitive anxiety ($\beta = .428, p < .10$) were marginally significant predictors of effort in Wave 7. Surprisingly, no other variables in the full model were found to predict effort. Apparently, the addition of three paths was enough to account for a significant amount of variance in effort, even though no individual variable exerted a strong influence on effort. Given that other variables predicted effort in only one of the nine waves, self-efficacy was the strongest and most consistent predictor of effort in the model. These findings are consistent with previous research demonstrating that individuals with a strong sense of efficacy exert greater effort in an attempt to master a challenge, whereas those with weaker efficacy beliefs exert less effort when confronted with difficulties (Schunk, 1984; Weinberg et al., 1979).

The absence of significant self-efficacy–effort paths in Waves 4, 6, and 9 may be traced either to players' biased perceptions of effort or to an inadequate assessment of effort. Effort was assessed at the conclusion of each game, so players were aware of their hitting performance when they reported effort expenditure. In situations where performance was poor, players' reports of effort expenditure may have been an indication of the attributions they were making for their performance rather than the actual amount of effort they exerted while hitting. Indeed, subjects with high beliefs of personal efficacy have been shown to attribute failure to effort (Collins, 1982). Thus, the effort measure may have been tapping a self-serving attributional bias that athletes employed in an attempt to ascribe poor performance to unstable, internal factors (Weiner, 1986).

Nonetheless, these findings are of particular relevance given the lack of self-efficacy research employing effort as a dependent variable. The consistent relationship between self-efficacy and effort found in the present study supports Bandura's (1977) contentions, but it also suggests that variables other than self-efficacy may account for some of the variance in effort. Future research should continue to examine the influence of self-efficacy, as well as other variables, on effort expenditure. This approach will likely require the development of more accurate, objective assessments of effort expenditure.

**Hitting Performance.** The final portion of the model hypothesized that self-efficacy and effort would be the only predictors of performance, with self-efficacy being the stronger of the two predictors. Moderate support for the model was found in that self-efficacy was a significant predictor of hitting performance in Wave 1 ($\beta = .449, p < .02$), Wave 5 ($\beta = .379, p < .02$), and Wave 8 ($\beta = .349, p < .05$). In addition, there was a trend toward significance for the self-efficacy–performance path coefficients in Wave 2 ($\beta = .339, p < .06$) and Wave 3 ($\beta = .310, p < .08$). In contrast, a trend toward significance was found for only the Wave 5 effort–hitting performance path coefficient ($\beta = .296, p < .07$). No other path coefficients approached significance.

To test the hypothesis that self-efficacy and effort were the only predictors of performance, the hypothesized model was compared to the fully recursive model. The chi-square goodness-of-fit test was significant, $\chi^2 (36, n = 38) = 69.36, p < .05$,
and the $Q$ coefficient was .13, indicating that variables other than self-efficacy and effort were explaining some of the variance in hitting performance. An examination of the full model indicated that somatic anxiety ($\beta = -.455, p < .03$) and cognitive anxiety ($\beta = .345, p < .05$) were significant predictors of performance in the first wave. In addition, there was a trend toward significance for the previous performance–performance path ($\beta = .423, p < .07$) and the somatic anxiety–performance path ($\beta = -.403, p < .06$) in Wave 2. Finally, past performance ($\beta = .327, p < .08$) and cognitive anxiety ($\beta = -.430, p < .09$) were marginally significant predictors of performance in Wave 4 and Wave 6, respectively.

By finding only a trend toward significance in two of the nine waves for the past performance–future performance paths, these results stand in contrast to a number of investigations that have found past performance accomplishments to be strong predictors of future performance (e.g., Feltz, 1982; Feltz & Mugno, 1983; Fitzsimmons et al., 1991; McAuley, 1985). It is plausible that the past performance–future performance relationship is particularly strong in research employing closed skills and highly controlled, unchanging environments. Subjects in these settings would be consistently proficient across trials, leading to a very strong association between performance trials. In contrast, subjects in the present study performed an open skill in which they had to react to changing, often unpredictable, environmental conditions, much like that of many sport settings. Thus, proper skill execution may have resulted in successful performance in one situation, but not in another. Given the uncertainty of the performance environment, it is not surprising that subjects’ personal sense of efficacy, rather than their past performance accomplishments, exerted the strongest influence on hitting performance.

The fact that subjects in the present study were highly experienced with the task may have also precluded stronger past performance–future performance paths. Previous research has generally employed novice subjects who had little or no experience with the experimental task. Therefore, efficacy beliefs in these research settings were probably derived from indirect experiences with the task. Subjects in the present study, in contrast, had years of experience performing the task, providing numerous mastery experiences on which to base efficacy expectations. Thus, subjects may have presented more accurate judgments of their abilities than inexperienced subjects would have. However, one study using experienced weightlifters (Fitzsimmons et al., 1991) found that past performance, as opposed to self-efficacy, was the strongest predictor of subsequent performance. Unfortunately, a closed-skill task was employed, therefore confounding the effect of experience on self-efficacy and performance. Thus, the influence of experience on self-efficacy and performance remains unclear.

In sum, self-efficacy was found to be a significant predictor of hitting performance in three waves, and marginally significant in two other waves. However, self-efficacy did not predict performance in four waves. Bandura (1984) notes that self-efficacy operates as a common cognitive mechanism, not an exclusive mechanism, for mediating the effects of various sources of information on performance. Thus, other mechanisms may also influence performance. However, in support of Bandura’s (1977, 1986) theory, self-efficacy was found to be the strongest and most consistent predictor of performance. Given the complexity of the task and the variable conditions under which the task was performed, the findings in the present study are particularly noteworthy and underscore the robustness of self-efficacy theory.
General Discussion

Despite widespread support for the basic tenets of Bandura’s (1977) self-efficacy theory in controlled motor performance settings, little is known about the causal elements of Bandura’s theory in the dynamic, variable environments found in many sport contexts. The present study was designed to examine the direction and causality of the network of relationships posed by Bandura’s theory in a naturally occurring sport setting, under changing environmental conditions.

The overall results of this study support Bandura’s (1986) assertions and provide much-needed evidence for the predictive ability of self-efficacy theory in an actual sport setting. Though previous research has provided correlational support for the self-efficacy–performance relationship in sport settings (e.g., Barling & Abel, 1983; Gayton et al., 1986; Lee, 1982), the present study provided external validity for the causal and directional elements of Bandura’s (1986) model found in more controlled settings (e.g., Feltz, 1982; Feltz & Mugno, 1983; McAuley, 1985).

The results of the path analysis also provide support for the reciprocal relationship hypothesized to exist between self-efficacy and performance. In the hypothesized model, past performance was a significant predictor of self-efficacy, and self-efficacy, in turn, significantly predicted subsequent performance. Moreover, consistent with earlier research (Feltz, 1982, 1988b; Feltz & Mugno, 1983), the effect of each variable on the other was not equal. Past performance exerted a stronger and more consistent influence on self-efficacy than self-efficacy exerted on performance.

The findings in the present study differed from previous research in that the direct effect of past performance on future performance found in earlier research was not observed. This inconsistency may be attributed to differences in the methodology employed in the present study compared to that used in previous research. As noted earlier, the type of task employed or subjects’ experiences with the task may have accounted for the lack of significant past performance–future performance path coefficients. Furthermore, Feltz (1988a) suggested that previous performance experiences may override the effects of self-efficacy beliefs on performance when performance trials are temporally close together and vary little in terms of requirements. In most real-life sport situations, athletes perform under varying temporal intervals and task requirements. Perhaps the expanded time frame in which subjects performed or the different games, with different pitchers and other contextual variables, allowed efficacy judgments to exert a stronger effect on subsequent performance attempts.

Another purpose of the present study was to investigate the influence of self-efficacy on effort expenditure, a topic neglected by many efficacy researchers. The findings lend moderate support to the hypothesis that self-efficacy is a determinant of one’s effort expenditure. Moreover, Bandura’s (1986) proposition that higher percepts of efficacy are associated with increased effort expenditure received support in that the self-efficacy–effort path coefficients were significant in four waves, and marginally significant in two other waves. These findings are important because they address Bandura’s (1977) assertion that self-efficacy influences effort and other motivational behaviors such as choice of activities and persistence. Clearly, these behaviors contribute to performance, but most of the research has examined self-efficacy in relation to performance rather than in...
terms of the behaviors specified by the theory (Feltz, 1992). Future research should continue to examine the relationship between self-efficacy and motivational behavior, as well as the influential effects of various motivational behaviors on skilled performance.

As previously noted, the self-efficacy–performance relationship may have been affected by variables outside of the model or by methodological limitations. For example, self-efficacy will not predict performance if factors beyond one's control are partially responsible for successful performance (Bandura, 1990). In the present study, hitting performance consisted of the contact percentage of each player. Although this measure was believed to accurately represent the performance of the hitter, it may still have been influenced by the performance of others (e.g., pitcher, umpire). Given this interdependence, self-efficacy may not have been a strong predictor of performance because skill execution was not totally responsible for hitting performance. In addition, the way contact percentage was assessed may have influenced the findings. Rather than having subjects report their confidence in simply making contact with the ball, perhaps a more qualitative assessment of hitting efficacy and performance was needed. For example, subjects could indicate their efficacy for hitting the ball “hard” or “on the line.” In doing so, a more fine-grained analysis of the efficacy–performance relationship might be possible.

Another methodological issue is that the performance measure was comprised of each players' average performance for a game. In contrast, each player completed only one self-efficacy measure per game. It is possible that players' efficacy expectations changed during the course of a game. If this were the case, the self-efficacy measure taken before the game would not have been an accurate assessment of players' efficacy appraisals at a later point in the game. A stronger relationship between self-efficacy and performance may have been found if self-efficacy were assessed prior to each plate appearance. In doing so, fluctuations in self-efficacy during competition could be assessed and compared to performance. Unfortunately, this protocol was not feasible in the present study due to situational constraints. Future field-based research should attempt multiple self-efficacy assessments, within and across contests, to capture any modifications in efficacy beliefs during competition.

Finally, the time lapse between the administration of the efficacy questionnaire and actual performance also may have influenced the strength of the self-efficacy–performance paths. Bandura (1978) argued that if self-efficacy and performance are not measured closely in time, efficacy beliefs may be influenced by new experiences during the intervening period. Self-efficacy was assessed approximately 15–20 min prior to each game. Events occurring during this time period may have altered players' efficacy expectations. For example, heightened anxiety levels just prior to performance may have influenced players' percepts of efficacy. This explanation seems somewhat plausible, given the moderate relationship found between anxiety and self-efficacy. It is also possible that variables not accounted for in the model, such as vicarious experiences or persuasion, affected self-efficacy during this time period. Certainly, these potentially influential factors should be examined in future research. In light of these potential

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1I would like to thank an anonymous reviewer for this suggestion.
limitations, the findings in the present study should be interpreted with caution until further field-based support is provided.

In conclusion, the findings in the present study provided much-needed evidence for the predictive ability of self-efficacy theory under the variable conditions of an actual sport setting. The findings also suggest that the type of task being performed, individuals’ experience with the task, and the temporal spacing of performance trials may all influence the network of relationships in Bandura’s model of self-efficacy. Future research needs to determine whether the mediational effects of self-efficacy are dependent upon such contextual factors. Likewise, as suggested by McAuley (1992), future research needs to examine how various psychological skills such as imagery, self-talk, and goal-setting are related to efficacy expectations. Information pertaining to the influence of these variables may facilitate a greater understanding of the processes associated with the generation of efficacy expectations, and provide practical guidelines to coaches, athletes, and sport psychology consultants relative to the self-confidence/performance relationship.

References


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