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Performance and Perceived Team and Player Efficacy in Bowling Teams

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Abstract

Perceptions of team efficacy and player efficacy were collected along with objective performance measures for both individuals and teams over 16 weeks during a bowling tournament. Perceptual data were significantly correlated with objective data, but averaged *self*-efficacy measures were more highly correlated with team performance than were *team* efficacy measures.

Press Paragraph

We compared self-reported performance with objective performance for both individuals and as teams using competitive bowling teams during a tournament. We found that there was better than chance agreement between self-reports and objective measures, but averaging what people said about *themselves* was a better indicator of actual team performance than averaging what people said about their *team* as a whole. We explain the results in terms of the low level of team member dependence in bowling teams.

Perceived Team and Player Efficacy in Bowling Teams

Many studies have examined the relations between self-efficacy and individual performance both in the workplace (Gibson, 1999; Stajkovic & Luthans, 1998; Barling & Beattie, 1983) and in the sports arena (Feltz & Lirgg, 1998; Gould, Weiss & Winberg, 1981; Mahoney & Avenuer, 1977). It has been consistently found that increased self-efficacy is linked to improved or increased performance. A meta-analytic review (Stajkovic & Luthans, 1998) of the relationship between self-efficacy and work-related performance revealed a mean correlation of .34. The authors concluded that increasing self-efficacy is likely to result in a bigger gain in performance than can be achieved from goal-setting, feedback interventions, or organizational behavior modification.

Although much is known about self-efficacy's effects on *individual* performance, much less is known about self-efficacy's effects on *team* performance. As today's organizations continue to move toward a team-based format, this is an increasingly important area to be explored. As a result of current organizations' move to team-based contributions, the term *collective efficacy* was coined by Bandura (1986, 1997). Collective efficacy can be viewed as an extension of self-efficacy theory to help us understand the underlying motivation for a group of people to work together toward a common goal. Bandura (1997) defined collective efficacy as "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainment" (p. 477).

The main difference between self-efficacy and collective efficacy, according to Bandura (1997), is the unit of agency. Self-efficacy focuses on *individual* perceptions of perceived ability; collective efficacy focuses on the *group* or *team's* perception of the team's perceived

ability. Collective efficacy and team efficacy are virtually interchangeable. Following Gully, Joshi and Incalcaterra (2001), the term team efficacy will be used in this paper.

Because the core tenets of efficacy (enactive mastery, vicarious experience, verbal persuasion and physiological and affective states) are the same for both self-efficacy and team efficacy, is seems reasonable to believe that increased team efficacy would result in improved team performance just as improved self-efficacy results in improved individual performance. Some empirical work in the laboratory supports such a position (Hodges & Carron,1992; Prussia & Kinicki, 1996; Silver & Bufanio, 1996). Additional studies exploring the team efficacy/performance relationship have been conducted in field settings (e.g., Bandura, 1993; Gully, Beaubien, Incalcaterra & Joshi, 2000; Little & Madigan, 1997; Riggs, Warka, Babasa, Betancourt, & Hooker, 1994). These studies lend support to the theory that team efficacy does follow the same pattern as self-efficacy, as increased levels of team efficacy did result in improved performance. However, Gully et al. (2000) also confirmed the presence of a moderator, team interdependence.

The degree to which team efficacy predicts performance depends on the degree of interdependent effort needed to produce the desired team goal (Bandura, 1997). More interdependent teams require highly coordinated effort of all team members to reach the team goal. Bandura (1997) used the example of a soccer team to describe a highly interdependent team in which the ultimate goal (winning a game) can only be obtained by the coordinated effort of all the team members on the field. If one team member fails in his or her task, it can lead to a decrease in the performance of other team members. The team members must work in together to achieve a goal. As team task interdependency increases, the other team members have a greater impact on individual perceptions of team efficacy. As team task interdependency

decreases, the other team members have less of an impact on individual perceptions of team efficacy.

Like highly interactive teams, less interactive teams also rely on a coordinated effort to achieve a team goal, but the level of coordination required among team members is lower. In less interactive teams, individual performances are aggregated for a measure of team performance. A bowling team is an example of a less interdependent team. In bowling, all team members' scores are added together to produce a team score (this corresponds to pooled interdependence, see Bass, 1982). Although a failure of one team member to perform at his or her optimal performance level will affect the team's overall standing, it is less likely that a failure of one team member will directly affect another team member's performance.

Due to the differences in team interdependence in performing a task, there have been two ways presented to measure perceptions of team efficacy. The first method involves utilizing individual ratings of perceived *self-efficacy* and aggregating those scores across team members, to form a measure of team efficacy (Bandura, 1997; Gist, 1987). Such a measurement has been described as the method of choice for less interdependent teams. For more interdependent teams, the method of choice is obtained by collecting individual team members' perceptions of *team efficacy* and then aggregating those scores to the team level for a measure of team efficacy. Using these methods reflects a belief that, for less interdependent teams, team efficacy is merely an aggregation of individual self-efficacy perceptions (essentially an average or total) but for more interdependent teams, the function that relates indirectly to team efficacy is more complex, thus requiring a direct assessment.

In a meta-analysis by Gully, Joshi and Incalcaterra (2001), task interdependence was shown to be a moderator in the team efficacy, self-efficacy and performance relationship. This

meta-analysis confirmed that self-efficacy was a better predictor of team performance when task interdependence was low, and team efficacy was a better predictor of team performance when task interdependence was high. To date, however, there has been very little research that examines the relations among efficacy perceptions and performance over time. Thus, this study is one of the first to examine such an issue.

The Present Study

The first two hypotheses are based directly on the research literature. The contribution of the current study with regard to these two hypotheses is the test of boundary conditions enabled by the longitudinal design.

Hypothesis 1: In low interdependent teams, average self-efficacy perceptions will be more highly correlated with team performance than will average team-efficacy perceptions.

Hypothesis 2: In low interdependent teams, average self-efficacy perceptions will be more affected by previous performance than will average team-efficacy perceptions.

Finally, research conducted to date has looked at self-efficacy as a predictor of individual performance (Bouffard-Bouchard, Parent & Larivee, 1991), self-efficacy as a predictor of team performance (Feltz & Lirgg, 1998; Gould, Weiss & Winberg, 1981; Mahoney & Avenuer, 1977), and team efficacy as a predictor of team performance (Feltz & Lirgg, 1998). What is lacking in the literature is a determination of how self-efficacy is influenced by measurable individual performance and measurable team performance. To date, it is not known how self-efficacy or team efficacy is affected when team members can be evaluated and measured by their individual performance as well as the team's performance. The use of a bowling team allows for such an exploration because individual bowling scores are obtained along with combined team bowling scores. Accordingly, this study examined the influence of both individual performance and

team performance on self-efficacy and team efficacy. These were exploratory questions; no particular hypothesis was made initially.

Method

Participants

Participants were members of a "mixed" bowling league that competed weekly in southwest Florida. Bowling teams were chosen because (a) every team member was used in every game, (b) all team members had equal opportunities to score, and (c) there was a low amount of interdependency among team members. The league consisted of 16 teams with five members per team; only one entire team (Team #11) declined to participate in the study. Of the remaining 15 teams, eight members from various teams declined to participate, leaving a final participating pool of 15 teams with 67 individual bowlers participating. Not all participants participated every week; a total of 801 individual scale scores were collected across 16 weeks. The sex of the participants was 49.25% female. The age of the participants ranged from 18 to 72 years with a mean of 42.04 and a standard deviation of 13.01 years. Games were played every Wednesday night, with teams competing against different teams within the league. The data collection lasted 16 weeks. Players were asked on the questionnaires to identify their position on the team and the team number so that the longitudinal data collected could be matched appropriately; participation was anonymous. Questionnaires were completed during the warm-up session of each match.

Dependent Measures

Efficacy measures. The team efficacy measure was comprised of eight items (see Appendix A) that asked players to assess the degree of confidence they had in their team's ability to perform important game skills. These items were developed during a consultation with a

bowling coach after conducting a conceptual analysis of the competence areas required in bowling. This analysis was in accordance with Bandura's (1986) recommendations for constructing efficacy measures. The skill areas included: beating the opponent; scoring points; maintaining league standing; increasing league standing; and bouncing back from poor performance. The questions addressed the degree of confidence that each team member had in the team's ability to outperform the opposing team on each of the competency areas. Aggregated team efficacy scores were computed by averaging the eight ratings made by each player. Cronbach's alphas were computed on the weekly individual responses and then averaged across weeks. Mean alpha obtained was .95, the standard deviation was .01 and the range was.92 to .97. Prior to collapsing weekly team efficacy measures across weeks, a reliability estimate was calculated by correlating the average of the first eight weeks with the average of the last eight weeks. The correlation was .77, supporting the decision to average over weeks.

The self-efficacy measure (see Appendix B) consisted of nine questions that assessed beliefs about the individual team member's ability to (a) out-perform one of his/her opponent team members, (b) obtain his/her average bowling score in one game, (c) obtain his/her average bowling score in two games, (d) obtain his/her average bowling score in three games, (d) make up points missed by team members, (e) score multiple, consecutive strikes, (f) pick up spares, (g) pick up splits, and (h) bounce back from performing poorly. Player efficacy scores were computed in the same way as the team efficacy scores. Cronbach's alphas were computed on the weekly individual responses and then averaged across weeks. Mean alpha obtained was .95, the standard deviation was .02 and the range was.91 to .97. Prior to collapsing weekly self efficacy measures across weeks, a reliability estimate was calculated by correlating the average of the first eight weeks with the average of the last eight weeks. The correlation was .78. The

questionnaires were counter-balanced so that there was an equal chance that the Personal Confidence or Team Confidence sheet was presented first.

Prior to the aggregation of participant level data to the team level, two checks on perceptual consensus were computed. One such check was an intraclass correlation based on ANOVA in which the teams represent levels of the independent variable and the team members' within team scores represent the dependent variable (Shrout & Fliess, 1979, ICC(1)). The ANOVA resulted in $F(14) = 16.28$, $p<.01$. $ICC(1,1) = .50$, and the $R^2 = .28$. A consensus analysis using within-group interrater agreement (r_{wg}) (James, Demaree & Wolf, 1984) was computed for each measure averaged across teams and games. The computed value of r_{wg} was .85. Both the ICC and r_{wg} suggested that aggregating the data over teams was reasonable for the rating scales.

Performance measures. Game statistics, both team and individual, were obtained from the league captain after each game. Game statistics used in this study were (a) individual scratch scores for each of the three games played, (b) individual scores with handicap for each of the three games played, (c) points won during the match (0, 1, 2, 3 or 4), (d) team scratch total, and (e) team total with handicap.

Prior to collapsing individual and team performance measures across weeks, reliability estimates were calculated by correlating the average of the first eight weeks with the average of the last eight weeks. The reliability estimate for individual scratch score was .90. The reliability for individual score with handicap was .31. The reliability estimate for points won was .02. The reliability estimate for team scratch total was .93. The reliability estimate for team total with handicap was .31. The reliability estimates for individual handicap score, points, and

team scratch handicap were surprisingly low. Despite the low reliability estimates, analyses were still computed using these measures.

Results

Descriptive statistics are reported in Table 1. The table depicts the number of teams participating, the number of weekly matches played by each team, and player efficacy and performance summary data.

To test Hypothesis 1, which stated that average self-efficacy perceptions predict performance better than average team efficacy perceptions, a correlation matrix was computed (see Table 2). The correlation matrix shows correlations among average self-efficacy, average team-efficacy and three separate measures of concurrent team performance: team scratch performance scores, team handicap scores, and points won. These correlations are computed with both teams and weeks as observations.

As can be seen in Table 2, the only performance measure that was significantly correlated with self-efficacy and team-efficacy was team scratch score. The correlation between self-efficacy and team total scratch score was .29 ($p<.01$) and the correlation between team efficacy and team total scratch score was .20 ($p<.01$). The difference between these two correlations was tested for significance using Steiger's (1980) test for comparing elements of a correlation matrix. The result ($t(113) = 2.37$, $p<.05$) confirmed that the correlation between individual self-efficacy perceptions and team scratch total was significantly larger than the correlation between individual team efficacy perceptions and team scratch total. Thus, Hypothesis 1 was partially supported.

To test Hypothesis 2, another correlation matrix was computed. The correlation matrix shows correlations among average self-efficacy, average team-efficacy and the different

measures of team performance for the previous week. The data are collapsed across individual participants, teams and weeks. As can be seen in Table 3, the only performance measure from the previous week that was significantly correlated with self-efficacy and team-efficacy was team scratch score. The correlation between self-efficacy and prior team total scratch score was .24 ($p<.01$) and the correlation between team efficacy and prior team total scratch score was .24 ($p<.01$). The difference between these two correlations was not significant. Thus Hypothesis 2 was not supported.

For an initial evaluation of the relationships among self-efficacy, team efficacy, individual performance and team performance, a correlation matrix was computed (see Table 4) that reflects the degree of relatedness of all variables of interest when performance measures, both individual and team, are taken at the same time. As can be seen in this table, the pattern of relations between efficacy beliefs and performance is the same for both self-efficacy and team efficacy, although the relationship between self-efficacy and performance measures is stronger. Self-efficacy is significantly related to individual scratch score ($r=.41$, $p<.01$) as is team efficacy ($r=.26$, $p<.01$).

The final step in the exploration of how self-efficacy and team efficacy are influenced by individual performance as well as team performance was to compute regression analyses. Two separate regression equations were computed. Both equations had the five individual and team performance measures (individual scratch score, individual handicap score, team scratch score, team handicap score and points) as the independent variables. The first regression equation used self-efficacy perceptions as the dependent variable, and the second regression equation used team efficacy perceptions as the dependent variable. Table 5 reports the overall model results, including the appropriate R-square, *F* values, and standardized regression weights for each

performance measure as well as *t* values for the regression weights. As can be seen in Table 5, for self-efficacy, the only performance measures that had significant regression weights were the individual scratch score and individual handicap score. For team efficacy, all performance measures except individual handicap score had significant regression weights.

Discussion

Measurement of Team Efficacy

The first hypothesis in this study was that, in low interdependent teams, average self-efficacy perceptions would be more highly correlated with team performance than would average team-efficacy perceptions. Partial support was found for this hypothesis as aggregated self-efficacy perceptions were more strongly related to team scratch score than were aggregated team efficacy perceptions.

Past Performance Effects on Efficacy

The second hypothesis proposed in this study was that in low interdependent teams, average self-efficacy perceptions would be more affected by previous performance than would average team-efficacy perceptions. This hypothesis was not supported because both self-efficacy and team efficacy were equally related to prior team scratch scores.

The correlations between efficacy and both current and prior performance were similar for both self- and team-efficacy. In fact, average self-efficacy and team-efficacy scores were correlated .88, which leaves little room for differential relations with performance criteria. One might question whether the scales are measuring anything different.

Exploratory Research Questions

A goal of this study was to explore how self-efficacy and/or team efficacy is influenced by past individual and team performance. Because this issue had not been explored in previous

research, there were no hypotheses posited. However, it was believed that this exploration would increase our understanding of how humans are affected by successes and failures when operating in a team environment.

Two regression analyses were computed. The first analysis regressed self-efficacy on all five performance measures, two of which were related to individual performance and three of which were related to team performance. Only the individual measures added unique variance to perceptions of self-efficacy. Team performance does not appear to affect the individual's assessment of his or her own ability to perform within the team above and beyond individual performance.

The second analysis regressed team efficacy on the same five performance variables. In this analysis, team measures of performance played a significant role in the perception of team efficacy. Interestingly, individual scratch score remained a significant predictor of team efficacy. However, all additional measures of team performance were significant as well. This finding suggests that, although individual performance is important in a low task interdependent teams, as would be expected, the team members are also aware of the importance of how the team is functioning as a whole. Such a result indicates that team efficacy and self efficacy measures appear to have different determinants and despite their large correlation are in fact at least partially distinct.

Importance of Appropriate Performance Measure

Although the finding that neither self-efficacy or team efficacy was related to team handicap score or points was somewhat surprising, it brought to light some very important issues. It is clear from these findings that the determination of the appropriate measure of team performance is critical.

Team scratch score represents the actual performance of the team during the competition. Team scratch score is the most available and salient feedback to the team members because it is recorded and posted at the lane while the teams are competing. Because the team scratch score represents the actual performance of the team, it makes sense that the scratch scores are most closely related to both self-efficacy and team efficacy perceptions.

Team handicap score allows for a more level playing field *between* teams so that a less talented team is not disadvantaged by a more proficient bowling team. Team handicaps are aggregates of individual handicaps that are calculated based on a specific formula (80% of the difference between bowling average and 200). Points are awarded based on the total team handicap score. Using such a system, it is quite possible that one team could actually score more scratch points and still lose to an opponent who has a higher cumulative team handicap. The small correlation between team scratch score and points confirms that a higher team scratch score does not necessarily result in points awarded.

In both hypothesis 1 and 2, team scratch score was the only performance measure that was related to self-efficacy and team efficacy perceptions. As the performance measure becomes more distal to teams and team members, its relative importance becomes less salient. Team performance measures must be directly tied to the actions performed by the team and its members to have any effect on efficacy perceptions.

Summary

The current study confirms that self-efficacy was a better predictor of performance in low task interdependent teams than was team-efficacy. The current study was the first of its kind to document such a pattern of results over time. Unlike prior research the study found no difference between self-efficacy and team efficacy in terms of relations with prior performance.

An important finding from the study is that self-efficacy and team-efficacy perceptions appear to have different determinants, even though self-and team-efficacy are highly correlated.

The results also underscore the importance of having appropriate individual and team performance measures when a low task interdependent team is used. We found much stronger relations between efficacy measure and performance measures that were under control of the team members. As the performance measures became increasingly distal (win/loss records), the relations with efficacy scores diminished.

References

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28, 117-148.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: Freeman.

Bandura, A. & Cervone, D. (1986). Differential engagement of self-reactive infuences in cognitive motivation. Organizational Behavior and Human Decision Processes, 38, 92-113.

Barling, J. & Beattie, R. (1983) Self-efficacy beliefs and sales performance. Journal of Organizational Behavior Management, 5, 41-51.

Bass, B. (1982). Team performance and productivity. In M.D. Dunnette & E.A. Fleishman (Eds.), Human performance and productivity: Vol 1. Human capability assessment (pp. 179-232). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Bouffard-Bouchard, T., Parent, S., & Larivee, S. (1991). Influence of self-efficacy on self-regulation and performance among junior and senior high-school age students. International Journal of Behavioral Development, 14, 153-164.

Feltz, D.L. & Lirgg, D.C. (1998). Perceived team and player efficacy in hockey. Journal of Applied Psychology, 83, 557-564.

Gibson, C.B. (1999). Do they do what they believe they can? Group efficacy and group effectiveness across tasks and cultures. Academy of Management Journal, 42, 138-152.

Gist, M.E. (1987). Self-eficacy: Implications for organizational behavior and human resource management. Academy of Management Review, 12, 472-485.

Gould, D., Weiss, M.R. & Weinberg, R.S. (1981). Psychological characteristics of successful and nonsuccessful big-ten wrestlers. Journal of Sports Psychology, 3, 69-81.

Gully, S.M., Beaubien, J.M., Incalcaterra, K.A., & Joshi, A. (2000, April). A meta-analytic investigation of the relationship between team efficacy, potency, and performance. Paper presented at the annual meeting of Society for Industrial and Organizational Psychologists, New Orleans, LA.

Gully, S.M., Joshi, A. & Incalcaterra, K.A. (2001, April). A meta-analytic investigation of the relationships among team-efficacy, self-efficacy, and performance. Paper presented at the annual meeting of Society for Industrial and Organizational Psychologists, San Diego, CA.

Hodges, L., & Carron, A. (1992). Collective efficacy and group performance. International Journal of Sport Psychology, 23, 48-59.

James, L.R. (1982). Aggregation bias in estimates of perceptual agreement. Journal of Applied Psychology, 67, 219-229.

Johnston, W.A. (1967) Individual performance and self-evaluation in a simulated team. Organizational Behavior and Human Performance, 2, 309-328.

Lichacz, F.M. & Partington, J.T. (1996). Collective efficacy and true performance. International Journal of Sport Psychology, 27, 146-158.

Little, B.L. & Madigan, R.M. (1997). The relationship between collective-efficacy and performance in manufacturing work teams. Small Group Research, 28, 517-534.

Mahoney, M.J. & Avenuer, M. (1977). Psychology of the elite athlete: An exploratory study. Cognitive Therapy and Research, 1, 135-141.

Prussia, G.E. & Kinicki, A.J. (1996). A motivational investigation of group effectiveness using social cognitive theory. Journal of Applied Psychology, 81, 187-198.

Riggs, M.L., Warka, J., Babasa, B., Betancourt, R. & Hooker, S. (1994). Development and validation of self-efficacy and outcome expectancy scales for job related applications. Educational and Psychological Measurement, 54, 793-802.

Seijts, G.H., Latham, G.P. & Whyte, G. (2000). Effect of self- and group efficacy on group performance in a mixed-motive situation. Human Performance, (3), 279-298.

Short, S.E. (2000). The effect of task type on the relationship between efficacy beliefs and team performance. Unpublished doctoral dissertation, University of North Dakota, North Dakota.

Shrout, P.E. & Fleiss, J.L (1979). Intraclass correlations: Uses in assessing rater reliability. Psychological Bulletin, 86(2), 420-428.

Silver, W.S. & Bufanio, K.M. (1996). The impact of group-efficacy and group goals on group task performance. Small Group Research, 27, 347-359.

Stajkovic, A.D., & Luthans, F. (1998). Toward an integrated model of work experience. Personnel Psychology, 51, 321-355.

Stajkovic, A.D., & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. Psychological Bulletin, 124, (2), 240-261.

Steiger, J.H. (1980). Tests for comparing elements of a correlation matrix. Psychological Bulletin, 87, 245-251.

Tesluk, P., Mathieu, J.E. & Zaccaro, S.J. (1997). Task and aggregation issues in the analysis and assessment of team performance. In M.T. Brannick, E. Salas, & C. Prince (Eds.), Team performance assessment and measurement (197-224). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Wood, R. & Bandura, A. (1989). Social cognitive theory of organizational management. Academy of Management Review, 14, 361-384.

Table 1

Means and Standard Deviations for Efficacy Scores, Performance and Actual Team Points Won Collapsed Across Matches

Team	Number of Matches	Player Efficacy		Team Efficacy		Individual Performance		Team Scratch Performance		Team Performance With Handicap		Points	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
1	14	6.18	.83	6.66	1.04	475.38	47.48	2461.64	99.19	3099.57	110.13	2.42	1.22
2	9	6.81	1.02	6.74	1.32	468.61	32.76	2438.00	109.01	3118.11	106.79	1.78	1.48
3	16	7.46	.85	7.99	.53	480.41	93.39	2425.56	231.63	3082.06	99.42	1.75	1.06
4	13	8.82	.40	8.93	.40	503.90	71.06	2295.92	107.67	3039.54	135.18	1.85	1.41
5	15	6.28	1.28	7.03	1.26	433.90	71.94	2129.00	83.41	3014.00	138.98	1.73	1.22
6	14	5.63	.88	5.77	.80	420.16	61.02	2140.29	135.73	3043.71	94.31	1.93	1.27
7	12	5.91	.54	6.62	.60	402.69	70.46	2099.17	126.10	3079.33	73.30	2.00	1.54

8	13	8.09	.68	8.27	.64	520.54	68.28	2428.38	93.97	3042.00	97.90	1.35	1.31
9	14	5.74	.94	6.14	1.03	397.59	50.34	1972.36	117.43	3046.64	117.32	1.86	1.46
10	16	7.97	1.07	8.82	.84	474.64	77.50	2357.56	174.29	3072.44	101.35	2.28	1.18
12	14	7.70	1.24	8.05	.93	399.91	72.93	2109.93	125.14	3067.14	129.30	1.86	1.23
13	14	7.92	1.20	8.61	.80	412.57	78.06	2118.00	115.81	3042.64	99.15	1.93	1.44
14	6	7.09	.70	7.48	.95	480.81	53.21	2376.50	96.93	3024.00	99.04	2.25	1.54
15	3	7.30	.75	8.40	.90	475.27	81.69	2152.00	150.64	3058.00	193.83	2.67	1.53
16	3	6.92	1.10	6.98	1.24	467.30	77.99	2406.67	39.25	3039.67	74.81	1.33	.58

Table 2

Correlation Matrix between Self-efficacy, Team Efficacy and Concurrent Performance

Variable	Mean	SD	1 SE	2 TE	3 TSS	4 THS	5 POINTS
(1) SE	7.06	1.35	1.00				
(2) TE	7.50	1.33	.88**	1.00			
(3) TSS	2251.00	205.84	.29**	.20**	1.00		
(4) THS	3059.00	110.03	.07	.03	.51**	1.00	
(5) POINTS	1.92	1.30	.10	.09	.29**	.54**	1.00

N=176

SE = Self-efficacy, TE = Team Efficacy, TSS = Team Scratch Score, THS = Team Handicap Score

* p<.05

** p<.01

Table 3

Correlation Matrix between Self-efficacy, Team Efficacy and Prior Performance

Variable	Mean	SD	1	2	3	4	5
(1) SE	7.13	1.31	1.00				
(2) TE	7.53	1.29	.88**	1.00			
(3) TSS	2249.00	210.54	.24**	.24**	1.00		
(4) THS	3052.00	110.56	.04	.06	.51**	1.00	
(5) POINTS	1.86	1.28	.02	.06	.30**	.55**	1.00

N=161

SE = Self-efficacy, TE = Team Efficacy, TSS = Team Scratch Score, THS = Team Handicap Score

* $p<.05$

** $p<.01$

Table 4

Correlation Matrix between Self-efficacy, Team Efficacy, Concurrent Individual Performance and Concurrent Team Performance

Variables	Mean	SD	1	2	3	4	5	6	7
(1) SE	7.02	2.07	1.00						
(2) TE	7.48	1.92	.84**	1.00					
(3) ISS	446.95	79.62	.41**	.26**	1.00				
(4) IHS	606.30	50.78	.13**	.08*	.59**	1.00			
(5) TSS	2229.00	191.54	.22**	.21**	.50**	.26**	1.00		
(6) THS	3056.00	102.41	.06	.04	.26**	.40**	.58**	1.00	
(7) POINTS	1.90	1.28	.08*	.09*	.16**	.25**	.32**	.57**	1.00

N = 608

SE = Self-efficacy, TE = Team Efficacy, ISS = Individual Scratch Score, IHS = Individual Handicap Score, TSS = Team Scratch Score, THS = Team Handicap Score

* p<.05

** p<.01

Table 5 – Results of Regressing Performance Measures on Self-Efficacy and Team Efficacy

	Dependent Variables							
	Self-Efficacy				Team Efficacy			
Independent Variables	R^2	F	Beta	t	R^2	F	Beta	t
	.19	27.61**			.09	12.57**		
ISS			.01	9.27**			.01	4.53**
IHS			-.01	-3.22**			-.00	-1.45
TSS			.00	.56			.00	2.70**
THS			-.00	-1.12			-.00	-2.43*
POINTS			.12	1.67			.16	2.23*

ISS = Individual Scratch Score, IHS = Individual Handicap Score, TSS = Team Scratch Score, THS = Team Handicap Score

N=609 for Self-Efficacy and N=608 for Team Efficacy

* $p<.05$

** $p<.01$

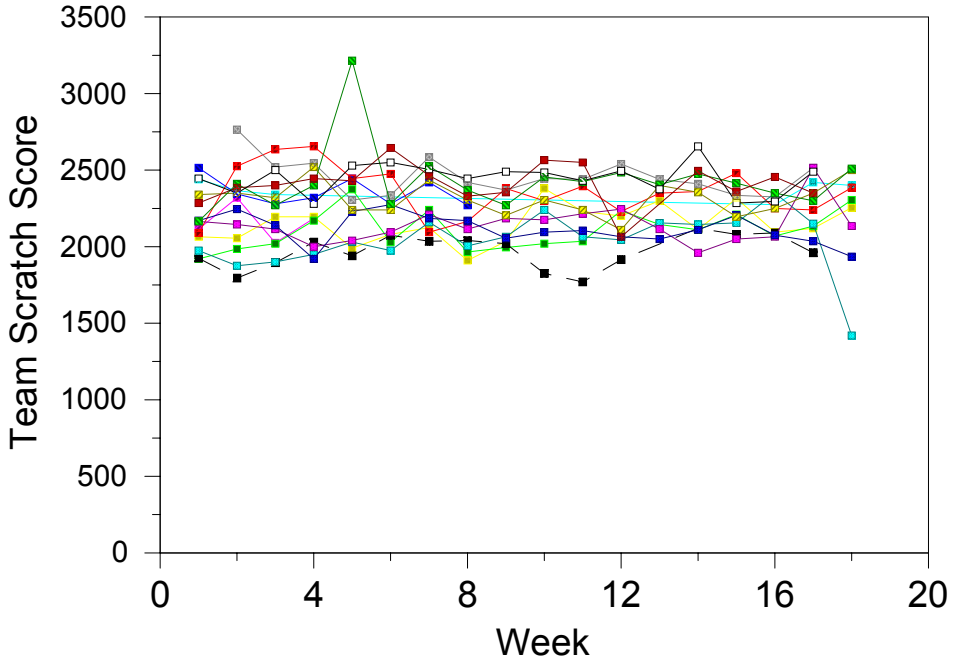

Figure 1. Team Scratch Scores Over Time

Appendix A

Team Confidence Bowling Survey

Team Number_____
Position Number_____

WEEK __
BOWLING CONFIDENCE SURVEY

Team Confidence

For the next 8 items, please rate your confidence in your TEAM'S ABILITY to perform against your upcoming opponent. Indicate your degree of confidence by circling the appropriate number to the right of each item.

	Cannot do at all				Moderately certain can do						Certain can do
1. Rate your confidence right now that your TEAM can BEAT your upcoming opponent team:	0	1	2	3	4	5	6	7	8	9	10
2. Rate your confidence right now that your TEAM can SCORE 1 point in tonight's league session:	0	1	2	3	4	5	6	7	8	9	10
3. Rate your confidence right now that your TEAM can SCORE 2 points in tonight's league session:	0	1	2	3	4	5	6	7	8	9	10
4. Rate your confidence right now that your TEAM can SCORE 3 points in tonight's league session:	0	1	2	3	4	5	6	7	8	9	10
5. Rate your confidence right now that your TEAM can SCORE 4 points in tonight's league session:	0	1	2	3	4	5	6	7	8	9	10
6. Rate your confidence right now your TEAM will MAINTAIN its league standing after tonight's game:	0	1	2	3	4	5	6	7	8	9	10
7. Rate your confidence right now your TEAM will INCREASE its league standing after tonight's game:	0	1	2	3	4	5	6	7	8	9	10

Appendix A (Continued)

8. Rate your confidence right now in your TEAM'S ability to BOUNCE BACK from performing poorly (come from behind, not give up) and be successful against your upcoming opponent team: 0 1 2 3 4 5 6 7 8 9 10

Appendix B

Personal Confidence Bowling Survey

Team Number_____
Position Number_____

WEEK __
BOWLING CONFIDENCE SURVEY

Personal Confidence

For the next 9 items, please rate your confidence in YOUR OWN ABILITY to perform against your upcoming opponent. Indicate your degree of confidence by circling the appropriate number to the right of each item.

	Cannot do at all				Moderately certain can do					Certain can do	
1. Rate your confidence right now that YOU can outperform your opponent with the closest average to yours:	0	1	2	3	4	5	6	7	8	9	10
2. Rate your confidence right now that YOU will bowl AT LEAST your AVERAGE in 1 game tonight:	0	1	2	3	4	5	6	7	8	9	10
3. Rate your confidence right now that YOU will bowl AT LEAST your AVERAGE in 2 games tonight:	0	1	2	3	4	5	6	7	8	9	10
4. Rate your confidence right now that YOU will bowl ATLEAST your AVERAGE in all 3 games tonight:	0	1	2	3	4	5	6	7	8	9	10
5. Rate your confidence right now that YOU can make up any POINTS MISSED by other team members tonight:	0	1	2	3	4	5	6	7	8	9	10
6. Rate your confidence right now that YOU will be able to score multiple, consecutive, STRIKES tonight:	0	1	2	3	4	5	6	7	8	9	10
7. Rate your confidence right now that YOU will be able to pick up every SPARE tonight:	0	1	2	3	4	5	6	7	8	9	10

Appendix B (Continued)

8. Rate your confidence right now that YOU will be able to pick up SPLITS tonight: 0 1 2 3 4 5 6 7 8 9 10

9. Rate your confidence right now that YOU can BOUNCE BACK from performing poorly (come from behind, not give up) and be successful against your upcoming opponent: 0 1 2 3 4 5 6 7 8 9 10