

THE OBSERVATION OF BEHAVIORAL PRINCIPLES IN BASEBALL PERFORMANCE

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ABSTRACT

Three studies were done to demonstrate that formalized sports can be used to test or observe the operation of psychological phenomena. Major league baseball was chosen as the representative sport, in part because of the completeness of its data record. In the first study, the notion that positive affective arousal enhances performance on certain tasks was tested with respect to a player's birthday, an event presumed to generate a positive affective state. Sixty-two major league baseball players, whose birthdays fell between April and October and who were active between 1970 and 1982, were selected from the Official Encyclopedia of Baseball (1982). Their performance on their birthdays were extracted from boxscores of games listed in the New York Times during the years stated. Finally, their batting performance on their birthdays was compared to their overall batting performance during the years in question. Results suggest a trend toward the existence of a birthday effect, however, this trend does not achieve statistical significance. The second study involved the application of territoriality theories to baseball. Numerous studies have demonstrated that teams playing on their home field win significantly more often than the visiting teams, an effect which is often marginally significant in baseball. Therefore, focusing on extraordinary physical feats, this study

attempted to determine whether and to what extent a relationship existed between no-hitters and home field setting. All no-hitters pitched since the turn of the century were examined to determine if such a relationship existed, using a chi-square goodness of fit test. Results suggest that territoriality does exist when using no-hitters as a measure of peak performance. The home field advantage seems to increase as the superiority of performance increases. The final study involved the extension of personality theories to baseball performance. Following a recent finding of an inverse relationship between pitching control and longevity, the present study attempted to determine if a similar relationship prevailed with respect to fielding performance and longevity. The lifetime fielding averages of 155 deceased former major league baseball players, who played a minimum of five years between 1920 and 1930, were correlated with their age at death. Results suggest that no such relationship exists. However, a trend toward a relationship between the lifetime fielding average and age at death of catchers was evident. It is possible that it is the consequences of one's mistakes that are related to longevity since pitchers and catchers are arguably the two most important players on a baseball team.

INTRODUCTION

For years, games and sporting events have been subjected to scientific analysis (e.g. Dickinson, 1977). The impetus for this approach owes much to the pioneering work of von Neumann and Morgenstern (1944), who in their now classic work, Theory of Games and Economic Behavior, applied game theory to economic problems. More recently, Bell and Coplans (1976) have introduced a method of using game theory as a decision-making process when faced with personal dilemmas. These and other writers have shown that the objective analysis of games and sporting events is a relatively common occurrence.

The notion of parallels between sports and life is, of course, not new, being expressed most recently in the title of a best-selling book by Boswell (1982) called "How Life Imitates the World Series". This thesis focuses on baseball as a game that reflects many aspects of everyday life and might, in keeping with the scientific approach, be used to investigate scientific, especially psychological, theories and principles.

While any sport may conceivably be used to test such theories, baseball is particularly convenient for a number of reasons. First, statistics for virtually every offensive and defensive aspect of the game are easily recorded and as a result can be objectively quantified. Second, since the data have been derived from an enormous sample size

obtained under uniform and readily defined circumstances, it follows that the data are extremely reliable. Thus, at least twelve teams have played a minimum of 150 nine-inning games per year since before the turn of the century. Finally, the majority of statistical measures in baseball are presented in the form of response probabilities and, as a result, are directly applicable to behavioral analysis (Goldstein, 1983).

Baseball has long been subjected to analysis in other realms of science, particularly in physics (Brancazio, 1984). For example, one question which puzzled people for years was why a curveball curved.

Recently, the evolutionary theory of extremes has been applied to baseball in an attempt to explain why major league baseball players no longer hit .400 (Gould, 1983). One aspect of contemporary evolutionary theory states that the appearance of a new species is characterized by extreme variability in physical and behavioral features. As the species evolves, as it is acted on by selection pressures, a gradual transition to a steady-state, with the extremes removed, occurs. Gould (1983) claims that baseball follows a similar evolutionary scenario and finds support for this in the disappearance of the extremely high (and extremely low) batting averages.

The idea of subjecting baseball statistics to behavioral analysis is not a novel one. Kopelman and Pantaleno (1977) tested their hypothesis that a

professional athlete who is traded tends to perform better against their former team than against other teams. The authors advanced two psychological explanations for this traded player syndrome: (a) separation from an attachment object leads to anger, hostility and aggression; and (b) being traded lowers or threatens the athlete's self-esteem which leads to counteraction, particularly against the disconfirming source. The data were derived from thirty traded professional baseball players over a three year period. Although support for the hypothesis was weak across the entire sample, some support was evident among players who (a) were traded for the first time, (b) had long tenure with the trading team, (c) were young, and (d) had high ability. When a player met two or more of the above criteria, somewhat stronger positive results were found.

In a similar fashion, Lord and Hohenfeld (1979) tested predictions based on equity theory in a naturally occurring experiment involving 23 major league baseball players who began the 1976 season without a contract. Equity theory (Adams, 1965; Goodman and Friedman, 1971) assumes that individuals rely on multiple social comparisons with others and self to gauge the fairness of job outcome to job input ratios. If inequity exists it produces tension that motivates an individual either to alter inputs, outcomes, or social referents to restore equity or to withdraw from the exchange in either actual or psychological terms. The

authors (Lord and Hohenfeld, 1979) hypothesized that due to changes in the reserve system, the players in question would perceive themselves as undercompensated relative to salient others; and due to substantial reductions in salary from the previous year, they would also perceive themselves as under compensated relative to self-referents from the previous year. Such perceptions should produce lower performance. This hypothesis was supported for performance as measured by batting average, home runs, and runs batted in but not for runs scored.

Another study which utilized baseball data to test a psychological theory was done by Bateman, Karwan and Kazee (1983). These authors attempted to determine if career transition to a new location and employment environment enhanced job performance. A sample of recently traded professional baseball players was chosen and assigned to one of four groups based on the following criteria. Each trade was classified as (a) occurring during the season or between seasons, and (b) being sent to a new team in the same league versus the other league. The dependent measures in each case were three offensive statistics: batting average (BA), home runs (HR) and runs batted in (RBI). The data were derived from performance for the half season prior to the trade and the half season following the trade.

Results indicated that players traded during the season showed a significant increase in performance when

compared to those traded between seasons. No significant differences were found when comparing same league versus other league trades. These results suggest that the increase in motivation will dissipate when players change teams during the off season. On the other hand, when the trade is during the season, no preparation can be made and the performance demands are immediate. This can be generalized to the work setting. That is, when a worker is given little notice of a change in career or work setting, production should increase more than if he has had plenty of time to prepare for the change.

The correlational nature of the data from the above studies makes it difficult to specify the existence of a causal relationship. It would seem, however, that baseball has provided a valid model for the illustration of the application of psychological principles to formalized sports by virtue of the fact that many deductive correlational studies have been done in the past (e.g. Lord and Hohenfeld, 1979). Such studies have been done using the natural quasi-experimental method of research in which the information is derived from standardized natural settings (Ray and Ravizza, 1981). Three separate studies will be conducted on this premise.

Study 1: Birthday Effect

It has been suggested that certain positive life

events have an appreciable effect on an individual's performance. For example, Young (1966, 1967) has demonstrated that positive affective arousal has an enhancing effect on the performance of certain tasks.

More recently, Isen and Means (1983) investigated the influence of positive affect on the decision-making process. Positive affect was induced in the participants by being given feedback that they had succeeded on a prior task of perceptual-motor skills. They determined that subjects experiencing positive affect made decisions more quickly than did control subjects. In their study, positive affect subjects were less likely to review information they had already perused and were more likely to ignore unimportant information. The authors interpreted the effect of positive affect on the task as an increase in efficiency.

In humans, birthdays have been conditioned to create positive affect by means of reinforcement through presents, attention, affection, etc. Based on these facts, it logically follows that a positive event such as a birthday would enhance performance on certain tasks, for example, hitting.

The first study examined whether a "birthday effect" exists; that is, do players perform better on their birthdays than on the average? Recently, James (1983) conducted a study on players whose birthday fell on a playing date during the 1982 regular season. He found the

overall birthday batting average of the players in this group to be .337. Because the average player in the major leagues bats far below this average, James concluded that there was, in fact, a significant birthday effect. In order to insure that his findings were not due to chance, James repeated this procedure for the 1980 season. While the results were not as dramatic (the overall birthday batting average for this group was .290), they suggested that the "birthday effect" did exist.

One major difficulty with James' (1983) study was that he compared the birthday batting average of his sample group with the mean batting average of every player in the major leagues. As a result, the comparisons made in the James study were inappropriate since he did not include a control group to determine if the effect was a function of month of birth. The present study corrected this problem by comparing the mean birthday batting average of the sample population with the mean yearly batting average of this same group. In this manner, each subject in this study acted as his own control.

The main purpose of this first study was to form an adequate control group in order to determine if there is a significant "birthday effect". A second purpose was to determine if this effect exists over an extended period of time. Therefore, this study examined a number of seasons. It was predicted that the players in the sample would hit for a significantly higher average on their birthdays than

over the course of a season.

Study 2: Territoriality

Territoriality can be viewed as "a set of behaviors an organism or group exhibits, based on perceived ownership of physical space (Bell, Fisher and Loomis, 1978, p.169)." In animals, territory is maintained for certain important functions such as food gathering, mating, rearing of young and controlling intraspecies aggression. Animals tend to actively defend territories when violations occur (Edney, 1976).

The second study investigated the effect of territoriality in sports. The concept of home field advantage is not limited to sporting events. Leary and Maroney (1962) demonstrated that a monkey's position of dominance was lowered when it was a guest in another cage. Psychotic patients were found to be more successful at influencing others when they were in their home territories than when they were elsewhere (Esser, 1970). Finally, Martindale (1971) reported that residents of a dormitory were more successful at negotiation tasks in their own territory than were visitors.

Numerous studies have investigated the phenomenon of territoriality or "home field advantage", as it applies to sporting events. The fact that sports teams playing in their home arena or on their home field win significantly

more often is well documented (Koppet, 1972). This has been found to be true for professional baseball, hockey, football and basketball as well as college basketball and football (Koppet, 1972; Lefebvre and Passer, 1974; Schwartz and Barsky, 1977). It has also been found that this effect is stronger in some sports, such as football and basketball, than in others such as baseball (Edwards, 1979).

Similarly, Edwards (1979) has pointed out several territoriality themes shared in animals behavior and in sporting events. First, there is the idea of a certain place where the organism carries out certain functions. In sports, this is the home arena or home field. Second, there is a personalization of this certain place by some sort of marking device. A sports arena is usually decorated with signs and banners clearly demonstrating which is the home team. Finally, there is the aspect of defense against intrusion. Edwards, however, did not want to go so far as to draw an analogy between the warning cries of animals and the chants of home town fans.

There are, of course, many dissimilarities between territoriality in animals and sporting events. For example, in sporting events, teams are invited to their opponent's territory. On the other hand, animals defend their territory against intruders.

The main purpose of this study was to determine if a relationship exists between home field advantage and the

peak performance of the individual athlete in a team sport. Edwards (1979) points out that the "home-field advantage" effect is stronger in sports such as football than it is in baseball. One possible explanation for this may be the fact that the football season consists of far fewer games than does baseball. As a result, the intensity of each football game may be at its peak, whereas it would be physiologically impossible to maintain peak intensity over a 162 game schedule, as is the case in major league baseball. The no-hitter, however, may be described as the peak performance of the baseball pitcher because; (1) it is a relatively rare event; and (2) it requires maximum control, concentration and efficiency on the part of the pitcher. As a result, this study attempted to determine if a significant number of the no-hitters pitched in major league baseball since the turn of the century have occurred on the home field of the pitcher who threw the no-hitter. A no-hitter occurs when, in the course of a game, the pitcher does not allow a member of the opposing team to reach base by virtue of a single, double, triple or home run.

While a no-hitter may be considered the peak performance of a pitcher, a perfect game may represent the ultimate peak performance of a pitcher. A pitcher is credited with a perfect game when he retires all 27 batters he faces in a nine inning game. It was predicted that a significant number of these no-hitters would have occurred on the home field of the pitcher who threw it. It was

further predicted that this effect would be even stronger for perfect games.

Study 3: Longevity

Many psychological theories suggest that the manner in which we live our lives is either a determinant of, or a correlate of, psychological well-being (e.g. Jenkins, Rosenman and Zyzanski, 1972). Further, the evidence of a relationship between psychological well-being and certain physical disorders is well documented (e.g. Weiner, Thaler, Reiser and Mirsky, 1957). Since one's physical well-being is a determinant of longevity, it is reasonable to believe that psychological well-being may affect longevity. For example, it has been demonstrated previously that certain behavioral patterns are an important determining factor in predicting heart attacks (e.g. Friedman and Rosenman, 1974).

Recently, Goldstein (1983) conducted a study in which the earned run average (ERA) and the ratio of base on balls to innings pitched (BB) of pitchers were correlated with their age at death. The ERA was taken as an indicator of the average number of runs per nine innings scored due to the pitcher's own "mistakes". The BB was taken as the pitcher's inability to control the trajectory of the ball. The purpose of the study was to determine if the control one exhibited in daily life activities affected longevity.

The measures above were the measures of control used in the study. Results indicated that ERA ($r=-.33, p<.0001$) and BB ($r=-.21, p<.006$) were significantly negatively correlated with longevity.

In a study of the psychological aspects of athletic competitors (Meyers, Cooke, Cullen and Liles, 1979), it was reported that the more skilled athletes "were better able to cope with competitive mistakes and were able to control and effectively utilized the anxiety produced by competition (p.366)". Therefore, competitive mistakes in the form of errors should interfere with the coping ability of the poorer players, who in turn make more errors, and these coping difficulties may extend to their daily living. In the long run, this may have a deleterious effect on the longevity of the player with the lower fielding average.

In a similar fashion, the third study attempted to determine if fielding ability is a correlate of longevity by correlating the fielding averages of a sample of players with their age at death. Based on the findings of Goldstein (1983) and Meyers et al. (1979), it was predicted that a significant positive correlation would exist between these variables.

METHOD

Study 1: Birthday Effect

For the first study, all major league baseball players for whom birthday batting data were available for a minimum of three years between 1970 and 1982 and whose birthdays fell between April and October were selected from the Baseball Encyclopedia (1982). This procedure produced a sample size of 62, presumably because players may be given the day off on their birthday. Following subject selection, data concerning the birthday performance of the subjects was collected from boxscores of games during the period in question. This entailed a microfilm search of the New York Times in which it was necessary to find the issue of the New York Times published the day after the birthday of each player in the sample. The data for the yearly batting average of each player was then obtained from the Sporting News Official Baseball Register (1983).

The yearly batting averages were compared to the birthday batting averages by several methods. First, the overall birthday batting average of all the players in the sample was compared to their corresponding overall yearly batting average. A paired t-test was conducted on these data to determine if the players in the sample hit for a significantly higher batting average on their birthdays than they did over the twelve year period. Second, the

players were grouped according to their lifetime batting average to determine if a certain calibre of hitter exhibited a significant "birthday effect". Finally, a chi-square analysis was conducted on the data to determine if a significant number of the players in the sample hit for a higher batting average on their birthdays than they did over the twelve year period.

Study 2: Territoriality

For the second study, all 170 no-hitters pitched since 1900 were analyzed to determine if a significant number of them occurred on the home field of the pitcher who threw the no-hitter. This information was derived from the Official Encyclopedia of Baseball (1982). The percentage of no-hitters pitched at home was determined and a chi-square goodness of fit test was done to determine if the number of no-hitters pitched at home was significant. It was planned to analyze the perfect games in the same manner. However, there have only been nine perfect games since 1900, a sample too small from which to derive meaningful statistics.

Study 3: Longevity

For the third study, all 155 deceased former major league baseball players who played a minimum of five years

between 1920 and 1930 were selected from the Official Encyclopedia of Baseball (1982). Each player's lifetime fielding average was then correlated with their age at death using Pearson product moment correlations. Unfortunately, since lifetime fielding performances are not presently available in published form, the necessary data were obtained by averaging yearly performances of each member of the sample population. This was done by going through team fielding statistics year by year for each player in the sample, totaling their fielding percentages, and dividing these totals by the number of years for which the percentages were available. This provided a rough estimate of each player's lifetime fielding average.

RESULTS

Study 1: Birthday Effect

A paired t-test was conducted on the mean birthday batting average and the mean yearly batting average of all the players in the sample. This was done in order to determine if the players in the sample hit for a significantly higher batting average on games played on their birthdays than they did over the selected twelve year period. The mean birthday batting average for all the players was .293 (standard deviation=.100) while their mean yearly batting average was .273 (standard deviation=.022). While this may suggest that a birthday effect does exist, the results were not significant ($t=1.55$, 61 df, $p<.125$).

Paired t-tests were performed on the yearly and birthday batting averages when the yearly averages were broken down into groups of thirty batting average points. The reason for this was to determine if a birthday effect existed as a function of hitting ability. That is, is there a stronger birthday effect for a certain calibre of hitter? The groups were broken down in the following manner. The players with yearly batting averages between .200 and .229 were grouped together and arbitrarily labeled poor hitters. Similarly, players with yearly batting averages between .230 and .259 were labeled average hitters. Players with yearly batting averages between .260 and .289 and those

hitting .290 or better were labeled good and excellent hitters, respectively.

The t-tests were performed on the mean birthday batting average and the mean yearly batting average of each group. Figure 1 shows the graphic relationship between the two variables while Table 1 shows the results of the analyses. No significant differences were found within any of these groups. The difference between the mean batting averages for the poor hitters was 165 batting average points. However, one must take into consideration the small sample size for this group. Future study in this area may determine if such a large difference between the mean batting averages existed for this particular calibre of hitter if a larger sample size were used (see Figure 1).

A final analysis was done to determine if a significant number of the players in the study performed better on their birthdays than they did over the specified twelve year period. Batting average was again used as the measure of performance. A chi-square analysis produced no significant results ($\chi^2=1.862, 1 \text{ df, n.s.}$). The same held true when the players were grouped according to their yearly batting average (see Table 2). However, the number of players who hit for higher batting averages on their birthdays than over the twelve year period is higher in each case.

Study 2: Territoriality

Since the turn of the century, 170 no-hitters have been pitched in the major leagues. Of these, 115 or 68 percent were pitched on the home field of the pitchers who threw them. A chi-square goodness of fit test indicated that a significant number of the no-hitters were pitched on the pitcher's home field ($\chi^2=21.16$, 1 df, $p<.001$). Nine of the no-hitters pitched since 1900 were perfect games. Of these, seven or 78 percent were pitched on the home field of the pitcher who threw them.

Study 3:Longevity

A Pearson product-moment correlation between the lifetime fielding average and age at death of all the players in the sample are shown in Table 3. No significant effects emerged. Since the amount and degree of difficulty of fielding chances varies from position to position, it was deemed necessary that the players in the sample be broken down according to their position. These groups were chosen based on the similarity of fielding chances they receive. Second basemen, shortstops and third basemen made up one group. Outfielders, catchers and first basemen respectively made up the other three groups. Pitchers were not included in the sample because they are not everyday players and generally have far fewer fielding chances than any other position during the course of a season. When broken down by position, correlations between

these two variables were again not significant. However, one interesting finding from the analysis was that the correlation between age at death and lifetime fielding average for catchers approached significance (see Table 3).

DISCUSSION

Study 1: Birthday Effect

This study explored three areas in which behavioral principles may be observed in baseball performance. The first area was an attempt to determine if a birthday effect exists, in which major league baseball players perform significantly better on their birthdays than over the course of their careers.

While the results of the present study suggest that there is a trend toward a birthday effect, there is not sufficient statistical evidence to warrant such a conclusion. When the players were grouped according to their yearly batting averages, the results were again not significant. However, the mean birthday batting average was higher than the mean yearly batting average in all cases. Furthermore, the number of players who performed better on their birthdays was not significant. This also held true when the players were grouped according to their yearly batting average. In each case, however, the number of players who performed better was higher than the number of those who did not.

There was a 20 point differential between the mean birthday batting average and the mean yearly batting average of the sample. If a baseball manager had to choose between two players of equal ability and it were one of the

player's birthday, he may get a better performance from the player on whose birthday the game falls.

When James (1984) repeated his birthday study for the 1983 season, the results were far from impressive. The birthday batting average of all players whose birthday fell on the day of a game during the 1983 season was .252. Furthermore, when the performances of pitchers who pitched on their birthdays were analyzed for the 1983 season, the results suggested a quite different relationship. For the most part, these pitchers performed quite poorly, compiling a 4-11 win-loss record with an earned run average of 4.22. Again, however, James neglected to include a control group.

These findings raise a question for future study. Based on the inconsistencies in James' studies using batting average as a measure of a birthday effect, it would be interesting to determine if the birthday effect exists for pitchers. While the data from James' (1984) study would lead one to believe that it does not, one must remember that the data was extracted from a single season. The question is, would a birthday effect for pitchers show up if data were collected over a number of seasons?

The work of LoLordo and his associates (LoLordo, 1971; LoLordo, McMillan and Riley, 1974) offer a possible explanation for James' (1984) results. They found that stimuli associated with positive reinforcers enhanced appetitively motivated behaviors and disrupted avoidant

behaviors. Conversely, stimuli associated with aversive conditions enhanced avoidant behaviors and disrupted appetitively motivated behaviors. If one were to generalize these findings to baseball, pitching may be seen as defensive or avoidant behavior. The pitcher attempts to avoid giving up hits. On the other hand, hitting may be seen as offensive or appetitively motivated behavior since the batter is trying to reach base with the ultimate goal of scoring runs.

Study 2: Territoriality

The second study was to determine if territoriality or home-field advantage affected the peak performance of an individual athlete. Using the no-hitter as the measure of peak performance of a pitcher, a highly significant territoriality effect or home-field advantage was found. The results indicate that more than two-thirds of all no-hitters pitched in the major leagues since the turn of the century were pitched on the pitcher's home field.

Two findings make these results more impressive. First, baseball was found to have a much less significant home-field advantage than other sports such as football and basketball. Second, based on certain statistics, the home-field advantage appears to be primarily the result of offensive factors which lead to scoring points rather than defensive factors such as preventing the opposition from

scoring. However, this finding is somewhat tenuous because it is often difficult to separate the impact of offensive and defensive factors. As a result, the home-field advantage may be the result of a combination of the enhancement of the home team's offense and a breakdown of the opposition's defense (Edwards, 1979).

It was stated previously that one possible explanation for the lessened home-field advantage in baseball was the length of the season. That is, it is physically impossible to maintain peak intensity and performance over a 162 game schedule played in a period of just six months. However, pitchers, unlike other players, are not required to perform day after day. The usual practise is for pitchers to have four days rest between appearances. This may allow him to return to the intensity levels of the previous performance.

According to David Kauss (1980), there are two main factors which contribute to the difficulties of playing away from home. These are unfamiliarity with the suuroundings and hostility from the opponents and their fans. Since the home team simultaneously benefits from familiarity with their home field or arena and fan support, the home-field advantage is magnified. Of these two factors, Kauss states that unfamiliarity plays the greatest role in the problems of playing on the road.

He outlined three sources of unfamiliarity. The first pertains to the physical facilities the visiting athletes

are playing in. The athletes must adjust to factors such as lighting, temperature, terrain, architectural features and so on. The second source is the various distractions of being in an unfamiliar setting. The different sights and sounds of the opponent's home field can affect the visiting athlete. Finally, there are breaks in the visiting athlete's preparation for competition. The athlete must contend with such things as finding a comfortable place to mentally prepare for the game. All of these things can affect performance, especially when attempting complex, highly skilled behaviors such as pitching and hitting.

Considering that pitching requires a great deal of attention and concentration, these distractions can adversely affect the performance of the visiting pitcher. On the other hand, the pitcher pitching on his home field does not have to contend with these things. This, coupled with the fact that the home team pitcher is familiar with his surroundings allows him to concentrate and the support provided by the fans motivates him to excel. The importance of attention may also account for the well-known ritual of teammates not talking to pitchers who are working on no-hitters during the latter stages of a game.

The fact that 78 percent of perfect games were pitched at home suggests that this home field advantage is stronger yet for them than it is for no-hitters. However, the sample size makes it difficult to determine the statistical significance of the effect. The nature of this study makes

it impossible to manipulate the data and at the rate that perfect games have been pitched since the turn of the century, it may be another 80 years before the number of perfect games doubles to a figure of eighteen. The perfect game appears to be the best measure of peak performance of a pitcher to date. The ultimate perfect game would be when the pitcher strikes out every batter he faces. However, this has never been done but if it were, the results of this study suggest that it would probably be done on the home field of the pitcher who throws it.

Study 3: Longevity

The results suggest that no correlation exists between lifetime fielding average and longevity as measured by age at death. One possible explanation for lifetime fielding average not being a correlate of longevity while both earned run average and the ratio of base on balls to strikeouts are is that a pitching mistake often has more impact on game results than a fielding mistake. Hence, more pressure is placed upon a pitcher than a fielder to perform to perfection. For example, a pitcher may give up a three-run home run which costs his team the game. It is not often that a player makes a three run error or an error that allows the game-winning run to score. Further, errors by fielders place additional pressures on pitchers to perform.

It was interesting to note that the correlation between lifetime fielding average and age at death approached significance for catchers. The reason may be that both pitchers and catchers have the most direct involvement in the management and control of the game. One often hears the catcher referred to as the "field general". He is the only player who can see every other player on the field. Furthermore, it is the catcher who handles each pitch from the pitcher and he is usually the one who decides on the location and type of each pitch. Thus, perhaps the pressure on a catcher to perform to perfection is greater than all the other players on the field except the pitcher.

This trend lends tentative support to the work of J.V. Brady and his associates (1958). They found that when a monkey was able to control the occurrence of electric shock for both himself and a second monkey, the first monkey developed severe gastric ulcers. Brady referred to the first monkey as the "executive monkey", since the pressure and responsibility of the welfare of the second monkey rested with him. The ulcers were so severe that, if the monkey continued on in the experiment, the ulcers killed him. This "executive ulcer syndrome" is believed to hold true for people in responsible, high-level positions. It should be noted that Brady et al.'s conclusions have been challenged in subsequent experiments (Weiss, 1971a; 1971b; 1971c).

Conclusions

This study attempted to demonstrate that certain behavioral principles may be observed in formalized sports. The sport chosen for this study was baseball primarily due to the availability and standardization of the data. Three studies were done in the attempt to demonstrate baseball's effectiveness in this regard.

The first study failed to support the notion that a birthday effect exists in which major league baseball players hit for a higher batting average on their birthdays than over the course of a twelve year period, as was expected from Young's (1967) theory that positive affective arousal enhances performance on certain tasks.

The second study suggests that a territoriality effect or home-field advantage applies to the peak performance of an individual athlete in a team sport. More than two-thirds of the no-hitters pitched in the major leagues since the turn of the century occurred on the home field of the pitchers who threw them. These results lend support to the theories of territoriality as they apply to sporting events (Edwards, 1979).

Finally, an attempt was made to correlate fielding average as a measure of competence and coping ability with longevity. The results show no such relationship. Therefore, they do not support the contention of Meyers et al. (1979) that higher skilled athletes cope better with

competitive mistakes. However, it is possible that fielding average was not a good measure of competence and coping ability since Goldstein's (1983) findings suggest a relationship between longevity and several pitching statistics. It may also be that one's "mistakes" correlate with longevity only when those mistakes are critical in nature.

The results of the study on longevity and the study on the birthday effect are somewhat inconclusive. On the other hand, the territoriality study demonstrated a clear relationship between home-field advantage and the peak performance of an individual athlete as measured by the no-hitter. Future studies in this area which exert more control over other variables may provide more conclusive evidence for or against these results. However, this study appears to have achieved its primary goal, that is, to demonstrate that certain behavioral principles may be observed in baseball performance.

REFERENCES

- Adams, J. Stacy. Inequity in social exchange. In L. Berkowitz (Ed.), ADVANCES IN EXPERIMENTAL SOCIAL PSYCHOLOGY (VOL. 2). New York: Academic Press, 1965.
- Bateman, Thomas S., Karwan, Kirk R. and Kazez, Thomas A. Getting a fresh start: A natural quasi-experimental test of the performance effects of moving to a new job. JOURNAL OF APPLIED PSYCHOLOGY, 1983, 68(3), 517-524.
- Bell, P.A., Fisher, J.D. and Loomis, R.J. ENVIRONMENTAL PSYCHOLOGY. Toronto: W.B. Saunders Co., 1978.
- Bell, Robert and Coplans, John. DECISIONS, DECISIONS: GAME THEORY AND YOU. New York: W.W. Norton and Co., Inc., 1976.
- Boswell, Thomas. HOW LIFE IMITATES THE WORLD SERIES: AN INQUIRY INTO THE GAME. New York: Doubleday, 1982.
- Brady, J.V., Porter, R.W., Conrad, D.G. and Mason, J.W. Avoidance behavior and the development of gastroduodenal ulcers. JOURNAL OF THE EXPERIMENTAL ANALYSIS OF BEHAVIOR, 1958, 1, 69-73.
- Brancazio, Peter J. SPORTSCIENCE New York: Simon and Schuster, Inc., 1984.
- Dickinson, John. A BEHAVIOURAL ANALYSIS OF SPORT. Princeton, N.J.: Princeton Book Co., 1977.
- Edney, J.J. Human territories: Comment on functional properties. ENVIRONMENT AND BEHAVIOR, 1976, 8, 31-48.
- Edwards, John. The home field advantage. In J.H. Goldstein

(Ed.), SPORTS, GAMES AND PLAY: SOCIAL AND PSYCHOLOGICAL VIEWPOINTS. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1979.

Esser, A.H. Interactional hierarchy and power structure on a psychiatric ward. In S.J. Hutt and C. Hutt (Eds.), BEHAVIOR STUDIES IN PSYCHIATRY. New York: Oxford University Press, 1970, p.25-29.

Friedman, M. and Rosenman, R.H. TYPE A BEHAVIOR AND YOUR HEART. New York: Knopf, 1974.

Goldstein, S.R. Performance correlates of longevity in baseball pitchers. Paper presented to International Society for Sports Sociology, Paris, France, July, 1983.

Goodman, P.S. and Friedman, A. An examination of Adams' theory of inequity. ADMINISTRATIVE SCIENCE QUARTERLY, 1971, 16, 271-288.

Gould, S.J. Losing the edge: The extinction of the .400 hitter. VANITY FAIR, 1983, 46, 120.

Isen, Alice M. and Means, Barbara. The influence of positive affect on decision-making strategy. SOCIAL COGNITION, 1983, 2(1), 18-31.

James, Bill. THE BILL JAMES BASEBALL ABSTRACT, 1983. New York: Ballantine, 1983.

James, Bill. THE BILL JAMES BASEBALL ABSTRACT, 1984. New York: Ballantine, 1984.

Jenkins, C.D., Rosenman, R.H. and Zyzanski, S.J. THE JENKINS ACTIVITY SURVEY FOR HEALTH PREDICTION. Boston: Authors, 1972.

- Kauss, David R. PEAK PERFORMANCE. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1980.
- Kopelman, R.E. and Pantaleno, J.J. Rejection, motivation and athletic performance: Is there a traded player syndrome? PERCEPTUAL AND MOTOR SKILLS, 1977, 45, 827-834.
- Koppet, L. Home court: Winning edge. New York Times, January 9, 1972.
- Leary, R.W. and Maroney, R.J. The effects of home-cage environments in monkeys. JOURNAL OF COMPARATIVE AND PHYSIOLOGICAL PSYCHOLOGY, 1962, 55, 256-259.
- Lefebvre, L.M. and Passer, M.W. The effects of game location and importance on aggression in team sport. INTERNATIONAL JOURNAL OF SPORTS PSYCHOLOGY, 1974, 5, 102-110.
- LoLordo, Vincent M. Facilitation of food-reinforced responding by a signal for response-independent food. JOURNAL OF THE EXPERIMENTAL ANALYSIS OF BEHAVIOR, 1971, 15, 49-55.
- LoLordo, Vincent M., McMillan, John C. and Riley, Anthony L. The effects upon food-reinforced pecking and treadle-pressing of auditory and visual signals for response-independent food. LEARNING AND MOTIVATION, 1974, 5, 24-41.
- Lord, R.G. and Hohenfeld, J.A. Longitudinal field assessment of equity effects on the performance of major league baseball players. JOURNAL OF APPLIED PSYCHOLOGY, 1979, 64, 19-26.
- Martindale, D.A. Territorial dominance behavior in dyadic verbal interactions. PROCEEDINGS OF THE ANNUAL CONVENTION OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION, 1971, 6, 305-306.

- Meyers, A.W., Cooke, C.J., Cullen, J. and Liles, C. Psychological aspects of athletic competitors: A replication across sports. COGNITIVE THERAPY AND RESEARCH, 1979, 3, 361-366.
- THE OFFICIAL ENCYCLOPEDIA OF BASEBALL. New York: MacMillan, 1982.
- Ray, William and Ravizza, Richard. METHODS TOWARD A SCIENCE OF BEHAVIOR AND EXPERIENCE. Belmont, Ca.: Wadsworth, 1981.
- Schwartz, B. and Barsky, S.F. The home advantage. SOCIAL FORCES, 1977, 55, 641-661.
- THE SPORTING NEWS OFFICIAL BASEBALL REGISTER. St Louis: The Sporting News, 1983.
- von Neumann, J. and Morgenstern, O. THEORY OF GAMES AND ECONOMIC BEHAVIOR. Princeton, N.J.: Princeton University Press, 1944.
- Weiner, H., Thaler, M., Reiser, M.F. and Mirsky, I.A. Etiology of duodenal ulcers: Relation of specific psychological characteristics to rate of gastric secretion (serum pepsinogen). PSYCHOSOMATIC MEDICINE, 1957, 19, 1-10.
- Weiss, J.M. Effects of coping behavior in different warning signal conditions on stress pathology in rats. JOURNAL OF COMPARATIVE AND PHYSIOLOGICAL PSYCHOLOGY, 1971a, 77, 1-13.
- Weiss, J.M. Effects of coping behavior with and without a feedback signal on stress pathology in rats. JOURNAL OF COMPARATIVE AND PHYSIOLOGICAL PSYCHOLOGY, 1971b, 77, 22-30.

Weiss, J.M. Effects of punishing the coping response (conflict) on stress pathology in rats. JOURNAL OF COMPARATIVE AND PHYSIOLOGICAL PSYCHOLOGY, 1971c, 77, 14-21.

Young, P.T. Hedonic organization and regulation of behavior. PSYCHOLOGICAL REVIEW, 1966, 73(1), 59-86.

Young, P.T. Affective arousal: Some implications. AMERICAN PSYCHOLOGIST, 1967, 22, 32-40.

Calibre of hitter	Mean bday batting avg.	Mean yrly batting avg.	N of cases	Diff. (mean)	T value	Degrees of freedom	2-tail prob.
Poor .200-.229	.3885	.2235	2	.1650	2.75	1	.222
Average .230-.259	.2544	.2499	14	.0045	0.12	13	.907
Good .260-.289	.2914	.2751	35	.0163	1.15	34	.260
Excellent >.289	.3299	.3064	11	.0235	1.06	10	.314

Table 1. Birthday effect as a function of hitting ability.

Calibre of hitter	N of players Bday avg > Yrly avg	N of players Bday avg < Yrly avg	χ^2	Level of significance
Poor .200-.229	2	0	2.00	n.s.
Average .230-.259	8	6	0.29	n.s.
Good .260-.289	19	16	0.26	n.s.
Excellent >.289	8	3	2.27	n.s.

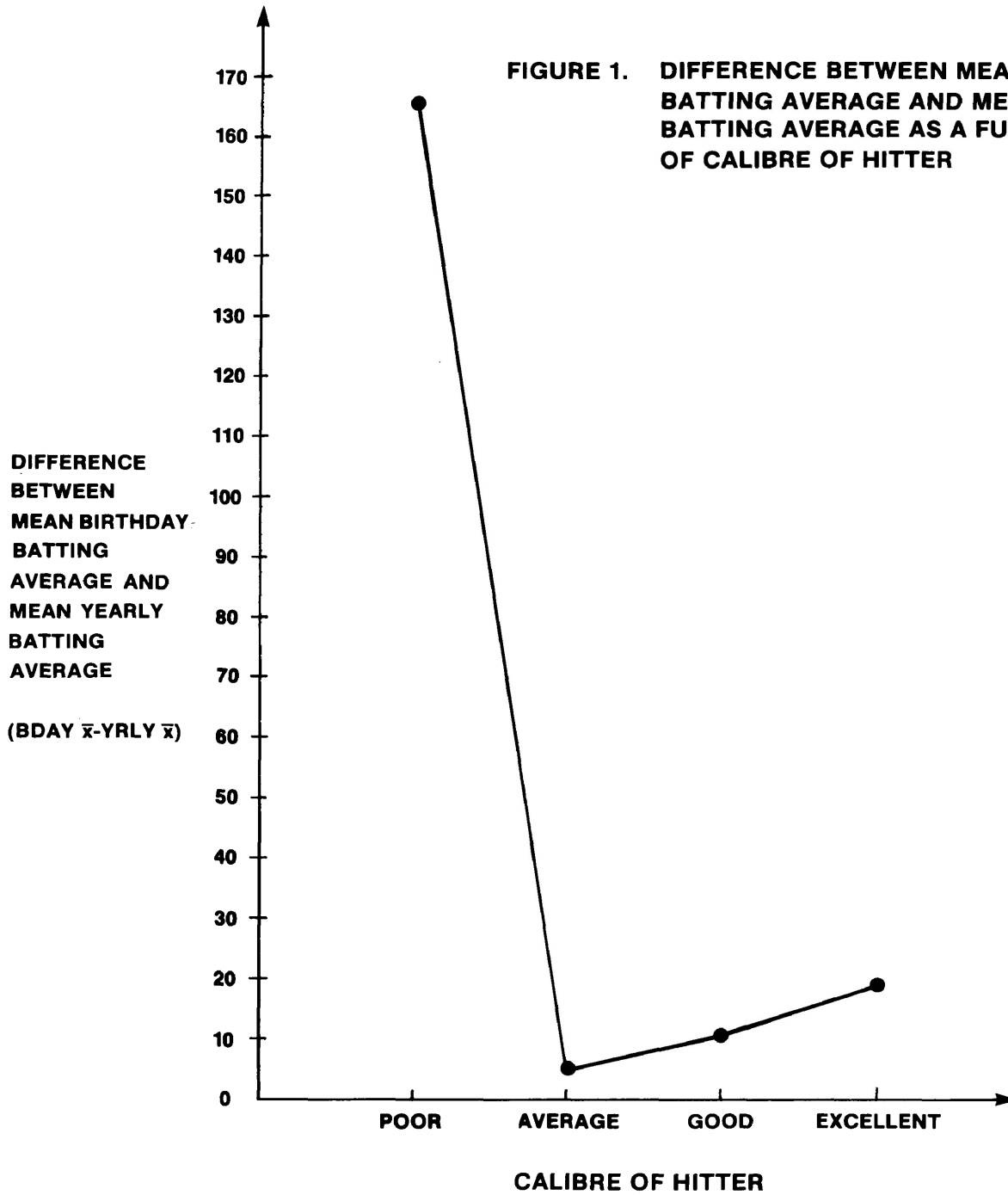
Table 2. Number of players hitting above and below mean yearly batting average as a function of hitting ability.

Group	r age at death and fielding avg	N of cases	p value	Mean age at death	Mean fielding avg.
All	.0457	155	.286	64.5	.9667
Pos 1	.0009	54	.498	66.6	.9569
Pos 2	.1417	57	.146	66.3	.9654
Pos 3	.2395	15	.195	64.7	.9878
Pos 4	.2626	29	.084	67.5	.9764

Table 3. Correlation coefficients of age at death and fielding average for the entire sample and broken down by position.

Pos 1- Second basemen, shortstops and third basemen.
 Pos 2- Outfielders
 Pos 3- First basemen
 Pos 4- Catchers

FIGURE 1. DIFFERENCE BETWEEN MEAN BIRTHDAY BATTING AVERAGE AND MEAN YEARLY BATTING AVERAGE AS A FUNCTION OF CALIBRE OF HITTER



POOR	.200-229	N = 2
AVERAGE	.230-259	N = 14
GOOD	.260-289	N = 35
EXCELLENT	$\geq .290$	N = 11