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The Psychology of Baseball: How the Mental Game Impacts the Physical Game

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The Psychology of Baseball:

How the Mental Game Impacts the Physical Game

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ABSTRACT

The purpose of this study was to find whether or not sports psychology can be effective. Baseball was chosen as the sport for the study because baseball can be analyzed for nearly every single factor of the game, with the exception of the mental readiness or state of the player when he steps onto the field. It therefore provides the optimal atmosphere to provide clinical and statistical support to the field of sports psychology. Despite the various, numerous pieces of literature that praise and show support for sports psychology, there hasn't been clinical research to support it. Additionally, multiple sports psychologists that work with baseball teams, including Harvey Dorfman and Ken Ravizza, have said that the greatest baseball players are the ones who work on their mental conditioning. Charlie Maher, a sports psychologist for the Indians, said "The focus of sports psychology in baseball is much more on performance, on development and improvement." (Lemire) Concluding from those expert opinions, this study could be particularly useful for the sport of baseball. The book The Inner Game of Tennis by W. Timothy Gallwey was chosen as the book of implementation because of its relative brevity and reading level, which would be useful for the student-athletes because of their busy schedules and time commitments, as well as its renowned ability, sworn on by people like Pete Carroll, Lawrence Jackson, Jimmy Rollins, to name a few. The book provided a simple way to implement sports psychology on the participants. It is important to note that the author emphasizes that reading the book and following its practices doesn't mean that an individual's wins will improve, but rather their overall performance and ability. The hope of this study was to show substantial statistical evidence in favor of sports psychology, so that its implementation and use could be backed by physical science and numbers.

LITERATURE REVIEW

Is there any support for studying psychology in the game of baseball?

Following The Inner Game of Tennis, there is support for sports psychology in all sports. For baseball, a book was written called The Psychology of Baseball: Inside the Mental Game of the Major League Player by Mike Stadler. Stadler is an Associate Professor of Psychology at the University of Missouri, where he specializes in cognitive psychology. His passion for baseball has led him to connect his field of study to the sport of his dreams.

The majority of Stadler's book is about the physics of the game and how psychology affects them. In his introduction, he states the support for sports psychology in baseball, saying, "Baseball is impossible without psychology: impossible to play, and impossible to appreciate fully as a fan" (Stadler, 2008). His main argument or thesis seems to be, "We are intrigued and amazed by the physical constraints on the game... And then there is the mental game... Psychology mediates between the demands imposed by the physics of the game and the capabilities afforded by the athletic ability of those who play it" (Stadler, 2008). To summarize, and what seems to be the full, final support of psychology in baseball, he says, "...psychology can probe more thoroughly the minds of the best players to understand what makes them the best of the best. And because of this research... psychology can help answer some of the questions that baseball fanatics have debated endlessly... psychology is now in a position to dispel some of baseball's most entrenched myths" (Stadler, 2008).

Therefore, it is easy to conclude that studying psychology in the game of baseball is more than supported; it is encouraged. If a cognitive psychologist is encouraging the use of psychology in baseball, then it is hard to contradict.

The book itself, The Psychology of Baseball, has support from multiple psychological and baseball journals and blogs alike. The Association for Psychological Science, the Association for Natural Psychology, and The Hardball Times (a daily baseball newspaper website), among others, have all written

about it. According to the Association for Psychological Science, plenty of psychologists and behavioral scientists have been trying to understand and break down the game of baseball from a scientific perspective. The Association for Psychological Science cites a study from 1921 done by psychologists that tested reaction times. Babe Ruth participated in the study and outperformed the majority of the population (approximately 98%) in reactions to sound, reactions to visual signals, hand-eye coordination, and perception of information. Recently, Albert Pujols underwent a similar set of tests and had similar results to those of Ruth. Psychologists, however, haven't been able to determine any causal relationship between these psychological results and success in baseball (Herbert). The organization states that Stadler follows a set-point theory, which means that a person is born with a certain array of talent and can achieve the top of it through work and practice. Stadler's work in the book is appreciated by The Hardball Times. They write that his book brings topics long ignored by baseball analysts to light, and that they hope it propagates conversation on the importance of cognitive psychology in baseball. Also, as a baseball newspaper, they appreciate that it's a baseball book that utilizes psychology, instead of the other way around. Overall, Stadler and his book have strong support from many sources.

What is the reach of the book The Inner Game of Tennis?

Athletes and professionals of all sorts have to perform. Performance in a game isn't much different from performance in an operating room or on a stage – all require the type of performance discussed in The Inner Game. The book is used and applicable to more than just tennis players; professional athletes, actresses, coaches, and more swear by the book. Pete Carroll, head coach of the Seattle Seahawks and former head coach at the University of Southern California, has been using the book since his time at USC to improve not only his skills as a coach but also those of his players. He gave the book to several of his USC players, all of whom later were drafted into the National Football League. Similarly, former Philadelphia Phillies second baseman Jimmy Rollins read the book in the 2006 offseason after watching Gallwey get interviewed on TV, and the next year he won the National League Most Valuable Player award. The next year in the World Series, he went 0-for-10 in the first two games,

so he went back to refer to the book. He went 5-for-9 in the following two games, scored four runs, and won the World Series. In an entirely different field of work, an acting coach named Susan Batson, with clients such as Nicole Kidman, uses the book in her work as well and calls it “an essential guide” for her clients. She is not alone in her distribution of the book, either. Al Gore gave the book to members of his Senate campaign in 1984 (Buzzfeed). In conclusion, the book, although written for tennis, has a much further reach than that sport alone. Its presented theory and practice are adaptable to performance in many fields.

What are psychological aspects that get in the way of an athlete’s performance?

Regarding performance, Gallwey discusses the ego-self and overthinking as being the combined source of the obstacle in the way of best performance (NOTE: *best* performance is not the same as *perfect* performance). The ego-self, also known as Self 1, is what causes overthinking. It wants to force the performance and it wants specific actions. When it thinks too much about what it wants, it forces the body to get tight. When the body gets tight, performance is inhibited, and one cannot perform to their best level. Mistakes happen and Self 1, since it has so much ego, blames Self 2, the inherent and natural talent, for its mistakes. Gallwey says, “By thinking too much and trying too hard, Self 1 has produced tension and muscle conflict in the body. He is responsible for the error, but he heaps the blame on Self 2 and then, by condemning it further, undermines his own confidence in Self 2” (Gallwey, 1997) When this happens, it creates a never-ending of error, where Self 1 wants a specific action, so Self 1 overthinks the effort and what it takes to make such desired action to occur, so Self 1 causes the body to get tight, so Self 2 is inhibited by the tightness caused by Self 1, so errors and mistakes occur, so Self 1 blames Self 2, so the natural talent inherent to Self 2 is despised by Self 1, and the cycles recurs. This overthinking behavior is common in baseball as well. In a 1984 study by a professor at Florida State, it was found that if you put a baseball player in a situation in which he has outside pressure, such as a clutch situation, he is abnormally self-focused, also known as he tries too hard (Herbert). It is crucial, therefore, for a baseball player to perfect his inner game so that he does not think too hard in high-pressure situations.

What are psychological aspects that are part of a baseball player's performance?

Gallwey's evaluation of Self 1 and Self 2 are extremely pertinent to baseball players as well. However, there are more psychological aspects within the game of baseball that are important to a player's performance. Stadler talks frequently throughout his book about the physics of baseball as well as the personalities of baseball players. These are two very important psychological factors specific to baseball players that affect the quality of performance.

Regarding the physics of baseball, Stadler discusses three main areas: hitting, catching, and pitching. He states, "As Ted Williams famously said, 'Hitting a baseball – I've said it a thousand times – is the single most difficult thing to do in sport'" (Stadler, 2008). According to Stadler, in the Major League Baseball organization, pitches travel so fast that in order for a batter to make any contact with the ball, he must actually start his swing before the ball even leaves the hand of the pitcher. Additionally, the batter loses sight of the ball during a short intermediate part of its flight to the plate due to limits of tracking ability (i.e. blind spots in vision). Therefore, the batter must make multiple decisions before and during his swing. First of all, he has to decide if he will even swing at the ball. Since he has to start his swing before the pitcher releases the ball, he has to predict what type of pitch will be thrown, where it will be thrown, how fast it will be thrown, etc. If he decides to swing, he has to follow the ball as closely as possible during its flight toward the plate. Since he loses the ball at some point during its travel when it goes through his blind spot, he has to guess where the ball is, where it is going, and how fast it is going so that he can ensure his swing follows through to the correct spot where the ball will be. The average batter must decide all of this in less than half a second, which is the time it takes for a 90mph pitch to make it to the plate. The batter's perception of the ball is also extremely important as well when it comes to swinging. Baseball players have a tendency to believe that fastballs rise. In fact, this is physically impossible. It is very real, however, for the batter. Due to the brief intermittent period when he loses the ball in his blind spot, the ball seems to rise when it returns into his field of vision very close to home plate. Therefore, being psychologically strong is important to the success of a baseball batter.

When it comes to fielding, i.e. catching, Stadler discusses two main theories of how fielders catch the ball. The first strategy is called the Optical Acceleration Cancellation, or OAC, model, designed by Seville Chapman, a physicist from Cornell University. In the OAC model, fielders move in a way such that the ball steadily rises in his perspective and such that he will meet the ball where it is going to be. Additionally, the OAC model states that a fielder does not go to where the ball will be and wait for it; rather, he will run towards where it will be and meet it there. In tests on the OAC model, it was found that even though fielders had the necessary foot speed to beat the ball to where it would be, they would slow down their speed or strides so that they could meet the ball. The opposing theory to fielding, called the Linear Optical Trajectory, or LOT, model, designed by Michael McBeath of the NASA Ames Research Center, follows that fielders run such that the ball stays in a straight line in their vision. If the ball strays from staying in a straight line, fielders adjust the way they run so that the path of the ball stays straight. If this happens, then the LOT model states the fielder will meet the ball at the right spot at the right time. Several studies have been performed to evaluate the efficiency of the LOT model. In a study with robots, it was proven that the LOT model works in theory. Also, in a study with dogs catching frisbees, it was found that the dogs caught the frisbees by using the LOT model supplemented by the OAC model. The same was found for baseball players. With both strategies, it is clear that they are both heavily psychological. Stadler states, “The information on which the OAC and LOT strategies operate must therefore be at some higher level of the nervous system, and must presumably integrate information from the eyes with information from the muscle systems that move the eyes and head along with the vestibular system” (Stadler, 2008). Neither strategy, however, is conscious. In fact, Stadler says, “...it is not something they normally think about as they make a catch. They just go where the ball is going” (Stadler, 2008). It can be concluded, therefore, that the subconscious state of the baseball player is constantly working as long as they aren’t overthinking. Their subconscious actions, which are highly psychological but of which they are unaware, help players see where the ball is going and meet it in that space.

The third physical aspect of the game of baseball that is highly psychological is pitching. Pitchers have many psychological processes contiguously occurring in order to pitch well. He has to have a high sense of spatial relations in order to get the ball to the catcher's mitt. He has to see the distance from his hand to the catcher's glove, the proper trajectory at which to throw the ball, and where in the box to throw the ball. Pitchers have only a one-quarter degree room for error (Stadler, 2008). Also, he has a complex series of intrinsic processes occurring. The muscle fibers in his arm, hand, fingers, and all muscle groups he uses to pitch must quickly twitch to achieve the proper speed and point of release (Stadler, 2008). The point of release is the most important factor for pitching a baseball. There are also key psychological factors that are particular to pitchers. They have been known to fall into one of two ways of overthinking. One is thinking too much about "don't", as in "don't throw a wild pitch" or "don't throw a ball." This effect has been studied by cognitive psychologists and has been deemed a "priming effect," in which thinking about a specific idea, action, or concept can influence later behavior. Therefore, if a pitcher thinks, "don't throw a wild pitch," he actually has a higher tendency to throw a wild pitch. The other method of overthinking occurs when a pitcher begins to question his own ability. In doing so, he evaluates everything he is doing – every little motion that he has done time and time again. By trying to make sure every aspect is right, he is overthinking, and errors are more likely to occur (Stadler, 2008).

Stadler also discusses the tendency of baseball players to have extremely high optic, stereo, and motor acuity. He, like the Association for Psychological Science, uses the 1920s study on Babe Ruth. After putting Ruth through a series of psychological and motor tests, the researchers found that his eyes, ears, brain, and nerves all functioned much faster than those of the average person. He also had eye, ear, brain, and muscle coordination much higher than those of an average person (Stadler, 2008). These are common themes throughout most baseball players, especially those who tend to have greater success, like Albert Pujols.

A non-physical psychological aspect that is key to success or lack thereof in baseball is personality. Nearly all baseball teams use personality tests to evaluate prospective players. The most

famous and most common personality tests were created by William Winslow. He created a 190-item Athletic Success Inventory, or Athletic Motivation Inventory (AMI), and a 130-item Athletic Success Profile. The tests evaluate eleven characteristics and traits while also accounting for accuracy and objectivity. The eleven characteristics include: drive; coachability; leadership; trust; aggression; responsibility; emotional control; mental toughness; self-confidence; determination; and conscientiousness. In previous tests comparing AMI results to player success, Winslow and other cognitive psychologists have found that the four leading characteristics to predict player success are self-confidence, emotional control, and mental toughness, supplemented by drive and aggression (Stadler, 2008). Many cognitive psychologists and followers of baseball have attributed these results to the diverging careers of Billy Beane and Darryl Strawberry. Both drafted by the Mets out of high school, the two players showed great promise and were some of the best young players in the country. Beane, however, seemed to tank under the new spotlight, while Strawberry surged. Strawberry had very high self-confidence scores on the AMI, while Beane did not.

Clearly, there are many psychological aspects that go into a baseball player's performance. It makes sense, therefore, to work on the psychological development and strength of baseball players.

What does Gallwey define as peak performance?

According to Gallwey, peak performance has a main defining characteristic with several causal pieces that he outlines throughout the book. To achieve peak performance, one must be in a mental state that is so focused it is still; this is often called "playing unconscious" or "playing out of your mind." It's a state of mind where one is conscious, but neither thinking nor over-trying. "When a player is in this state, there is little to interfere with the full expression of his potential to perform, learn and enjoy" (Gallwey, 1997). Peak performance is a mind so clear and focused it seems unconscious and free, yet the mind is so in control that its subconscious ability to perform comes through to achieve the best it possibly can.

How can an athlete perfect the mental game to achieve this peak performance?

The mental state required to achieve peak performance can only be accomplished if several factors are occurring. There are two main factors, with smaller pieces, that play into this mental state. The first main factor, which Gallwey discusses thoroughly, is that Self 1 must be quieted. Gallwey states that inside each person, there are two sides: Self 1 and Self 2. Self 1 is the ego-self: the controlling, opinionated self that overthinks, overdoes, and overtries. Self 2 is the self of natural ability: it knows what it's doing, it has known what it is doing, and it knows what it should do. It is when Self 1 interferes with Self 2, trying too hard to fix "mistakes," that people and athletes tend to mess up or make worse mistakes. The goal is to quiet Self 1 so that the natural ability of Self 2 comes through.

There are multiple steps that go into this quieting of the mind. Step 1 is to let go of judgments and see things as they are, as an umpire would. Instead of labeling events as good or bad, it is seeing them from an objective perspective. For example, instead of saying mentally, "My swing was bad," it would be thinking, "That was a strike" or "I missed the ball." Letting go of these judgments also means not labeling an action or lack thereof as good or bad, so that when the objective perspective is made, other thoughts such as "Why can't I hit the ball? I stink," aren't attached. Step 2 is to discover one's natural learning. It is an innate quality of each person that can only occur when the mind is clear and free of judgment. Then, the mind learns as easily as does a baby. The third and final step of quieting the mind is being aware of what is. It is seeing and feeling what one is doing without adding judgment about what is right or what is wrong.

After learning to quiet the mind, the next step is to trust in Self 2. Self 2 functions as, "a tremendously sophisticated and competent collection of potentialities. Inherent in it is an inner intelligence which is staggering. What it doesn't already know, this inner intelligence learns with childlike ease" (Gallwey, 1997). Self 1 tends to not let Self 2 perform on its own. Self 1 wants to interfere, wants to act like a helicopter overseeing every little bit of action instead of allowing Self 2 to do what it inherently knows how to do. By quieting Self 1 in Step 1, and then by trusting in the natural abilities of Self 2, the natural performance of Self 2 is allowed. It is important to understand the

difference between allowing or letting Self 2 to perform and *making* or forcing Self 2 to perform. By making Self 2 perform, Self 1 is overthinking and interfering. When a player overthinks, he gets tense, and when he becomes tense, he cannot play in his natural state, thereby restricting and inhibiting Self 2. Self 2, however, learns with ease as a baby does. Its learning ability is innate, and it soaks up everything around it like a sponge. By trusting in Self 2, one has to let it happen – meaning let Self 2 do what Self 2 knows how to do. At this point, Self 1 may try to communicate to Self 2 by being disparaging or hurtful. Instead, Self 1 should learn to appreciate and look up to Self 2 (Gallwey, 1997). Self 1 here can also not ask for results, form, etc. This creates more overthinking. It should continue to trust and respect Self 2 to allow for its innate ability to perform.

If athletes follow these steps, they theoretically should achieve their peak performance. There are a few aspects along with this term of “peak performance” to keep in mind. One aspect is for the peak performance achievement process to work, one has to trust in it and believe in it. The process needs to be trusted in order to be successful. Additionally, “peak performance” does not necessarily mean winning; it just means performing at the best level one can achieve. Sometimes opponents have higher levels of ability; that does not mean one is not achieving their own peak performance. Subscribers to the theory Gallwey discusses, including Gallwey himself, also recognize that the theory needs to be reimplemented at times. Athletes tend to gradually play without the separation of Self 1 and Self 2, so they need to come back to reinforce their prior learnings from the book. Gallwey, while playing in a tennis tournament, realized he was not playing at his peak performance, so he took time to refocus himself on his teachings and learnings. After doing so, he made it to the championship match, where he was outperformed on skill alone, not on effort. It is clear that the methods Gallwey states work. It is up to the individual to believe in them so that they can achieve peak performance.

RESEARCH QUESTIONS AND HYPOTHESIS

Despite the prolific literature supporting sports psychology, there is a large lack of clinical and research support for it. The game of baseball provides a perfect environment to analyze the effects of the implementation of sports psychology. Nearly every aspect of the game can be evaluated using statistics and analytics, with the exception being the mental state of the player when he steps onto the diamond. The performances of the players can be analyzed in many ways, using different statistics and formulas. Baseball, therefore, can be used as the environment in which to analyze the efficacy of sports psychology. The goal of this study is to determine whether implementation of a sports psychology procedure, in this case being the book The Inner Game of Tennis, will have an impact on a player's performance. The null hypothesis of the study is that there is no difference in performance following the implementation of a sports psychology intervention. The alternative hypothesis is that there is a difference in performance following the implementation of a sports psychology intervention.

It is important to note that the performance of a player comes in two aspects: (1) what they feel, (2) how they do. Gallwey states, "When I'm concerned only about winning, I'm caring about something that I can't wholly control... When one is emotionally attached to results that he can't control, he tends to become anxious and then try too hard. But one can control the *effort* he puts into winning... for the player of the Inner Game, it is the moment-by-moment effort to let go and to stay centered in the here-and-now action which offers the real winning and losing, and this game never ends... it is not necessarily true that all great effort leads to greatness" (Gallwey, 1997). He cites one of his own tennis matches as an example. The match hadn't been going much his own way, so at the halfway point between sets, he did a mental check on Self 1 and Self 2, and made a shift back to what he had taught himself about separating the two sides so that he could give his best performance. He went back out on the court and played his best game. At the end, however, he lost the match. Even though he lost, he felt as though he had won and had no regrets because he had given his best performance. Hence, we can conclude that the best levels of

performance don't necessarily lead to the best outcomes, but the player of the game can still feel as though they have won.

It is for this reason that performance should be evaluated in those two aspects, being (1) how the player feels about his performance, and (2) the statistics of the player's performance. The research questions therefore include:

- Does sports psychology have an effect on a player's physical performance?
- Does sports psychology have an effect on the way a player feels about his performance?
- Can sports psychology be used to ensure that a player is almost always giving his best performance?

METHODS

The design of this study was a two-sample experiment with differences in differences analysis. Participants were split into three positional categories and within those were assigned to either control or experimental groups. Data collected from the fall games was used as a control group of data, while data collected from the spring games was used for the comparison data. Surveys were used as well. The same initial survey was given to all participants. The ending survey was different for participants, depending on whether they were in the control or experimental groups. Results were compared for each individual from fall to spring. Results were also compared for each positional experimental group, each positional control group, and each positional group from fall to spring. These results were evaluated as t-tests for differences in mean between groups. Individuals' survey responses were compared from the initial survey to the final survey to see if their opinions changed or if the book had a psychological impact.

PARTICIPANTS

For this study, the University of Connecticut baseball team was recruited to participate. There were 26 participants from the team. Out of the participants, 38.5% were pitchers, 42.3% were infielders, and 19.2% were outfielders. Additionally, 50% of the pitchers were in the control group and 50% of them were in the experimental group. 45.5% of the infielders were in the control group and 54.5% of them were in the experimental group. 40% of the outfielders were in the control group and 60% of them were in the experimental group. The size of the sample was small, and this may have affected the study because it was a convenience sample. The study was intended for a baseball team, so recruiting members of the university's varsity team was a straightforward method. The sample size should be clearly noted, however, especially when considering the results. When using a sample size determination formula with a power of .8, t-tests of independent groups, an effect size of .5, and an alpha level of .05, the minimum sample size is 128. This was not feasible for the study at the time it was implemented. Should this be implemented at a higher level of organization, such as a Minor League Baseball organization, the sample size would be much easier to attain. This was not the case, however, so the study proceeded with caution.

MATERIALS

The materials used for the study included an initial survey, two ending surveys, and the book The Inner Game of Tennis by W. Timothy Gallwey. The initial survey was distributed during the time between the fall and spring observation periods. It was the same for all participants. It had open-ended questions for name, school email address, phone number, assigned study number (which came later), age, weight, and height. It had categorical questions for position (Pitcher, Infield, Outfield), year (Freshman, Sophomore, Junior, Senior, Graduate Student), throwing arm (Left, Right), and batting side (Left, Right, Ambidextrous). It then had a series of “Yes” or “No” questions to determine the opinions of the player as well as his eligibility for the study, including: (1) Do you think you always play your best possible game; (2) Do you think your mental preparation affects the way you play; (3) Do you do mental preparation before a game or competition; (4) If you were to work on your mental preparation or your mental state, do you think that would improve your performance; (5) Are you currently experiencing issues at home or with your family; (6) Are you currently experiencing academic issues; (7) Are you academically eligible; and (8) Are you athletically eligible. The former four questions were used to determine the opinions of the player regarding the practice of sports psychology in preparation for competition. The latter four questions were used to determine eligibility of a participant. If he considered a “Yes” answer to (5) or (6) as significant, then he was determined ineligible to participate in the study. If he had a “No” answer to (7) or (8), he was determined ineligible to participate in the study.

The book The Inner Game of Tennis was distributed after the initial survey and three weeks before the spring season, the experimental time period, to the experimental group participants. It was used to implement a practice of sports psychology on the experimental group participants. It is a fairly short book and not difficult to read. It presents ideas on what is wrong in a person’s performance, what a person should do to perform at their individually best level, and examples of people making such changes in their performances. It has been deemed one of the best sports psychology books since its publication and has support from people across all different fields. Professional athletes and politicians alike have used the

book to practice peak performance. Due to its high ranking as one of the best sports psychology books, its easy reading level and relatively short length, and the testimonies to it, The Inner Game of Tennis was chosen as the book to implement for the study.

There were two ending surveys used in the study as well. One was for the control group participants, while the other was for the experimental group participants. Both ending surveys used the same open-ended questions as the initial survey. They differed, however, in their next sets of questions. The ending survey for the control group asked a few “Yes” or “No” questions, some of which had follow-up questions, including: (1) Did anyone in the experimental group reveal to you anything specific from the book? If so, what did they reveal to you; (2) Did you read any mental readiness books throughout the time of the study? If so, what book and why; (3) As a member of the control group, do you think the mental readiness book helped members of the experimental group; (4) Will you consider reading the book in the future; and (5) Now that you have gone through the study, do you believe mental readiness affects a player’s performance. These questions were selected for the control group participants for several reasons. The first two questions were used to ensure that the integrity of the study was kept throughout it. If an experimental group member had revealed any information from the book to a control group participant, that would ruin the integrity and accuracy of the study because the control groups were supposed to be blind to the book and its information. Also, the reading of another mental readiness book by a control group participant would damage the accuracy of the study because control members were not supposed to implement any sort of mental readiness that would be new to them. The next three questions were made to gather the opinions of the control participants. Since they could see how their fellow experimental teammates were playing, their opinions on how those members played mattered. As a control group in general, they could see parts of the study objectively, even though they were part of it because they could see the effect or lack thereof of the book on the experimental group.

The ending survey for the experimental group also had a series of “Yes” or “No” questions, some of which also had follow-up questions. The questions included: (1) Did you enjoy the book; (2) Did you

find the book to be effective; (3) Did you learn something from the book? If yes, please explain; (4) Did you learn something from the experiment? If so, please explain; (5) Do you feel like your game has improved; (6) Do you feel like your game has gotten worse; (7) Do you think you are better off for participating in the experiment; (8) In the future, will you use the book as a reference; and (9) After being a participant in the study, do you believe mental readiness affects a player's performance. These questions were used to determine the opinion of the experimental participants. Gallwey emphasizes that playing at peak performance doesn't always mean winning. He says, "for the player of the Inner Game, it is the moment-by-moment effort to let go and to stay centered in the here-and-now action which offers the real winning and losing, and this game never ends... it is not necessarily true that all great effort leads to greatness." (Gallwey, 123) This is an important notion to take into account for the experimental participants, especially when comparing their performances to their survey responses. It could be the case that a player felt as though his game had improved, even though statistically it had not. To Gallwey, what would matter here would be the player's opinion on his performance. Maybe his batting average, number of errors, or some other statistic won't improve, but if he feels as if his performance has improved, if he plays looser, if he feels better in his swing – that's what matters. For these reasons, the selected questions for the ending survey for the experimental groups were used.

Data was analyzed using the SAS software program. It is a software program commonly used for data analysis.

PROCEDURES

After the study was approved by the Institutional Review Board, the first step was to go to a practice with the team, because per National Collegiate Athletic Association Required Athletically Related Activities rules and instruction from the university's Office of Compliance, all proceedings with the team had to be during scheduled sport time. At the meeting with the team, participants were recruited from the team. It was heavily emphasized that participation in the study was entirely voluntary and there would be no reward for participation. Those who agreed to participate in the study were immediately given a waiver of consent form to complete. Once the participants had filled out and handed in the waivers, they were given the initial surveys to complete at the meeting as well. All of the surveys were then collected.

Upon collection of the surveys and waivers, each participant was randomly assigned a numerical identifier within the range of the number of participants. Each participant's initial survey responses were put into a Microsoft Excel workbook. Two Excel workbooks were used for the study. The first workbook had sheets for Initial Survey Responses, Assigned Groups, Reading Completion, Ending Survey Controls, and Ending Survey Experimentals. The second workbook was used to collect the data and had sheets for Pitcher Control, Pitcher Experimental, Infield Control, Infield Experimental, Outfield Control, and Outfield Experimental. After recording the initial survey responses in the first workbook, I then split the participants into three groups based on their answers in the survey for position: infield, outfield, and pitchers. Within each of those groups, they were further split into experiment and control groups using a random number generator. Data was collected during the team's games played in their off-season, the fall, which was used as the control time. The data was collected by the coaches, so they sent me their information and I inputted the data into the workbook, ensuring that each participant's data corresponded with their assigned number.

Upon approval from the Office of Undergraduate Research for a Supply Award, copies of The Inner Game of Tennis were purchased for the participants. Extras were purchased with the intention of

distribution to coaches and players, not in the experimental groups, after the study was concluded, as many players showed high interest in receiving the book and the coaches were interested in continuing the use of the book after the conclusion of the study. When the books arrived, they were individually packaged into brown paper bags, which were then stapled closed and labeled with a set of rules for each experimental participant. The set of rules included: (1) Do not share the book with any teammates; (2) Do not show the book to any teammates; (3) Do not tell the title of the book to any teammates; (4) Do not share any information from the book with any teammates; (5) Finish the book in its entirety; (6) Finish the book before the first game of the season; (7) Email [my UConn email address] when you have finished the book. The books were then distributed at the end of a practice to the experimental group members. Each experimental participant later emailed when they had completed reading the book.

Data collection began as soon as the season started. In order to ensure that the first time period was the same as the second time period, participants were measured based on their previous either innings pitched (for the two pitching groups) or at-bats (for the two infield groups and two outfield groups). When a participant had matched the innings pitched or number of at-bats, he was emailed to let him know his participation in the study had ended, he had to fill out his final survey – which was different for the experimental and control groups -, and he had to maintain the integrity of the study until it was concluded. The responses to the ending surveys were collected in an Excel workbook.

Data analysis was done on several different sets of data and in multiple ways. The SAS System was used to code programs and run them to analyze the data. For each positional group, each variable in the set of fall data was analyzed using a “proc univariate” test to determine if it followed a normal distribution. This was also done within each positional group for the control and experimental groups. Then, again for each positional group, each variable was analyzed using a “proc ttest” test to determine if there was a significant difference between the control group and the experimental group. The same series of tests was run on the set of spring data. After that, for each player, differences between the fall and spring sets of data were taken for each variable. Each variable for each positional group was analyzed

using a “proc univariate” test to see if the data followed a normal distribution. Each variable for each positional group was also analyzed using a “proc ttest” to see if there was a significant difference in the differences between the normal group and experimental group. The goal of the data analysis was to determine if the experimental participants had significantly improved from the fall to the spring compared to the control participants. This was evaluated at each variable. A p-value of .05 was used to determine if there was a statistically significant result. Analysis was also performed on survey results of individuals. This was to see if individuals had kept or changed their opinions on the implementation or effects of sports psychology. It was also to see if players had felt a psychological impact after reading the book. For evaluating experimental participants, if they felt that the book had a strong impact, even if they did not improve statistically or physically, then the implementation of sports psychology technically still worked. It may not have affected the players’ actual performances, but if it impacted the way they perceive their performances, then that is something to note as well.

RESULTS

STATISTICAL RESULTS

Due to decreased playing time or no playing time, some participants failed to meet the required number of at-bats or innings pitched. Those who played but did not meet the required number of at-bats or innings pitched were still considered for the study. Those who did not play at all in the spring season were not considered for the study in terms of their playing results. However, their survey results were still considered. The distribution of censored participants is as follows:

Positional Group	Assigned Group	Did Not Meet AB or IP	Did Not Play
Pitcher	Control	3	1
	Experiment	2	1
Infield	Control	1	0
	Experiment	2	2
Outfield	Control	1	0
	Experiment	1	0

The variables for consideration for pitchers included: earned-run average (ERA); strike-outs (SO); hits; runs; earned runs (ER); and walks (BB). The variables for consideration for infielders and outfielders included: batting average (BA); strikeouts (SO); walks (BB); runs batted-in (RBI); on-base percentage (OBP); slugging percentage (SLG); on-base-plus-slugging (OPS); errors (E); batting average on balls-in-play (BABIP); hits; singles; doubles; triples; stolen-base percentage (SBP); and runs. All variables were evaluated for normalcy using “proc univariate” in the SAS program. An example of the code for evaluating normalcy is:

```
proc univariate data=FallInfielders normal plot;
var BA;
histogram / normal;
run;
```

An example of a “proc univariate” output is:

The SAS System

The UNIVARIATE Procedure
Variable: BA

Moments

N	11	Sum Weights	11
Mean	0.24954545	Sum Observations	2.745
Std Deviation	0.08443028	Variance	0.00712847
Skewness	-0.6272232	Kurtosis	-1.7893158
Uncorrected SS	0.756287	Corrected SS	0.07128473
Coeff Variation	33.833629	Std Error Mean	0.02545669

Basic Statistical Measures

Location		Variability	
Mean	0.249545	Std Deviation	0.08443
Median	0.300000	Variance	0.00713
Mode	.	Range	0.20800
		Interquartile Range	0.15700

Tests for Location: Mu0=0

Test	Statistic	p Value
Student's t	t 9.802746	Pr > t <.0001
Sign	M 5.5	Pr >= M 0.0010
Signed Rank	S 33	Pr >= S 0.0010

Tests for Normality

Test	Statistic	p Value
Shapiro-Wilk	W 0.78002	Pr < W 0.0051
Kolmogorov-Smirnov	D 0.30341	Pr > D <0.0100
Cramer-von Mises	W-Sq 0.209088	Pr > W-Sq <0.0050
Anderson-Darling	A-Sq 1.14201	Pr > A-Sq <0.0050

Quantiles (Definition 5)

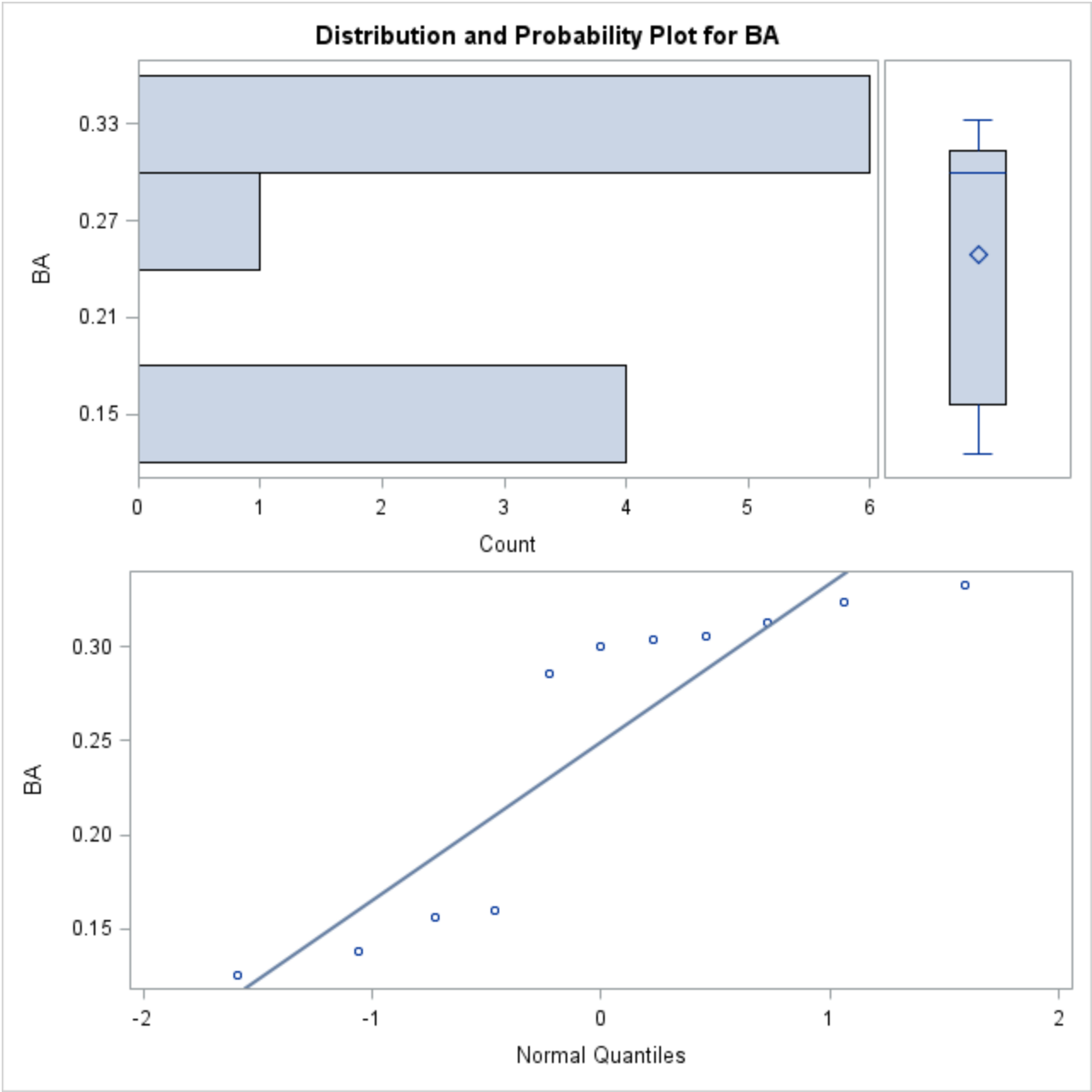
Level	Quantile
100% Max	0.333

Quantiles (Definition 5)

Level	Quantile
99%	0.333
95%	0.333
90%	0.324
75% Q3	0.313
50% Median	0.300
25% Q1	0.156
10%	0.138
5%	0.125
1%	0.125
0% Min	0.125

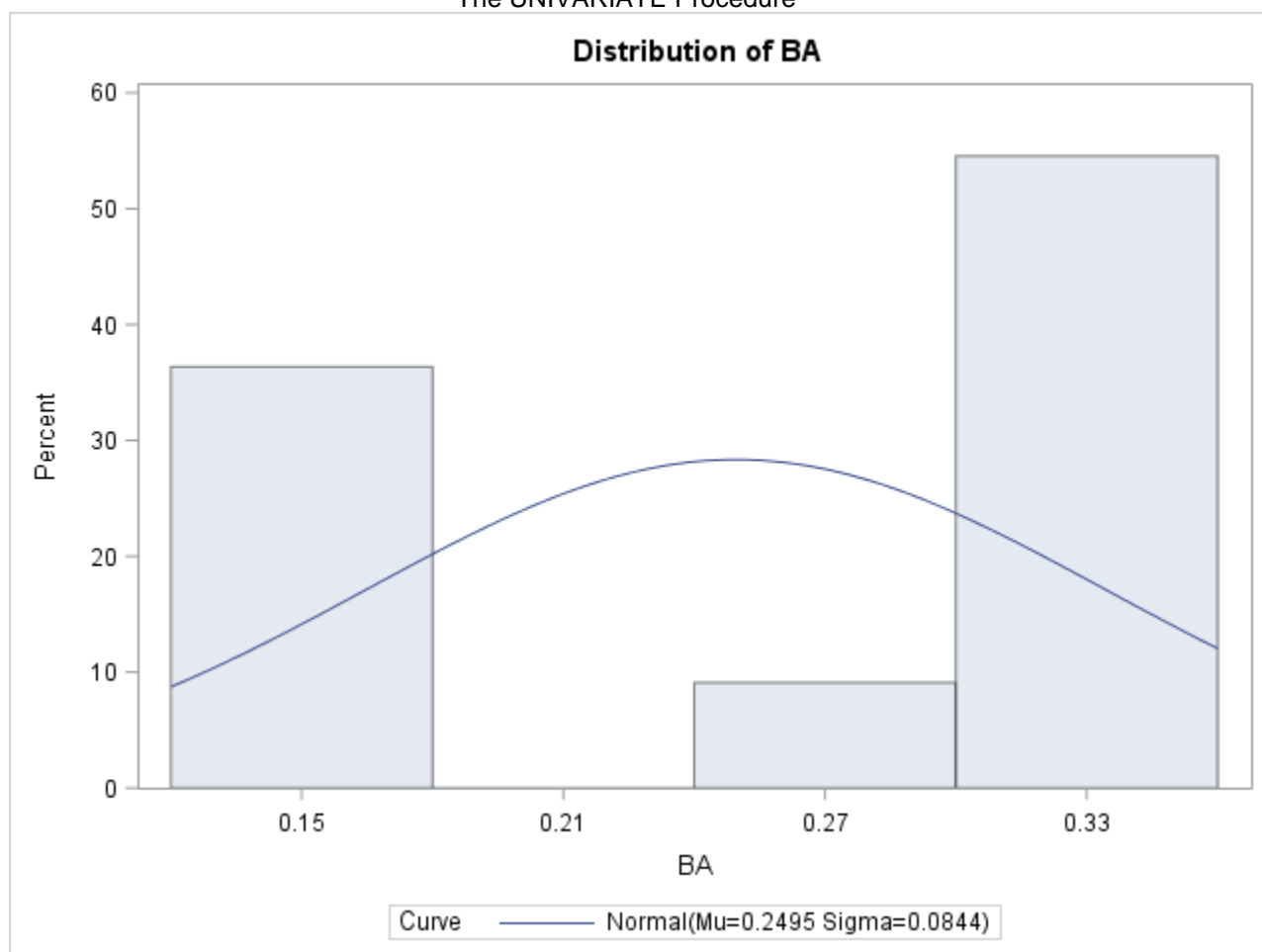
Extreme Observations

Lowest		Highest	
Value	Obs	Value	Obs
0.125	4	0.304	7
0.138	3	0.306	5
0.156	2	0.313	1
0.160	9	0.324	10
0.286	8	0.333	11



The SAS System

The UNIVARIATE Procedure



The SAS System

The UNIVARIATE Procedure
Fitted Normal Distribution for BA

Parameters for Normal Distribution

Parameter	Symbol	Estimate
Mean	Mu	0.249545
Std Dev	Sigma	0.08443

Goodness-of-Fit Tests for Normal Distribution

Test	Statistic	p Value
Kolmogorov-Smirnov D	0.30340970	Pr > D <0.010
Cramer-von Mises W-Sq	0.20908840	Pr > W-Sq <0.005
Anderson-Darling A-Sq	1.14201015	Pr > A-Sq <0.005

Quantiles for Normal Distribution

Percent	Quantile	
	Observed	Estimated
1.0	0.12500	0.05313
5.0	0.12500	0.11067
10.0	0.13800	0.14134
25.0	0.15600	0.19260
50.0	0.30000	0.24955
75.0	0.31300	0.30649
90.0	0.32400	0.35775
95.0	0.33300	0.38842
99.0	0.33300	0.44596

Variables that were found to be normal for the first time period (fall season):

- ERA for all pitchers
- SO for all pitchers
- Hits for all pitchers

- Runs for all pitchers
- ER for all pitchers
- ERA for experimental pitchers
- SO for experimental pitchers
- BB for experimental pitchers
- Hits for experimental pitchers
- Runs for experimental pitchers
- ER for experimental pitchers
- ERA for control pitchers
- SO for control pitchers
- BB for control pitchers
- Hits for control pitchers
- Runs for control pitchers
- ER for control pitchers
- Hits for all infielders
- Singles for all infielders
- Doubles for all infielders
- SO for all infielders
- BB for all infielders
- SBP for all infielders
- OBP for all infielders
- Hits for all infielders
- Singles for control infielders
- Doubles for control infielders
- Runs for control infielders

- SO for control infielders
- BB for control infielders
- E for control infielders
- RBI for control infielders
- SBP for control infielders
- OBP for control infielders
- SLG for control infielders
- Hits for experimental infielders
- Singles for experimental infielders
- Doubles for experimental infielders
- Triples for experimental infielders
- SO for experimental infielders
- BB for experimental infielders
- E for experimental infielders
- RBI for experimental infielders
- OBP for experimental infielders
- BA for all outfielders
- Hits for all outfielders
- Singles for all outfielders
- Doubles for all outfielders
- Runs for all outfielders
- SO for all outfielders
- BB for all outfielders
- RBI for all outfielders
- OBP for all outfielders

- OPS for all outfielders
- BA for control outfielders
- Hits for control outfielders
- Singles for control outfielders
- Doubles for control outfielders
- Triples for control outfielders
- Runs for control outfielders
- SO for control outfielders
- BB for control outfielders
- E for control outfielders
- RBI for control outfielders
- OBP for control outfielders
- OPS for control outfielders
- SLG for control outfielders
- BA for experimental outfielders
- Hits for experimental outfielders
- Singles for experimental outfielders
- Doubles for experimental outfielders
- SO for experimental outfielders
- OBP for experimental outfielders
- OPS for experimental outfielders
- SLG for experimental outfielders

Variables that were not found to be normal for the first time period (fall season):

- BB for all pitchers

- BA for all infielders
- Triples for all infielders
- Runs for all infielders
- E for all infielders
- RBI for all infielders
- DP for all infielders
- OPS for all infielders
- SLG for all infielders
- Triples for control infielders
- HR for control infielders
- BA for experimental infielders
- HR for experimental infielders
- Runs for experimental infielders
- SBP for experimental infielders
- OPS for experimental infielders
- SLG for experimental infielders
- Triples for all outfielders
- SBP for all outfielders
- SLG for all outfielders
- Triples for experimental outfielders
- Runs for experimental outfielders
- BB for experimental outfielders
- E for experimental outfielders
- RBI for experimental outfielders
- SBP for experimental outfielders

All variables were also evaluated within positional groups for a difference between the control and experimental groups by using “proc ttest” in SAS. An example of a “proc ttest” code is:

```
proc ttest data=ComparisonsBetweenInfieldGroups cochrans ci=equal umpu;
class Group;
var BA;
run;
```

An example of this code’s output is:

The SAS System

The TTEST Procedure

Variable: BA

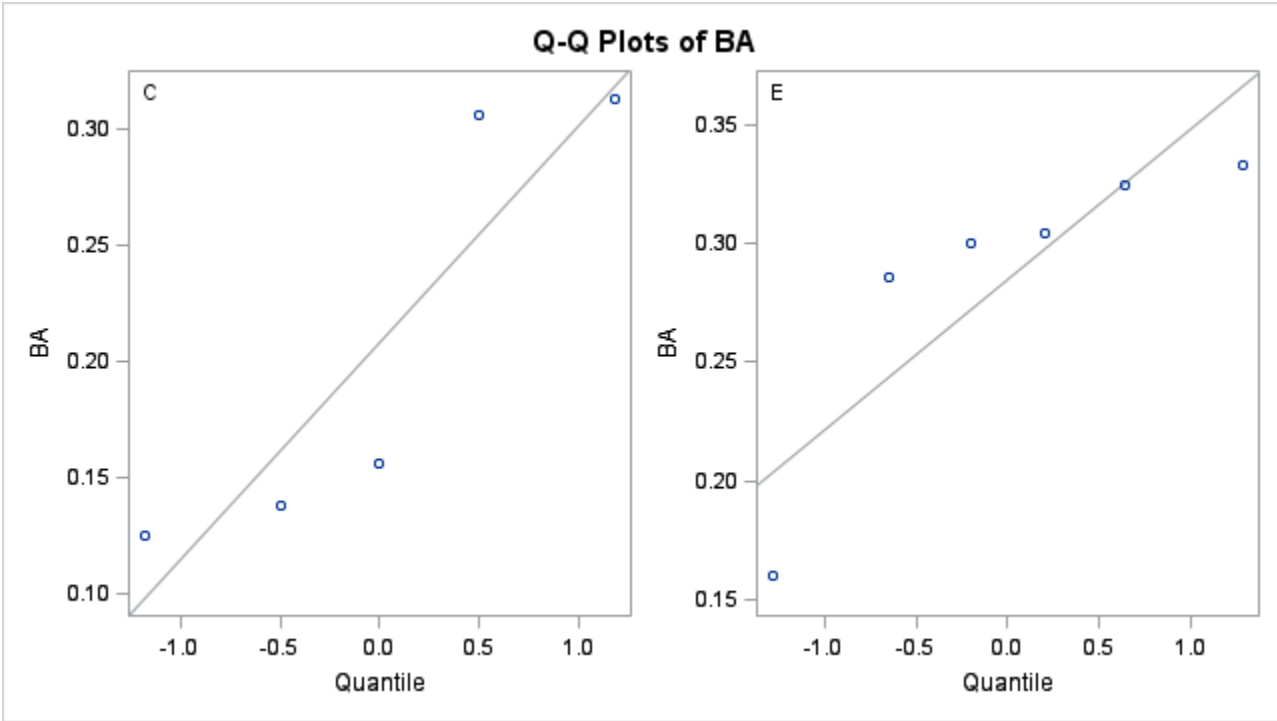
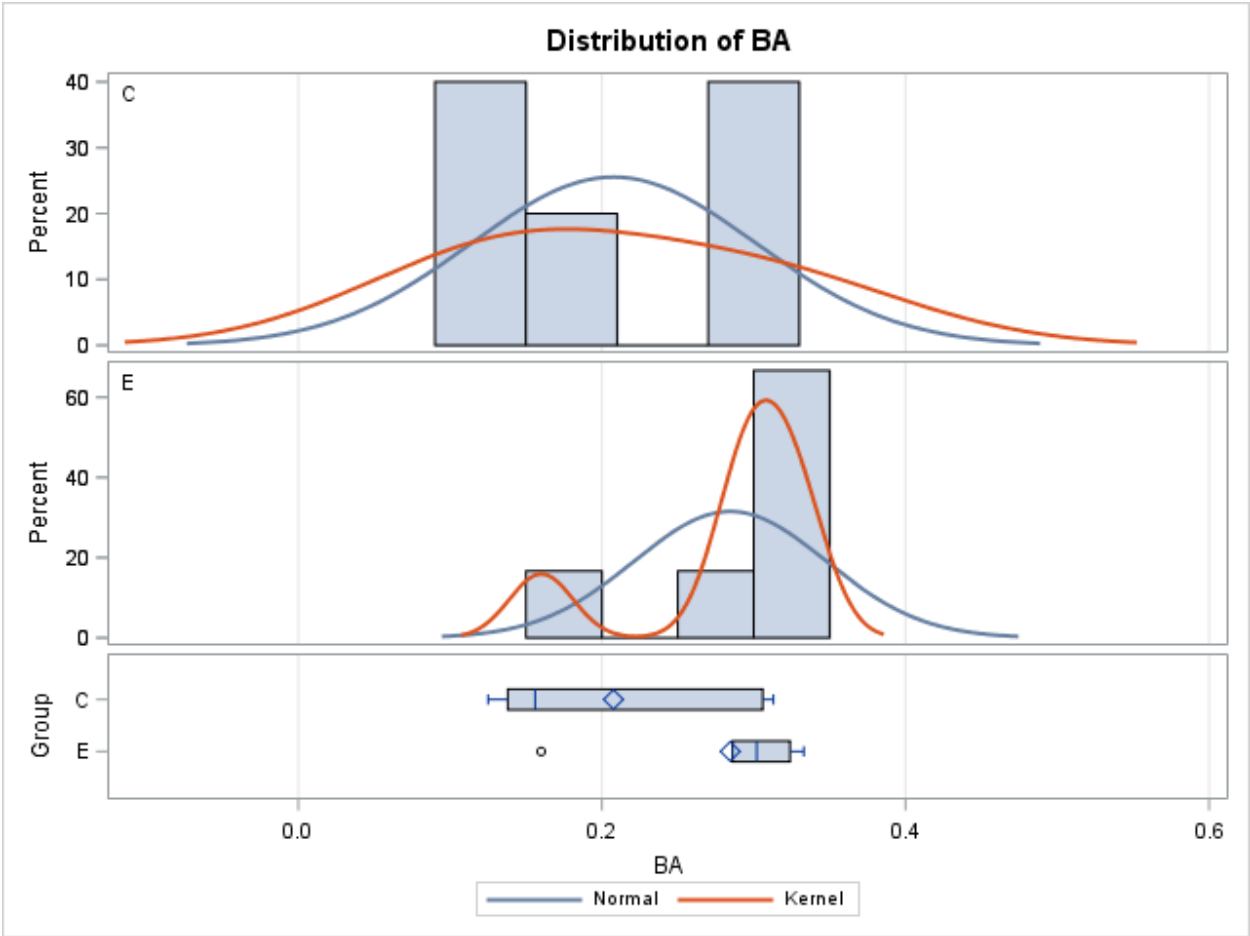
Group	N	Mean	Std Dev	Std Err	Minimum	Maximum
C	5	0.2076	0.0937	0.0419	0.1250	0.3130
E	6	0.2845	0.0633	0.0258	0.1600	0.3330
Diff (1-2)		-0.0769	0.0783	0.0474		

Group	Method	Mean	95% CL Mean	Std Dev	95% CL Std Dev	95% UMPU CL Std Dev
C		0.2076	0.0913 0.3239	0.0937	0.0561 0.2693	0.0524 0.2405
E		0.2845	0.2181 0.3509	0.0633	0.0395 0.1553	0.0373 0.1423
Diff (1-2)	Pooled	-0.0769	-0.1841 0.0303	0.0783	0.0538 0.1429	0.0521 0.1367
Diff (1-2)	Satterthwaite	-0.0769	-0.1939 0.0401			

Method	Variances	DF	t Value	Pr > t
Pooled	Equal	9	-1.62	0.1392
Satterthwaite	Unequal	6.8307	-1.56	0.1633
Cochran	Unequal	.	-1.56	0.1895

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	4	5	2.19	0.4122



Variables with non-significant t-tests (pooled for equal variances, Satterthwaite for unequal variances) for the first time period (fall season):

- ERA for pitchers
- SO for pitchers
- BB for pitchers
- Hits for pitchers
- Runs for pitchers
- ER for pitchers
- BA for infielders
- Hits for infielders
- Singles for infielders
- Doubles for infielders
- Triples for infielders
- Runs for infielders
- SO for infielders
- BB for infielders
- E for infielders
- RBI for infielders
- SBP for infielders
- OBP for infielders
- OPS for infielders
- SLG for infielders
- BA for outfielders
- Hits for outfielders
- Singles for outfielders

- Doubles for outfielders
- Triples for outfielders
- Runs for outfielders
- SO for outfielders
- BB for outfielders
- E for outfielders
- RBI for outfielders
- OBP for outfielders (NOTE: $p=.0512$)
- OPS for outfielders
- SLG for outfielders
- HR for outfielders
- SBP for outfielders

Variables with significant t-tests (pooled for equal variances, Satterthwaite for unequal variances) for the first time period (fall season): None.

The tests on the fall data that had significant results at the 5% alpha level or were not normal were not considered too significant. There were too few observations within each group to seriously consider these results.

Variables that were found to be normal for the second time period (spring season):

- ERA for all pitchers
- SO for all pitchers
- BB for all pitchers
- Hits for all pitchers
- ER for all pitchers
- Runs for all pitchers

- ERA for control pitchers
- SO for control pitchers
- BB for control pitchers
- Hits for control pitchers
- ER for control pitchers
- ERA for experimental pitchers
- SO for experimental pitchers
- BB for experimental pitchers
- Hits for experimental pitchers
- ER for experimental pitchers
- Runs for experimental pitchers
- BA for all infielders
- SO for all infielders
- BB for all infielders
- RBI for all infielders
- OBP for all infielders
- SLG for all infielders
- OPS for all infielders
- BABIP for all infielders
- Hits for all infielders
- Singles for all infielders
- Doubles for all infielders
- Runs for all infielders
- BA for control infielders
- SO for control infielders

- BB for control infielders
- RBI for control infielders
- OBP for control infielders
- SLG for control infielders
- OPS for control infielders
- BABIP for control infielders
- Hits for control infielders
- Singles for control infielders
- Doubles for control infielders
- Triples for control infielders
- Runs for control infielders
- BA for experimental infielders
- BB for experimental infielders
- OBP for experimental infielders
- SLG for experimental infielders
- OPS for experimental infielders
- E for experimental infielders
- BABIP for experimental infielders
- Hits for experimental infielders
- Singles for experimental infielders
- SBP for experimental infielders
- Runs for experimental infielders
- BA for all outfielders
- SO for all outfielders
- RBI for all outfielders

- OBP for all outfielders
- SLG for all outfielders
- OPS for all outfielders
- BABIP for all outfielders
- Singles for all outfielders
- Doubles for all outfielders (NOTE: $p=.0519$, which is close to the significant $p\text{-value}=.05$)
- Triples for all outfielders
- Runs for all outfielders
- BA for control outfielders
- SO for control outfielders
- BB for control outfielders
- RBI for control outfielders
- OBP for control outfielders
- SLG for control outfielders
- OPS for control outfielders
- E for control outfielders
- BABIP for control outfielders
- Hits for control outfielders
- Singles for control outfielders
- Doubles for control outfielders
- Triples for control outfielders
- SBP for control outfielders
- Runs for control outfielders
- BA for experimental outfielders
- SO for experimental outfielders

- BB for experimental outfielders (NOTE: $p=.0584$)
- RBI for experimental outfielders
- OBP for experimental outfielders
- SLG for experimental outfielders
- OPS for experimental outfielders
- E for experimental outfielders (NOTE: $p=.0584$)
- BABIP for experimental outfielders (NOTE: $p=.0584$)
- Hits for experimental outfielders
- Singles for experimental outfielders
- Doubles for experimental outfielders
- Triples for experimental outfielders
- SBP for experimental outfielders (NOTE: $p=.0584$)
- Runs for experimental outfielders

Variables that were not found to be normal for the second time period (spring season):

- Runs for control pitchers
- E for all infielders
- Triples for all infielders
- SBP for all infielders
- E for control infielders
- SBP for control infielders
- SO for experimental infielders
- RBI for experimental infielders
- Doubles for experimental infielders
- Triples for experimental infielders

- BB for all outfielders
- E for all outfielders
- Hits for all outfielders
- SBP for all outfielders

Variables with non-significant t-tests (pooled for equal variances, Satterthwaite for unequal variances) for the second time period (spring season):

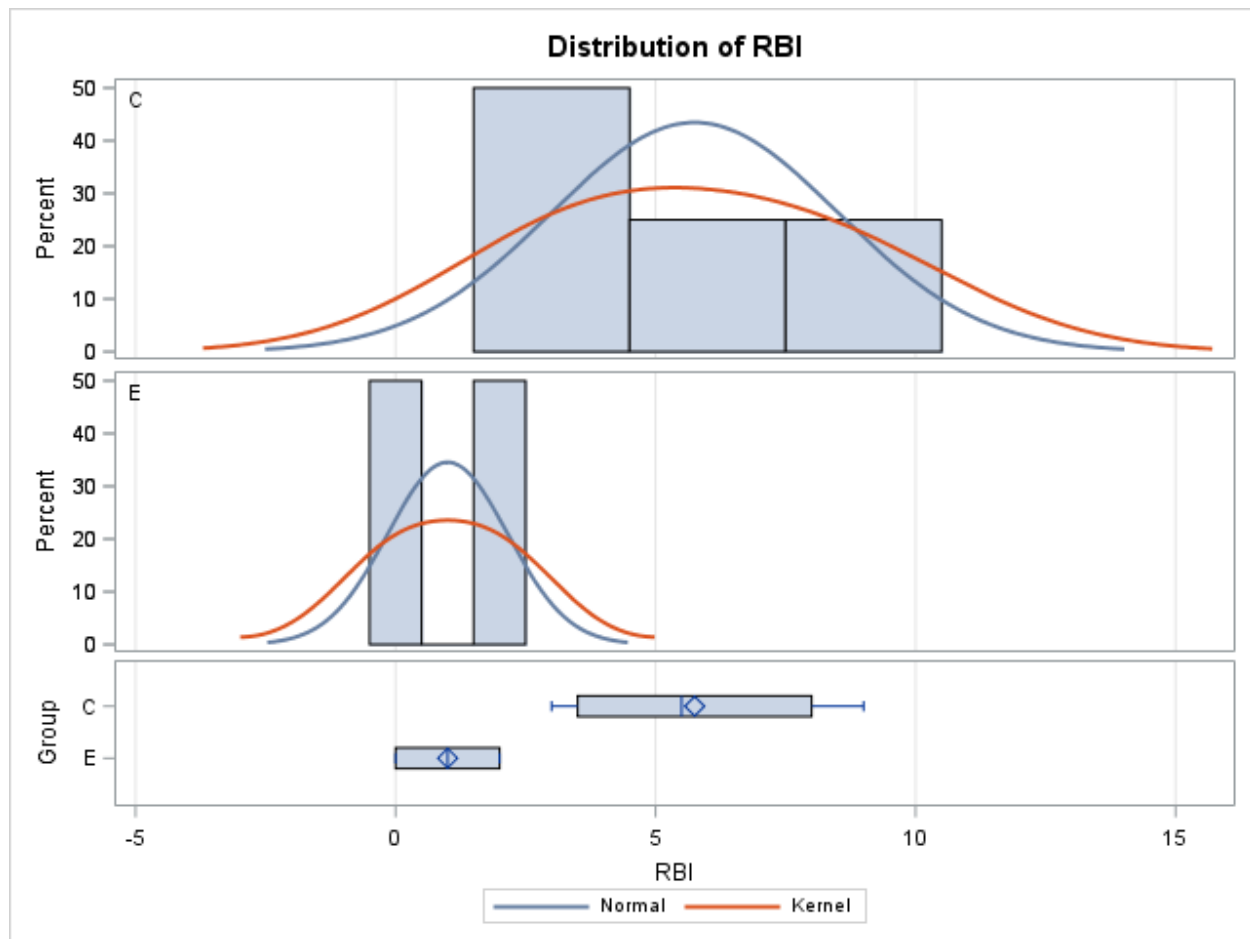
- ERA for pitchers
- SO for pitchers
- BB for pitchers
- Hits for pitchers
- ER for pitchers
- Runs for pitchers
- BA for infielders
- SO for infielders
- BB for infielders
- OBP for infielders
- SLG for infielders
- OPS for infielders (NOTE: $p=.0566$; this is very close to the p-value for significance)
- E for infielders
- BABIP for infielders
- Hits for infielders
- Singles for infielders
- Doubles for infielders
- Triples for infielders

- SBP for infielders
- Runs for infielders
- BA for outfielders
- SO for outfielders
- BB for outfielders
- RBI for outfielders
- OBP for outfielders
- SLG for outfielders
- OPS for outfielders
- E for outfielders
- BABIP for outfielders
- Hits for outfielders
- Singles for outfielders
- Doubles for outfielders
- Triples for outfielders
- SBP for outfielders
- Runs for outfielders

Variables with significant t-tests (pooled for equal variances, Satterthwaite for unequal variances) for the second time period (spring season):

- RBI for infielders ($p=.0190$)

The results for the experimental vs. control infielders for the spring data are:



Clearly, the distribution of the control group RBI is much more spread and higher than that of the experimental group RBI. There is a significant difference ($p=.0190$), so there is sufficient evidence to conclude that sports psychology has an impact on performance – in the negative direction. It is important to remember, however, that not all players in the infield experimental group met their required at-bats.

Tests were also run within each player and each control or experimental group for differences from fall to spring. To evaluate these, “proc ttest” tests were run through SAS. For equal variances, pooled t-tests were used. For unequal variances, Satterthwaite t-tests were used. The results are as follows:

Variables that were not found to have a significant difference between fall and spring:

- ERA for control pitchers

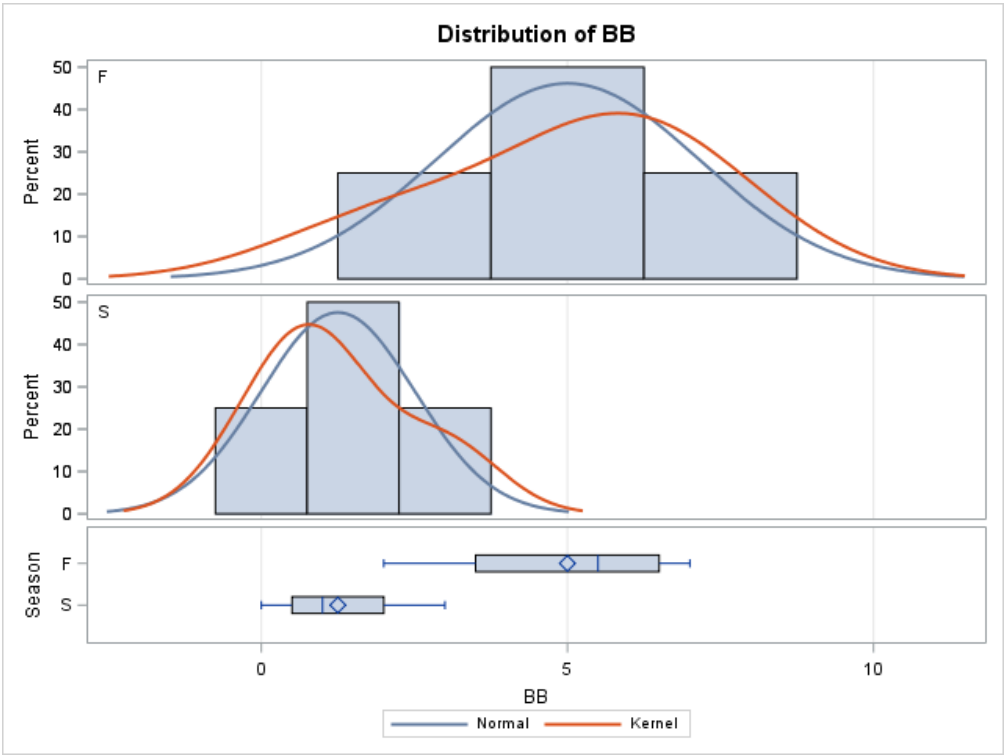
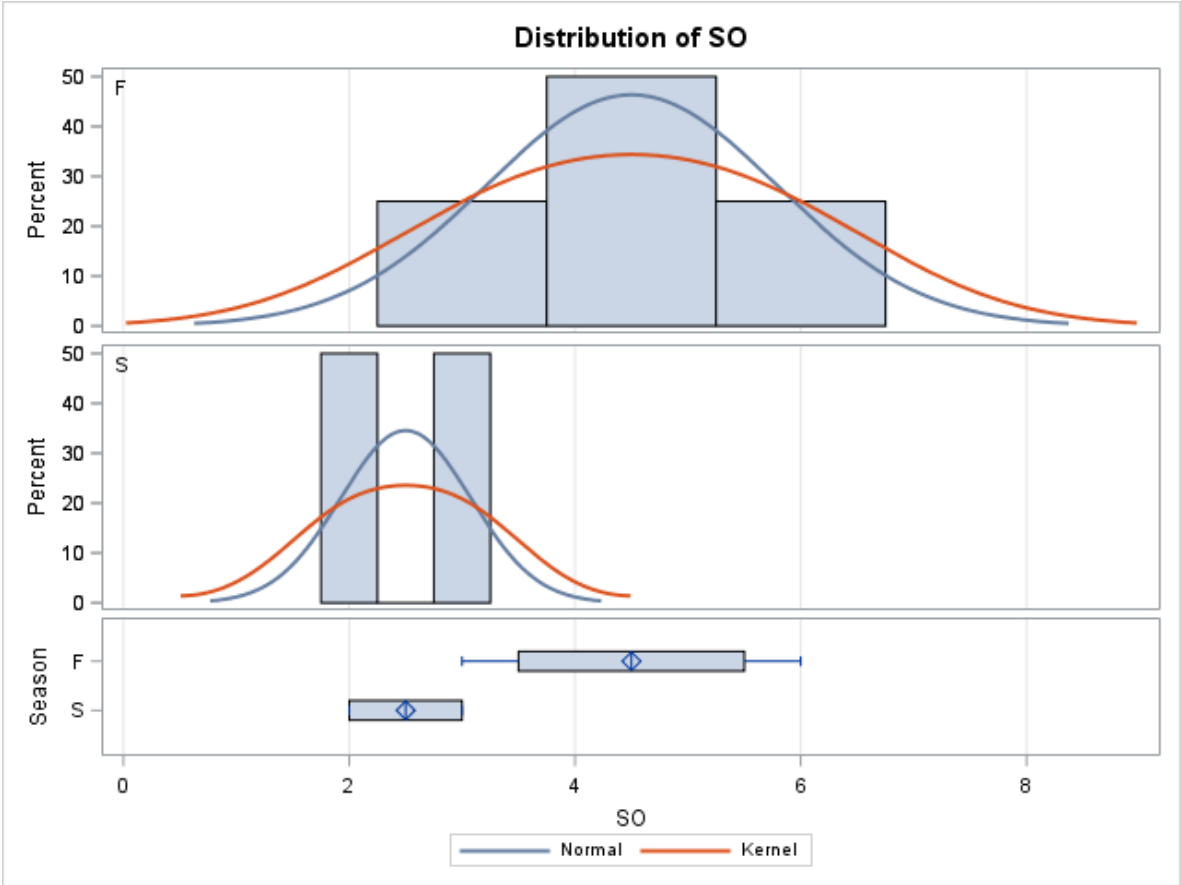
- SO for control pitchers
- BB for control pitchers
- Hits for control pitchers
- ER for control pitchers
- Runs for control pitchers
- ERA for experimental pitchers
- SO for experimental pitchers
- BB for experimental pitchers
- Hits for experimental pitchers
- ER for experimental pitchers
- Runs for experimental pitchers
- BA for control infielders
- SO for control infielders
- BB for control infielders
- RBI for control infielders
- OBP for control infielders
- SLG for control infielders
- OPS for control infielders
- E for control infielders
- BABIP for control infielders
- Hits for control infielders
- Singles for control infielders
- Doubles for control infielders
- Triples for control infielders
- SBP for control infielders

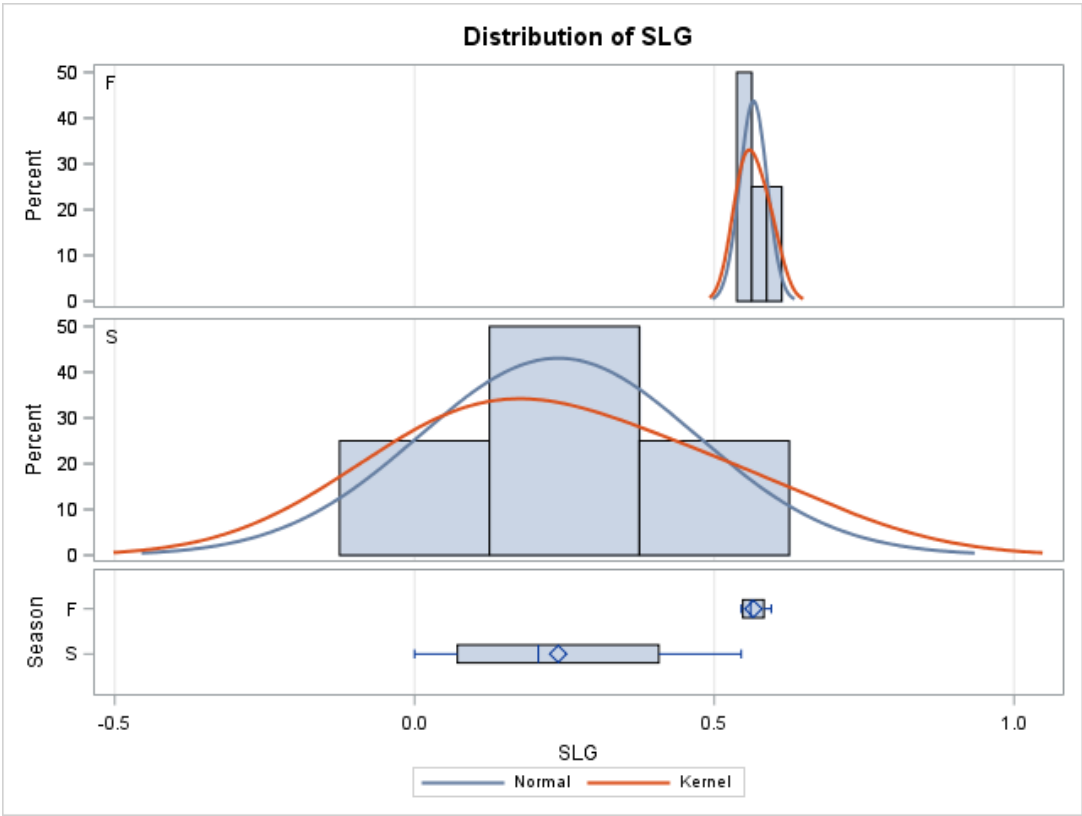
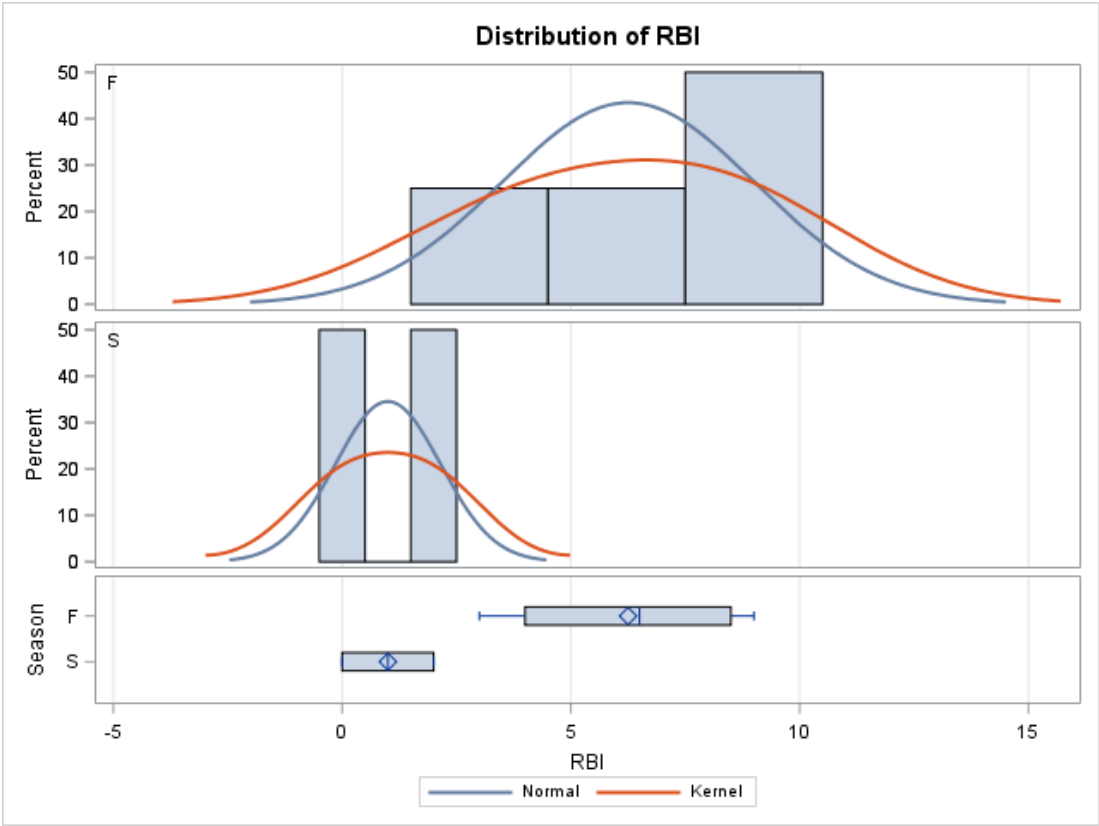
- Runs for control infielders
- Errors for experimental infielders
- Hits for experimental infielders
- Singles for experimental infielders
- Doubles for experimental infielders
- Triples for experimental infielders
- Runs for experimental infielders
- OPS for experimental infielders
- BABIP for experimental infielders
- SBP for experimental infielders
- BA for control outfielders
- SO for control outfielders
- RBI for control outfielders
- OBP for control outfielders
- SLG for control outfielders
- OPS for control outfielders
- BABIP for control outfielders
- Hits for control outfielders
- Singles for control outfielders
- Doubles for control outfielders
- Runs for control outfielders
- BB for control outfielders
- E for control outfielders
- Triples for control outfielders
- SBP for control outfielders

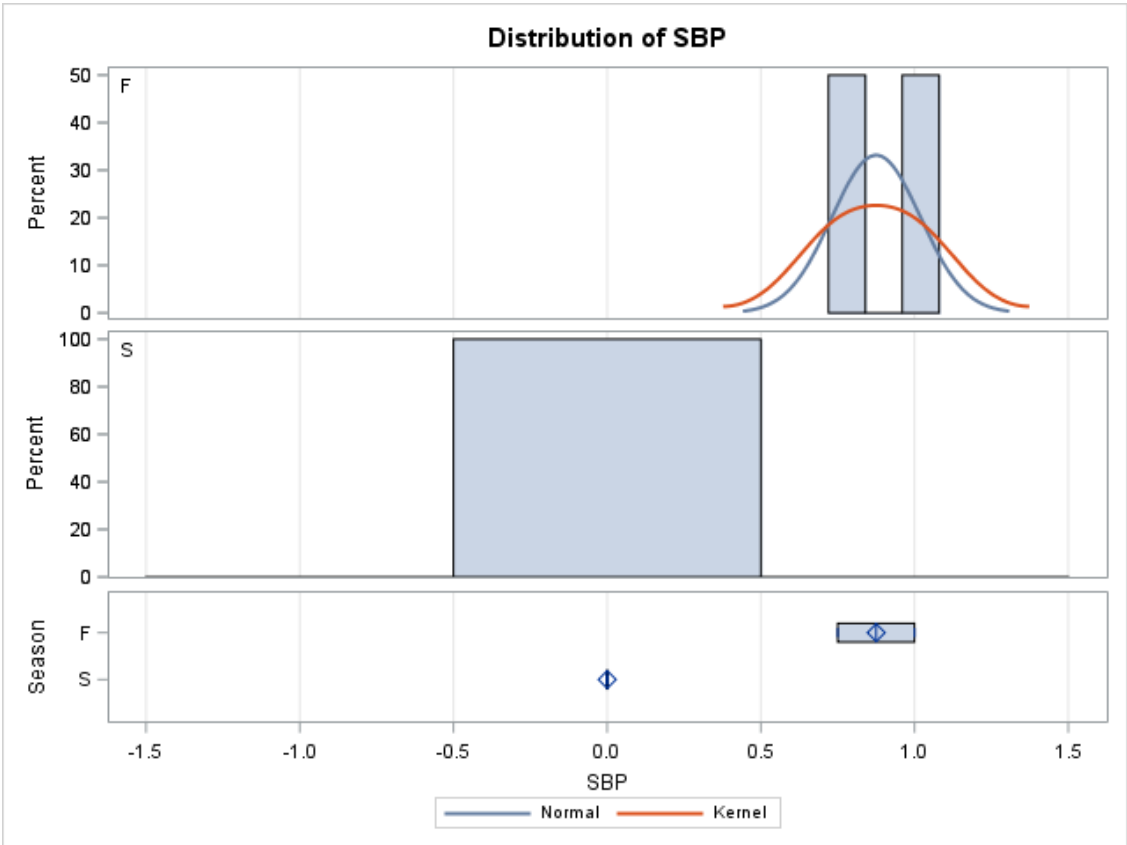
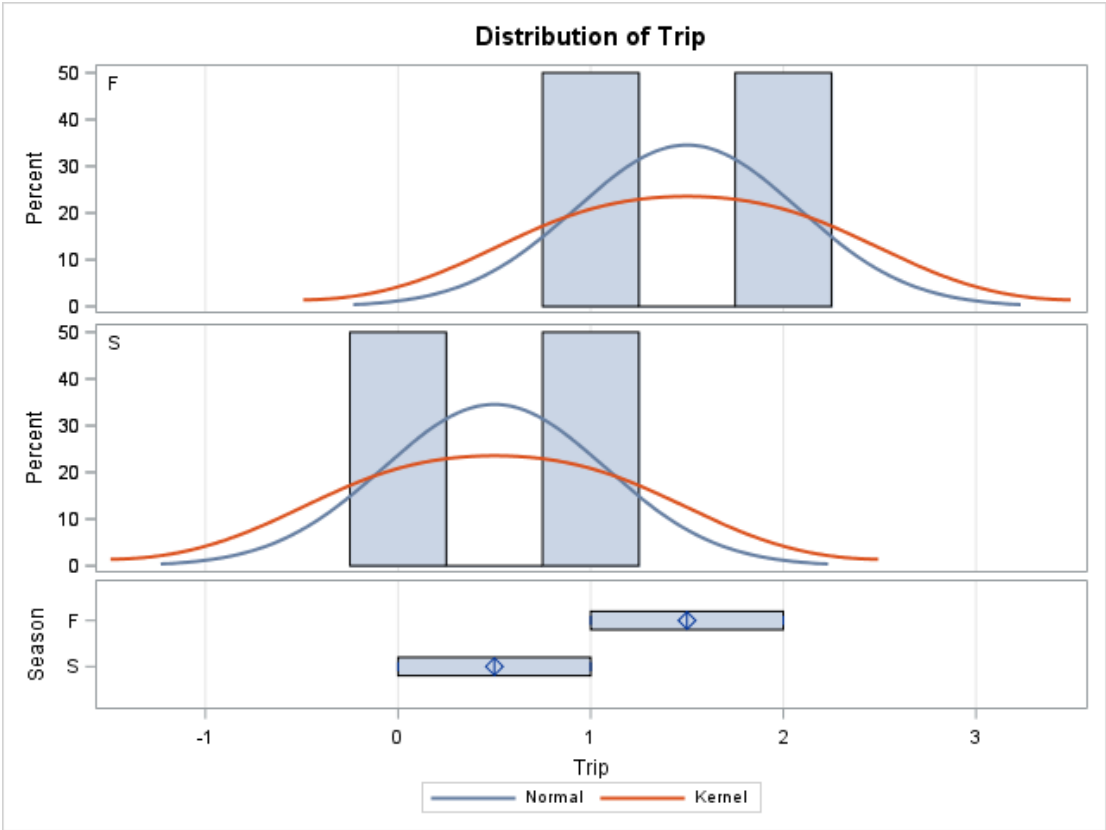
- BA for experimental outfielders
- SO for experimental outfielders
- BB for experimental outfielders
- RBI for experimental outfielders
- OBP for experimental outfielders
- SLG for experimental outfielders
- OPS for experimental outfielders
- E for experimental outfielders
- BABIP for experimental outfielders
- Hits for experimental outfielders
- Singles for experimental outfielders
- Doubles for experimental outfielders
- Triples for experimental outfielders
- SBP for experimental outfielders
- Runs for experimental outfielders

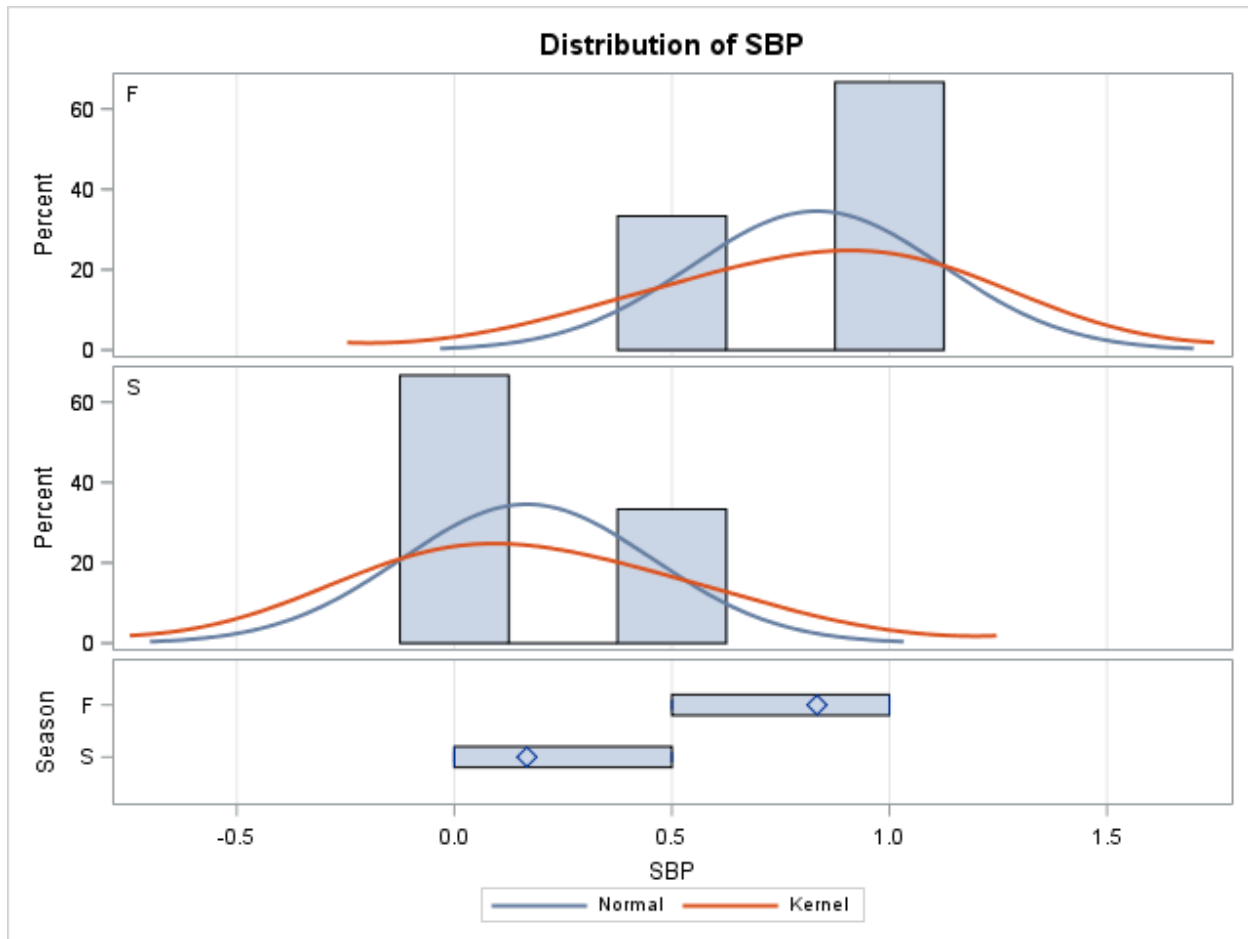
Variables that were found to have a significant difference between fall and spring:

- SO for experimental infielders ($p=.0300$)
- BB for experimental infielders ($p=.0240$)
- RBI for experimental infielders ($p=.0126$)
- SLG for experimental infielders ($p=.0312$)
- Triples for experimental infielders ($p=.0498$)
- SBP for experimental infielders ($p=.0012$)
- SBP for experimental outfielders ($p=.0474$)









At the 5% significance level, it is evident that from the fall to the spring, the implementation of sports psychology had an effect on SO for experimental infielders (decrease in strikeouts – a positive impact), BB for experimental infielders (decrease in BB – a neutral impact), RBI for experimental infielders (decrease in RBI – a negative impact), SLG for experimental infielders (decrease in SLG – a negative impact), Triples for experimental infielders (decrease in Triples – a negative impact), SBP for experimental infielders (decrease in SBP – a negative impact), and SBP for experimental outfielders (decrease in SBP – a negative impact).

Tests were run within each positional group to compare the change over the time periods. Differences and percent change were taken for each variable for each participant from fall to spring. These results were then compared control vs. experimental within each position. Pooled t-tests were used for equal variances. Satterthwaite t-tests were used for unequal variances. The results are as follows:

Variables that were not found to have a significant difference between experiment and control:

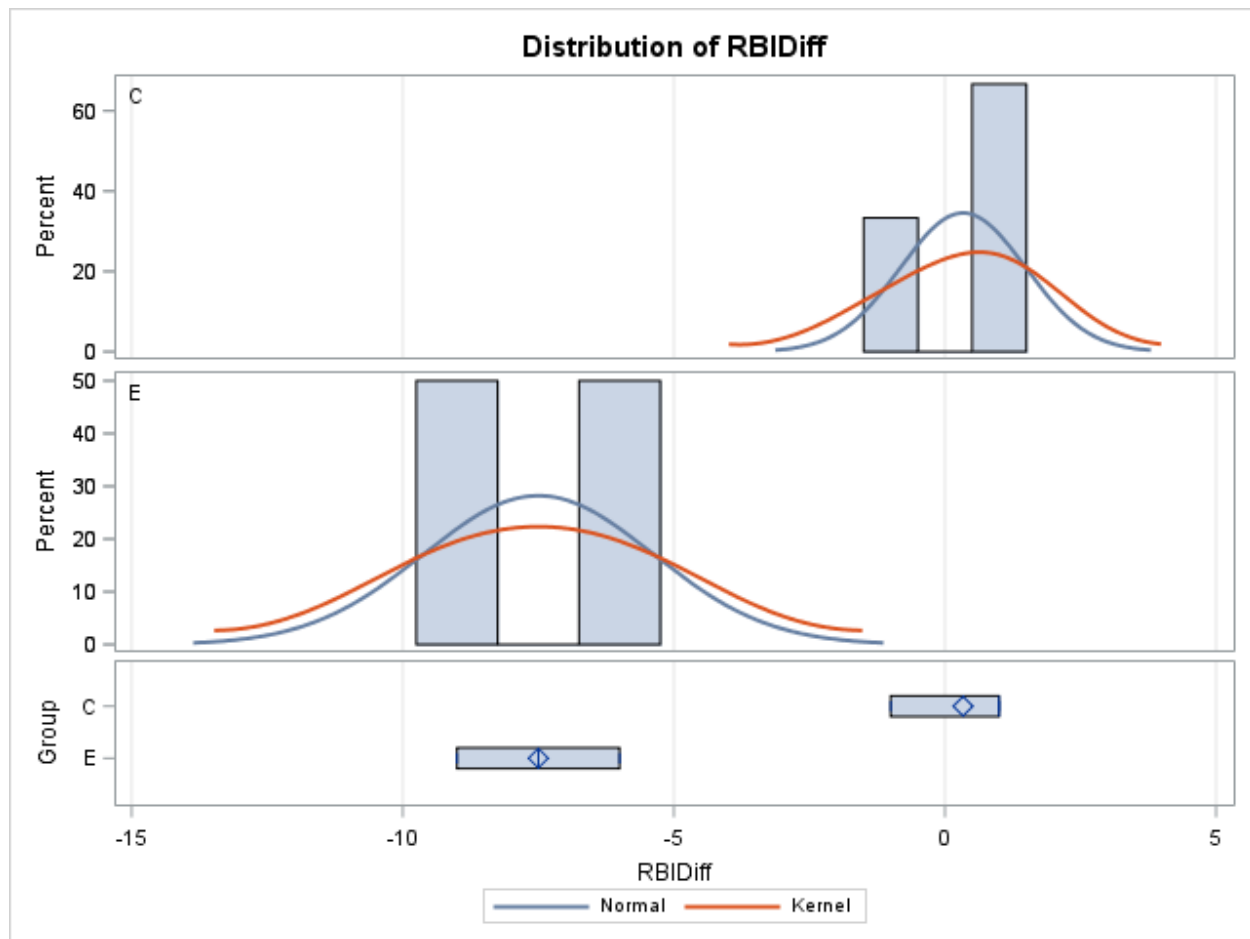
- ERA Difference for pitchers
- ERA Percent Change for pitchers
- BB Difference for pitchers
- BB Percent Change for pitchers
- Hits Difference for pitchers
- Hits Percent Change for pitchers
- ER Difference for pitchers
- ER Percent Change for pitchers
- Runs Difference for pitchers
- Runs Percent Change for pitchers
- BA Difference for infielders
- BA Percent Change for infielders
- SO Difference for infielders
- SO Percent Change for infielders
- BB Difference for infielders
- BB Percent Change for infielders
- RBI Difference for infielders
- RBI Percent Change for infielders
- OBP Difference for infielders
- OBP Percent Change for infielders
- SLG Difference for infielders
- SLG Percent Change for infielders
- OPS Difference for infielders
- OPS Percent Change for infielders

- E Difference for infielders
- E Percent Change for infielders
- Hits Difference for infielders
- Hits Percent Change for infielders
- Singles Difference for infielders
- Singles Percent Change for infielders
- Doubles Difference for infielders
- Doubles Percent Change for infielders
- SBP Difference for infielders
- SBP Percent Change for infielders
- Runs Difference for infielders
- Runs Percent Change for infielders
- BABIP Difference for infielders
- BABIP Percent Change for infielders
- Triples Difference for infielders
- Triples Percent Change for infielders
- BA Difference for outfielders
- BA Percent Change for outfielders
- SO Difference for outfielders
- SO Percent Change for outfielders
- BB Difference for outfielders
- BB Percent Change for outfielders
- RBI Difference for outfielders
- RBI Percent Change for outfielders
- OBP Difference for outfielders

- OBP Percent Change for outfielders
- SLG Difference for outfielders
- SLG Percent Change for outfielders
- OPS Difference for outfielders
- OPS Percent Change for outfielders
- E Difference for outfielders
- E Percent Change for outfielders
- BABIP Difference for outfielders
- BABIP Percent Change for outfielders
- Hits Difference for outfielders
- Hits Percent Change for outfielders
- Singles Difference for outfielders
- Singles Percent Change for outfielders
- Doubles Difference for outfielders
- Doubles Percent Change for outfielders
- Triples Difference for outfielders
- Triples Percent Change for outfielders
- SBP Difference for outfielders
- SBP Percent Change for outfielders
- Runs Difference for outfielders
- Runs Percent Change for outfielders

Variables that were found to have a significant difference between experiment and control:

- RBI Difference for infielders

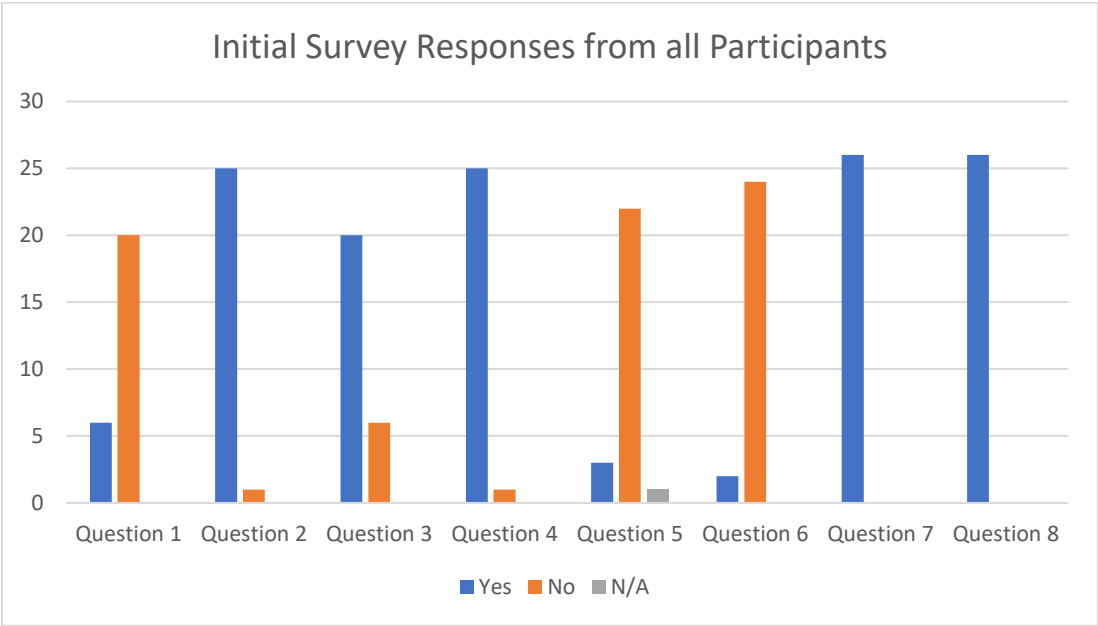


Although significant and non-significant differences have been shown for variables from fall to spring and between experimental and control groups, conclusions cannot be completely drawn due to the small sample size. With that being said, it seems as though the experimental groups tended to have more diverse responses after the implementation of the book. It is hard to determine if the book had an impact on the play of the participants due to the small sample size. Also, there is very little variability for multiple of the variables. This may be due to the short overall time period. It would be more impactful to implement this study over a longer period of time. For example, the initial and final time periods could each be a year.

Another area of interest regarding the results were the answers to the final surveys compared to how well individual participants performed.

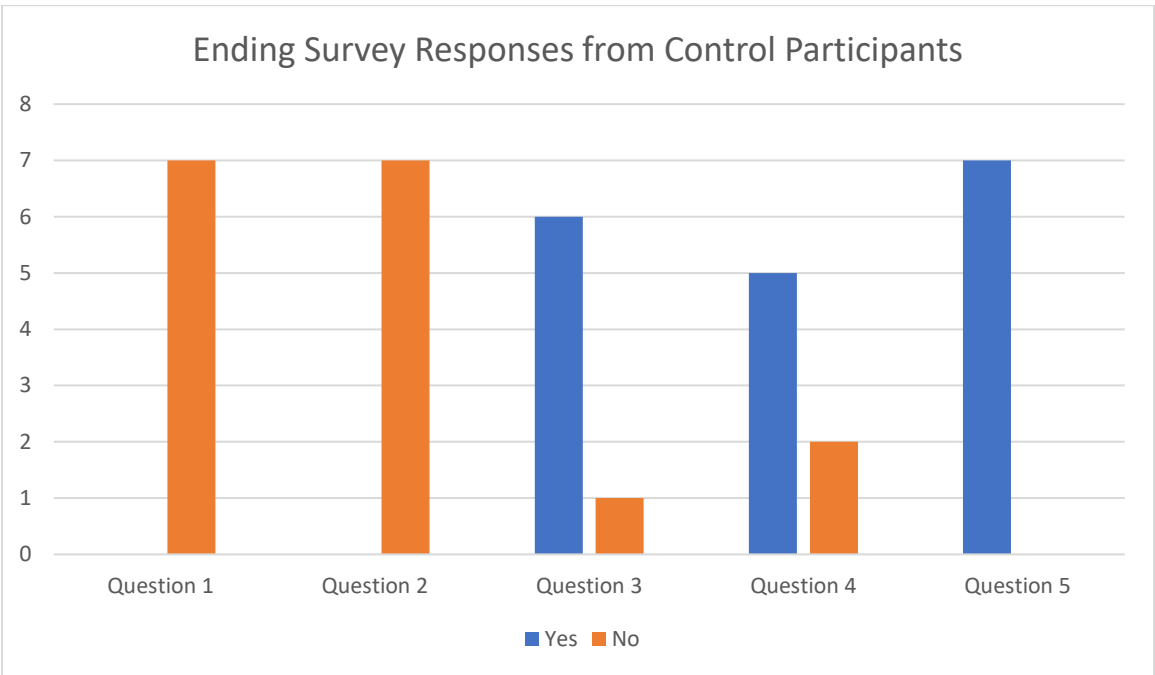
SURVEY RESULTS

Initial Survey Responses

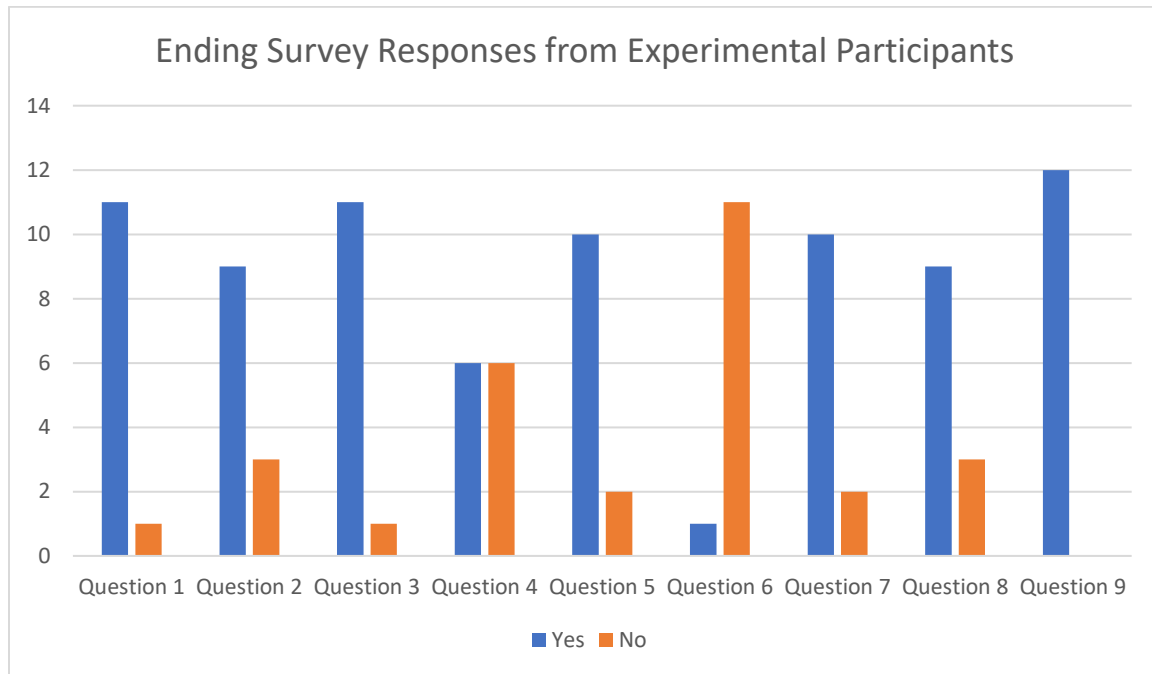


Ending Survey Responses

NOTE: Surveys from five of the control participants are missing.



NOTE: Surveys from two of the experimental participants are missing.



DISCUSSION

LIMITATIONS OF THE STUDY

There were several limitations of the study, which should be expected in such a small study. These limitations included but were not limited to the sample size, the in-season playing time of the participants, and the number of at-bats and innings pitched. The small sample size used for the study was a big limitation on the usefulness of the results. Because the sample size was smaller than 30, which is the general rule of thumb, and the general formula for the minimum number of subjects found 128 subjects, extra caution had to be used in proceeding with the study and analyzing the results.

Another limitation of the study was the time played by each person. In the fall season, each player was able to get almost the same amount of playing time in either at-bats, for the infielders and outfielders, or innings pitched, for the pitchers. This was not feasible or practical in the spring, however. The starting line-up hardly changed, so the regular players who had agreed to participate met their necessary at-bats or innings pitched within a few games. Meanwhile, the participants who didn't receive as much playing time in the spring or opted to redshirt didn't meet their necessary at-bats or innings pitched. Therefore, their results weren't as optimal as desired. Because of the timeline of the study for submission, the data collection had to end, and some players had not met their required at-bats or innings-pitched. They still received their respective final surveys. Their data was still valuable and viable; however, they were noted as not having completed the entire study.

More limitations came from the actual number of at-bats or innings pitched. A prime example is that one of the experimental participants, due to injury, only had five at-bats in the fall. This isn't nearly enough trials for a single individual to determine whether or not significant improvement occurred or if the book had a significant impact on the performance of an individual. A few pitchers had few innings pitched, which also was something to note. This wasn't of too much concern, however, because theoretically in just a few innings pitched, a pitcher can meet a minimum 30 pitches or 30 batters faced.

Something to note as well is the bias factor in survey responses. It cannot be completely trusted that the responses to the initial or ending surveys were entirely honest. This may affect the turnout response in favor of implementation of the book.

Another possible confounding variable for the differences from fall to spring is the different opponents. In the fall season, the team is limited to playing against themselves. In the spring season, however, the team faces other opponents all across the country, of all different levels of ability. This difference in opponent, and therefore opponent ability, may have impacted the data collected for the participants.

FINDINGS AND FUTURE OF THE STUDY

If it were possible, I would want to have continued this study over a longer period of time and with a much larger participant population. In a perfect world, this study would be performed in the Minor League system for a Major League team. It provides the right number of participants and the correct environment, while not putting the entire program's success at risk. Although the sample size used for the study is too small to make any definite conclusions, it can be said that there was no significant difference between the control and experimental groups over time (e.g. the differences from fall to spring, control vs. experimental). Only one of the variables (RBI Difference for infielders) showed a significant difference. The individual groups did not have enough participants or at-bats to ensure that this significant difference and the lack thereof for all other variables were actually due to implementation of the book.

It is also important to note that for the majority of the significant results, the control groups and the fall sets of data had much more compact, or tighter, not-as-spread, normally distributed results, whereas the experimental groups and spring sets of data had much more spread normally distributed results. This may be due to the small sample size or the limitations on playing time of the individual participants. For comparing the fall to spring data within each position control and experimental group, there was no difference in any variable for the infield control group, the outfield control group, the pitcher

control group, and the pitcher experimental group. Those with differences were SO for infield experimental (improved by decreasing), BB for infield experimental (neutral by decreasing; could mean participants are hitting more balls or getting out more), RBI for infield experimental (worsened by decreasing), SLG for infield experimental (worsened by decreasing), Triples for infield experimental (worsened by decreasing), SBP for infield experimental (worsened by decreasing), and SBP for outfield experimental (worsened by decreasing).

Due to the small size of the sample, full conclusions cannot be drawn. It is evident, however, that there were not many significant differences, neither between fall and spring nor between experimental and control. Those with significant differences, for the most part, showed that the experimental participants actually performed worse than the control participants. This is not necessarily enough to say that sports psychology does not work. It has worked for certain people, as discussed previously in the literature review. The difference between the results of those for whom it has worked, and the results of the study may be due to a different factor that cannot be controlled by anyone other than the participant. This is the factor of what is commonly called “buying in,” which can be defined in this scenario as how much an athlete believes and trusts in the process of practicing sports psychology. Certain participants in the study were “bought in” for it. One experimental participant in particular believed in the effects of the book so much so that he asked, after his data collection had ended, if he could lend his book to a member of one of the control groups, whose data collection had also ended. Because the entire study was still ongoing, this was not permitted. It does, however, prove that some participants believed strongly in the effects of the book. This particular experimental participant, despite having only 5 at-bats for the fall and consequently the same number were recorded for the spring, improved in the following variables: Singles, SLG, and OPS. He did not change in the following variables: BA, Hits, and Triples. He decreased in the following variables: SO, RBI, OBP, BABIP, Doubles, and Runs. Since this participant had only 5 at-bats, there are too few observations to make significant conclusions about his performance. One thing to point out is that his BA and SLG have continued to rise throughout the season.

The testimonies of the book from the experimental participants are something to note as well. These are just a few of their responses to question 3, in which they were asked if they learned something from the book, and if so, what they learned.

“I use mental techniques already and this book gave me more ways to focus my mental side of the game. Helped me focus on trusting my training and not to try too hard and press. Also to not think as much while competing, but rather focus on certain cues and triggers.”

“I learned the negative effects of judgment and the positive effects of concentration.”

“Figuring things out on your own through failure and success is best for development.”

“How to control your thoughts, and channel your emotions in high pressure situations.”

“After reading, I learned to do what feels comfortable, and to not focus on remembering certain steps in a sequence. By attempting to block out Self 1, Self 2 can function normally, and that makes a lot of sense, and it works. When hitting I tried to just focus on the ball itself and let my body do the rest, and surprisingly, I had more success.”

The final testimony here is extremely intriguing. This player did not get any playing time in the spring games used for the data collection. His work, as mentioned in his quote, then comes from the time he puts in in the batting cages. There is no way to measure, therefore, if his believed success is statistically proven. It is important in these situations, with these testimonies, to remember that Gallwey says that peak performance is highly mental, and that it does not always result in winning.

It is also interesting to look at the survey responses. Out of those who returned their ending surveys, all control and all experimental participants, regardless of their answers to the previous questions, responded “Yes” to if they believe that, after participating in the study, mental readiness, or sports psychology, affects a player’s performance. It was also interesting to see that a clear majority of

control participants believed that the mental readiness book affected their teammates in the experimental group.

In the experimental group, a large majority enjoyed the book and believed it had an impact on their performance. Question 4, which asks if participants learned anything from the experiment, had a split decision. Half of those who returned the ending survey believed they had learned something, while the other half responded negatively. Compared to the other responses from those who responded negatively, these answers stood out. For the most part, such participants had positive responses to the other questions. One participant, who is important to note, responded “No” to questions 1, 2, 3, 4, 5, 7, and 8, while responding “Yes” to questions 6 and 9. This aligned with his performance results. This participant improved only in number of strikeouts (decreased) and number of singles; his performance decreased from fall to spring in all other categories. Ten of the experimental participants, however, responded “Yes” to question 5, that they believed their game had improved. Of these ten, two did not perform in games during the spring season. Two of the ten decreased in almost all categories. One participant improved in nine categories while decreasing in four, another participant improved in one and decreased in four, another participant improved in three and decreased in six, another participant improved in one and decreased in ten, another participant decreased improved in three categories and decreased in two, another improved in two categories and decreased in ten. Overall, the majority of those who said they thought they had improved, had actually performed worse. This may be accounted for by multiple factors, including perception of performance and different opponents.

Overall, although there are not enough observations to completely confirm these findings, there is sufficient evidence that sports psychology has no impact between control and experimental groups, and that sports psychology negatively impacts experimental groups within themselves. One thing to note is that since the comparison of differences in differences between control and experimental from fall to spring shows no significant differences in anything other than RBI Differences. Therefore, since the experimental groups decreased in multiple categories from fall to spring, it can be concluded that their

decreases in performance were not that different than the decreases in performance of the control groups.

If this could be implemented in a different scenario, with many more participants and over a longer period of time, stronger evidence and stronger conclusions could be made.

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APPENDIX A: DEFINITIONS AND FORMULAS OF VARIABLES

Term	Definition	Formula if applicable
ER	Earned Runs; runs scored by opponent that are not caused by errors from the fielding team	
ERA	Earned Run Average	$= (\text{Earned Runs} \times 9) / \text{Innings Pitched}$
Runs	Total runs scored by a player or against a pitcher	
BB	Base on balls, also known as a walk; when a pitcher throws four pitches at an opponent that are all called balls, forcing the batter to automatically take first base	
SO	Strike-out; when three pitches thrown at a batter are all called as strikes before the batter has been walked; this results in the batter being called “out”	
Hits	Total hits by a player or against a pitcher by opponent	
BA	Batting average	$= \text{Hits} / \text{At-bats}$
RBI	Runs-batted-in; runs scored due to a player’s hit(s)	
OBP	On-base-percentage	$= \frac{(\text{Hits} + \text{BB} + \text{Hit-by-pitch})}{(\text{BA} + \text{BB} + \text{Hit-by-pitch} + \text{Sacrifice flies})}$
SLG	Slugging percentage	$= \frac{(\text{Singles} + 2 * \text{Doubles} + 3 * \text{Triples} + 4 * \text{Homeruns})}{\text{At-bats}}$

OPS	On-base-plus-slugging	=OBP + SLG
E	Errors; fielding mistakes made by a player	
Singles	Hits by a player that get them to first base	
Doubles	Hits by a player that get them to second base	
Triples	Hits by a player that get them to third base	
SBP	Stolen-base percentage	= Stolen Bases/(Stolen Bases + Caught Stealing)

APPENDIX B: SURVEYS

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Principal Investigator:

Student Researcher: Kiera Dalmass

Study Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game

Beginning Survey

Name:

Email (school address):

Phone Number:

Assigned Study Number:

Position (circle one): Pitcher Infield Outfield

Age:

Weight:

Height:

Year (circle one): Freshman Sophomore Junior Senior GS

Throwing arm (circle one): Left Right

Batting side (circle one): Left Right Ambidextrous

Questions:

- | | | | |
|--|---|---|-----|
| 1. Do you think you always play your best possible game? | | Y | N |
| 2. Do you think your mental preparation affects the way you play? | | Y | N |
| 3. Do you do mental preparation before a game or competition? | | Y | N |
| 4. If you were to work on your mental preparation or mental state, do you think that would improve your performance? | | Y | N |
| 5. Are you currently experiencing issues at home or with your family? | Y | N | N/A |
| 6. Are you currently experiencing academic issues? | Y | N | N/A |
| 7. Are you academically eligible? | | Y | N |
| 8. Are you athletically eligible? | | Y | N |



Principal Investigator: Dr. Haim Bar

Student Researcher: Kiera Dalmass

Study Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game

Ending Survey for Members of the Control Groups

Assigned Number:

Position (circle one): Pitcher Infield Outfield

Age:

Weight:

Height:

Year (circle one): Freshman Sophomore Junior Senior GS

Throwing arm (circle one): Left Right

Batting side (circle one): Left Right Ambidextrous

Questions:

1. Did anyone in the experimental group reveal to you anything specific from the book?

Y

N

If so, what did they reveal to you?

2. Did you read any mental readiness books throughout the time of the study?

Y

N

If so, what book and why?

3. As a member of the control group, do you think the mental readiness book helped members of the experimental group?

Y

N

4. Will you consider reading the book in the future?

Y

N

5. Now that you have gone through the study, do you believe mental readiness affects a player's performance?

Y

N



Principal Investigator: Dr. Haim Bar

Student Researcher: Kiera Dalmass

Study Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game

Ending Survey for Members of the Experimental Groups

Assigned Number:

Position (circle one): Pitcher Infield Outfield

Age:

Weight:

Height:

Year (circle one): Freshman Sophomore Junior Senior GS

Throwing arm (circle one): Left Right

Batting side (circle one): Left Right Ambidextrous

Questions:

1. Did you enjoy the book?

Y

N

2. Did you find the book to be effective?

Y

N

3. Did you learn something from the book?

Y

N

If yes, please explain.

4. Did you learn something from the experiment?

Y

N

If so, please explain.

5. Do you feel like your game has improved?

Y

N

6. Do you feel like your game has gotten worse?

Y

N

7. Do you think you are better off for participating in the experiment?

Y

N

8. In the future, will you use the book as a reference?

Y

N

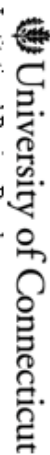
9. After being a participant in the study, do you believe mental readiness affects a player's performance?

Y

N

APPENDIX C: INSTITUTIONAL REVIEW BOARD FORMS

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Institutional Review Board
Office of Research Compliance

Appendix A: Key Personnel and Study Investigators Log/Personnel Amendment Form

Instructions: The IRB must review and approve all changes to the Key Personnel, *before* implementation in the field. Submit this log at the time of initial review and at continuing review if changes are being made. Include the complete list of UConn Key Personnel and non-UConn Investigators. In addition, submit this form and an IRB-3 Amendment Request Form, to add or remove individuals to the protocol throughout the approval period.

Date: 9/2/2017	Protocol # (if known): H17-238	PI Name: Haim Bar	Protocol Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game
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UConn Key Personnel Engaged in Research (i.e. enroll participants, conduct consent process, collect or review data/identifiable information from participants, intervene/interact by performing invasive procedures, have access to information that links participants' names or other identifiers with their data, or act as authoritative representatives for the investigators) – Provide the following information for each person:

Name (First, Last, Degree)	Department/ Unit #	Role/Primary Function Performed in Study (see <i>Important</i> Note Below)	Graduate/Undergraduate Student? (Indicate Yes/No)
Haim Bar, PhD.	Statistics	PI – oversee mentor student researcher	No
Kiera Dalmass		Student Researcher	Yes

Please make sure that CITI Certification for all personnel is up-to-date.

Note: tabbing out of the bottom right cell will insert another row if needed.

Other Non-UConn Investigators/Key Personnel:

Name (First, Last, Degree)	Affiliated Institution	Describe CITI (or equivalent) human subjects training	Role/Primary Function Performed in Study (see <i>Important</i> Note Below)	Graduate/Undergraduate Student? (Indicate Yes/No)

Note: tabbing out of the bottom right cell will insert another row if needed.

Important: Please be specific. For example, the term “Co-Investigator” is not sufficient. You must describe the specific role (e.g. “Co-Investigator – train confederates”). For student directed research, the role of the PI may be described as “PI – oversee mentor student researcher.” For full board and expedited studies, include the specific procedures (e.g. blood draws, interview, survey distribution, acting as a confederate) each person will perform and his/her experience/training with this procedure.

Consent Form for Participation in a Research Study



Principal Investigator: Dr. Haim Bar

Student Researcher: Kiera Dalmass

Study Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game

Introduction

You are invited to participate in a research study to determine the effect of psychological preparation and readiness on the sport of baseball. You are being asked to participate because you are a member of the university's varsity baseball team.

This consent form will give you the information you will need to understand why this study is being done and why you are being invited to participate. It will also describe what you will need to do to participate and any known risks, inconveniences or discomforts that you may have while participating. We also encourage you to ask questions now and at any time. If you decide to participate, you will be asked to sign this form and it will be a record of your agreement to participate. You will be given a copy of this form.

Why is this study being done?

The purpose of this research study is to determine if the mental readiness of a baseball player impacts his physical ability in the game. Baseball is a game that can be analyzed for almost every factor and made into a statistic, creating the science of sabermetrics. Nearly every variable can be monitored, with one of the main exceptions being the mental state of the player when he takes the mound or digs his cleats into the dirt. In baseball, players tend to mess up the most on the things they've been taught how to do since the first day of the sport. By analyzing the effect of a sports-related mental readiness book that aims to perfect this mental lapse so that an individual is always playing his or her best game possible, perhaps it can be determined if psychological assistance can improve the performance of a baseball athlete.

What are the study procedures? What will I be asked to do?

If you agree to take part in this study, you will be asked to participate in two surveys and an analysis. There are two parts to the research study. In the first part, you will be asked to answer a short pen-and-paper survey to fill out basic information as a screening and allow your performance metrics to be analyzed. In the second part, you will be asked to possibly read the book if you are placed into that group, allow the continued use of your performance metrics, and finally answer an ending survey.

The beginning survey will ask questions regarding your game, your opinion on mental preparation strategies, and if you are experiencing outside factors that may affect your ability to focus. It will also ask for your name, email, phone number, assigned number for the study, height, weight, age, year in school, position, throwing arm, and batting side.

The ending survey will be different for each person depending on whether you are in the experimental group or the control group. That being said, however, both ending surveys will again ask for your assigned number for the study, height, weight, age, year in school, position, throwing arm, and batting side. For those in the experimental group, the survey will ask questions regarding your opinions on the book, the efficacy of the book, the efficacy of the experiment, the status of your game, if you enjoyed the experiment, and if you will continue to consult the book in the future. For those in the control group, the survey will ask questions regarding if people told you what they read in the book and if so what it was they revealed, if you did any outside mental preparation and if so what it was, if you thought as a member of the control group that the book helped your teammates in the experimental group, and if you would consider reading the book.

The research will be conducted during the fall and spring seasons for baseball throughout the games played amongst the team. The fall games will be used for the first part of the analysis and the spring games will be used for the second part of the analysis. The number of games played in the fall will be matched to the number of games in the spring used for the study so that the sample sizes are the same.

There isn't much outside time required for the study. All you will need to do is fill out the surveys, attend your practices, and read the book if you are in the experimental group. The book isn't long or difficult to read, so that shouldn't take too long. For the study, no audio or videotape will be used.

If you choose to participate, you are expected to meet the deadlines for each part of the experiment, as well as be completely honest with every answer you give in the surveys and screenings.

If you are declared a member of the experimental group in the randomization process, you cannot share any information from the book to anyone in the control group. If information is shared, both your data and that of whom you have told will become censored information, and you and the other(s) will be removed from the study. You will know if you are in the experimental group or not if you are deemed required to read the book, because your number will have been randomly selected to be in one of the two groups. If you are randomly selected to be in the experimental group, please do not reveal this information so that sharing of information can be completely minimized.

Some research requires that the full purpose of the study not be explained before you participate. We will give you a full explanation at the end of the study.

What other options are there?

You have the option not to participate in this study. There are no risks associated with this option. The benefit associated with this option is that you aren't required to read the book, although if you were to participate there is a fifty-fifty chance of not being assigned it. Because we do not know if the treatment we are studying is effective in improving your performance, it is possible that choosing not to participate may be beneficial.

What are the risks or inconveniences of the study?

We believe there are no known risks associated with this research study; however, a possible inconvenience may be the time it takes to complete the study.

What are the benefits of the study?

As a result of the study, your performance may improve so that you are almost always playing your best game. If the study proves successful, it could be applicable to not only baseball, but also other sports and professions.

Will I receive payment for participation? Are there costs to participate?

There are no costs and you will not be paid to be in this study.

How will my personal information be protected?

The following procedures will be used to protect the confidentiality of your data. The researchers will keep all study records in encrypted files in Microsoft Office and SAS software, and all written records will be locked in a secure location. Research records will be labeled with a code. The code will be derived from a sequential two-digit number that reflects how many people have enrolled in the study. A master key that links names and codes will be maintained in a separate and secure location. The master key will be destroyed after 3 years. All electronic files (e.g., database, spreadsheet, etc.) containing identifiable information will be password protected. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the research staff will have access to the passwords. Data that will be shared with others will be coded as described above to help protect your identity. At the conclusion of this study, the researchers may publish their findings. Information will be presented in summary format and you will not be identified in any publications or presentations.

We will do our best to protect the confidentiality of the information we gather from you but we cannot guarantee 100% confidentiality.

The final study data will be released in a thesis paper, written by the student researcher as part of a requirement for her status as a member of the university's Honors Program. The results will be provided mostly in summary form, but if there are pieces of data that support a point or theme, they will be used. Your name will not be attached to your data. If your data is used for support, you will be notified. In that case, you will be asked to disclose your identity, on account of the fact that data may be potentially identifiable.

Confidentiality may be compromised if the data is hacked. This is a necessary potentiality, but there are several safeguards against it. In the case that the data is hacked, IT support will be contacted, and then the researchers will contact the participants of the study to notify them.

If you decide to withdraw from the study, your data will become censored data. It will be kept and used to the ability of its support for or against the thesis, but the data will be clearly labeled as censored.

You should also know that the UConn Institutional Review Board (IRB) and Research Compliance Services may inspect study records as part of its auditing program, but these reviews will only focus on the

researchers and not on your responses or involvement. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

Can I stop being in the study and what are my rights?

You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

You do not have to answer any question that you do not want to answer. Also, as an athlete for UConn, your standing with the team will not be affected if you decline to participate.

You may be withdrawn from the study if you have disruptive behavior during the observation period, are not deemed academically eligible, or are deemed not eligible for the study on the basis that there are other factors that may affect your mental performance. You may also be withdrawn from the study if you share sensitive information. This means that if you are in the experimental group and share information from the book to a member of the control group, then your data as well as that of whom you have told will become censored, and you and the other(s) will be removed from the study.

Whom do I contact if I have questions about the study?

Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this study or if you have a research-related problem, you may contact the principal investigator, Dr. Haim Bar at 860-486-5455, or the student researcher, Kiera Dalmass at 609-781-1397. If you have any questions concerning your rights as a research participant, you may contact the University of Connecticut Institutional Review Board (IRB) at 860-486-8802.

Documentation of Consent:

I have read this form and decided that I will participate in the project described above. Its general purposes, the particulars of involvement and possible risks and inconveniences have been explained to my satisfaction. I understand that I can withdraw at any time. My signature also indicates that I have received a copy of this consent form.

Participant Signature:

Print Name:

Date:

Signature of Person

Print Name:

Date:

Research Compliance Services

INSTITUTIONAL REVIEW BOARD SUBMISSION CHECKLIST/FACE PAGE

PI Name: Haim Bar, PhD. Unit Box::	Unit Box:	Correspondent Name:
Protocol # (if known): H17-238	Protocol Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game	

Instructions: When submitting documents to the Institutional Review Board, please check off all that apply for this submission. Be sure to include the protocol number and all attachments as noted on this sheet. A Face Page is not required for InfoEd submissions.

Please indicate whether this submission is for an expedited or full review and check all documents that are being submitted. Be sure to include the correct number of copies as indicated and all applicable documentation. If incomplete, the documents may be returned to you.

New Expedited or Full-Board Review Protocol Application Submissions (IRB-1, IRB-7 or IRB-9):

X ☐ Expedited Review or ☐ Full Board Review

X ☐ 1 original, signed* Protocol Application (**required**). *Signed application required for paper submissions only.

X ☐ 1 Appendix A Form (**required**)

Provide 1 copy of the following documents that may be applicable to this research study.

<input type="checkbox"/> Consent/Parental Permission Form(s)/Information Sheet(s)	X <input type="checkbox"/> Grant Application
<input type="checkbox"/> Child Assent Form	<input type="checkbox"/> Drug/Device Supplemental Form (IRB-1A)
X <input type="checkbox"/> Survey Instruments/Interview Questions	<input type="checkbox"/> Genetic Testing Supplemental Form (IRB-1B)
X <input type="checkbox"/> Recruitment Materials (Flyer, Email, Newspaper)	<input type="checkbox"/> Treatment Study Supplemental Form (IRB-1C)
<input type="checkbox"/> Medical Procedure SOPs	<input type="checkbox"/> Screening Instruments
<input type="checkbox"/> Debriefing Statements	X <input type="checkbox"/> Other documents in support of protocol submission

New Request for Exemption Protocol Application Submissions (IRB-5):

☐ 1 Original, Signed* IRB-5 Protocol Application Form (**required**) ☐ Appendix A Form (**required**)

*Signed application required for paper submissions only.

Provide 1 copy of any of the following documents that may be applicable to the research study:

- ☐ Consent/Parental Permission Form(s)/Information Sheet(s) ☐ Grant Application
- ☐ Survey Instruments/Interview Questions ☐ Recruitment Materials (Flyer, Email, Newspaper)
- ☐ Other documents in support of protocol submission

Revisions to address Requires Modifications to Secure Approval or Deferral Determinations – All**submissions (IRB-1, IRB-5, IRB-7 or IRB-9):**

- ☐ Expedited Review or ☐ Full Board Review
- ☐ 1 clean (signed*) & 1 track-change version of any documents revised. *Signed application required for paper submissions only.
- ☐ 1 copy of any new documents being added

Re-Approval of Expedited or Full-Board Review Protocols (IRB-1, IRB-7 or IRB-9):

- ☐ 1 original, signed* IRB-2 or IRB-8 Re-approval/Termination Form (**required**)

*Signed application required for paper submissions only.

If still enrolling new participants, the following documents must also be submitted to be validated for the new approval period:

- ☐ 1 Copy of Consent/Parental Permission Form(s)/Information Sheet(s) / Assent Form(s) (clean, **unvalidated** copies)
- ☐ 1 Copy of Recruitment Material (clean, **unvalidated** copies) ☐ Other previously validated documents (e.g. phone scripts, letters, etc.)

Amendments – All submissions (IRB-1, IRB-5, IRB-7 or IRB-9):

Please note: Any change to an existing protocol must be approved by the IRB prior to its implementation. Please submit a complete document.

- ☐ Expedited Review or ☐ Full Board Review

☐ 1 original, signed* IRB-3Amendment Review Form **(required)**. *Signed application required for paper submissions only.

☐ 1 clean and 1 track-change version of all documents amended

☐ 1 copy of any new documents being added

Adverse Event (IRB-4) & Protocol Deviation (IRB-6) Reports – All submissions (IRB-1, IRB-5, IRB-7 or

IRB-9):

☐ 1 original, signed* Adverse Event Report **(required)** or ☐ 1 original, signed* Protocol Deviation Report **(required)**

*Signed application required for paper submissions only.

Research Compliance Services Receipt

Submitted Material Received by:

Date Received:

New Submission Assigned Protocol # _____

IRB-1 Study Protocol

Protocol Version # and/or Date: H17-238

Study Protocol Title:

The Psychology of Baseball: How the Mental Game Impacts the Physical Game

Clinical Trial/GCP Training

Is this a research study in which one or more human subjects are prospectively assigned¹ to one or more biomedical or behavioral interventions² (which may include placebo or other control) to evaluate the effects of those interventions on health-related biomedical or behavioral outcomes³ (i.e a clinical trial)? Indicate “yes,” “no,” or “N/A” in the space immediately below.

Yes

Is the study fully or partially funded by the NIH? Indicate “yes,” “no,” or “N/A” in the space immediately below.

No

¹The term “prospectively assigned” refers to a pre-defined process (e.g., randomization) specified in an approved protocol that stipulates the assignment of research subjects (individually or in clusters) to one or more arms (e.g., intervention, placebo, or other control) of a clinical trial.

²An intervention is defined as a manipulation of the subject or subject’s environment for the purpose of modifying one or more health-related biomedical or behavioral processes and/or endpoints. Examples include: drugs/small molecules/compounds; biologics; devices; procedures (e.g., surgical techniques); delivery systems (e.g., telemedicine, face-to-face interviews); strategies to change health-related behavior (e.g., diet, cognitive/behavioral therapy, exercise, development of new habits); treatment strategies; prevention strategies; and, diagnostic strategies.

³ 3. Health-related biomedical or behavioral outcome is defined as the pre-specified goal(s) or condition(s) that reflect the effect of one or more interventions on human subjects’ biomedical or behavioral status or quality of life. Examples include: positive or negative changes to physiological or biological parameters (e.g., improvement of lung capacity, gene expression); positive or negative changes to psychological or neurodevelopmental parameters (e.g., mood management intervention for smokers; reading comprehension and /or information retention, behavioral intervention for psychiatric symptoms); positive or negative changes to disease processes; positive or negative changes to health-related behaviors; and, positive or negative changes to quality of life.

Have the required key personnel completed Good Clinical Practice (GCP) Training? Indicate “yes,” “no,” or “N/A” in the space immediately below. (Note that IRB approval will not be given for NIH funded clinical trials until all required key personnel complete the GCP training.)

N/A

Research Plan

Purpose/Introduction:

This study is being performed to see the impact that mental readiness has on athletic performance in the game of baseball. The research hypothesis is that mental readiness, as described and taught in The Inner Game of Tennis (1972) by Timothy Gallwey, will improve the performance of baseball players. The goal of the study is to prove the hypothesis.

The Inner Game of Tennis is a widely renowned book in the field of sports psychology. Gallwey, a tennis instructor, realized that his clients were most often messing up on the things that they knew how to do best. In the book, he describes how to separate one mind from the other, and isolate it so that an individual can always give their best performance possible. Pete Carroll, the current head coach of the NFL Seattle Seahawks, has sworn by the book since his time as head coach of the football program for the University of Southern California. He gave it to several players there, who later went on to play in the NFL. He still uses it at Seattle and even wrote his own version for football. The book is not useful for sports professions alone, however. It is also used in medical fields, performing arts, and many more careers.

The hope with this study is that those participants who are assigned the book can prove that the book improves athletic performance. Baseball is a unique sport in that nearly every aspect of it can be transformed into a variable or statistic and monitored. One aspect that cannot be monitored is the mental state of the athlete when he steps onto the diamond. For example, a player who is well-known to be one of the best hitters on the team could be off his mental game one day and hit terribly. As a result, several of his statistics that derive from the science of sabermetrics would be negatively impacted. If he had been able to separate himself from that negative mental state, however, perhaps he would have hit well and kept his numbers steady or improved them.

For EACH Participant Population State the Number of Participants to be Enrolled and Screened, if applicable: The number of participants to be enrolled will be the size of the baseball team for the fall season, which should be close to 40.

Justification of Sample Size: The sample size of approximately 40 is appropriate because it is a convenience sample. The study is intended for members of the baseball team, so using the size of the team's roster is the straightforward method. The method should proceed as cautious due to the small sample size, however. Although there are more than 30 participants, the researchers should proceed with caution. Using a sample size determination formula with a power of .8, t-tests of independent groups, an effect size of .5, and alpha of .05, the minimum sample size required is 128, with 64 in each group. Because this is a convenience sample, the small sample size will have to be clearly noted.

For EACH Participant Population State Describe the Study Population(s): The participant population consists of a group of male college students that are members of the University of Connecticut's varsity baseball team. Their ages will range from 18 to 23. Their ethnicities will be of all different backgrounds and their incomes will be of various levels, but these are not of concern to the study.

Enrollment of UConn Students and/or Employees:

UConn student-athletes will be enrolled in the study. These students do not include those who any key research personnel teachers or for whom any key research personnel has any responsibility. They are being studied because their athletic improvement is important to the image and success of the university. UConn employees will not be enrolled in the study.

Enrollment of Key Personnel, Spouses or Dependents/Relatives: Will study key personnel, spouses of key personnel, or dependents/relatives of any key personnel be enrolled in the study? If so, describe and provide justification.

Study key personnel, spouses of key personnel, or dependents/relatives of any key personnel will not be enrolled in the study.

For EACH Participant Population Describe Recruitment Methods:

Participants will be identified by their participation as a member of UConn's varsity baseball team. They will be recruited in a meeting with the team, where the student researcher will give a speech, asking for their participation. Each member of the team will also receive an email about the study from the student researcher, following nearly the same script as the presentation. In order to prevent a member of the team from feeling coerced into participation, not only will it be repeatedly stressed that the study

is completely voluntary, but also players will be asked to keep their participation or lack thereof in the study private until the study has actually begun.

Design, Procedures, Materials and Methods:

The study will be a two-sample experiment. Each participant in the study will be randomly assigned a numerical identifier within the range of the number of participants. The subjects will then be asked to answer the first survey, where they will indicate one of three positions: pitcher, infielder, or outfielder. These three positional groups will then be divided. Using randomization, half of each positional group will be assigned to the experimental group, while the other half will be assigned to the control group. The subjects will be studied during the 2017-2018 baseball year. Their fall games will be used as the control group of data and the spring games will be used for the comparison data. The number of games played in the spring that will be used for the study will match the number of games played in the fall scrimmage season from the team's set of intramural games. Each individual's statistics will be manually recorded by the coaches and then put into the spreadsheet by the student researcher. Over the University's winter recess, the participants in the experimental group of the study will be required to read the assigned book. They will not be allowed to share any of the information between groups. For the spring games, the statistics in question will continue to be monitored. At the end of the period of games, the participants will be asked to answer a final survey. There is a different survey for the experimental and control groups. Once all of the data collection is complete and recorded, analysis will be performed using SAS software. Final conclusions will be drawn and written into a thesis paper.

All of the surveys will ask for the participant for their numerical identifier for the study, height, weight, age, year in school, position out of the three groups, throwing arm, and batting side. The initial survey will ask questions regarding the player's game, opinion on mental preparation strategies, and if he is experiencing outside factors that may affect his ability to focus, in addition to his name, school email address, and phone number in case he needs to be contacted. He may be contacted if he failed to respond to a survey question, won't be eligible for the study, or if he hasn't arrived to a scheduled session. The final survey is different for the experimental and control groups. Those in the experimental group will be asked questions regarding the player's opinions on the book, the efficacy of the book, the efficacy of the experiment, the status of his game, if he enjoyed the experiment, and if he will continue to consult the book in the future. For those in the control group, the survey will ask a participant questions regarding if members of the experimental group what they read in the book and if so what it was they revealed, if he did any outside mental preparation and if so what it was, if he thought as a member of the control group that the book helped his teammates, and if he would consider reading the book. The surveys will be used to evaluate a participant's ability to be involved in the study, any belief or disbelief in mental readiness prior to the study, the efficacy of the study, the efficacy of the book, and the belief or disbelief in mental readiness after the study.

Several variables will be monitored throughout the study. For participants in the pitchers group, the variables monitored include earned run average (ERA), total number of pitches thrown, total number of strikes, total number of strikeouts, speed of the pitch, walks plus hits per inning pitched (WHIP), stolen base attempts (SBA), and walks. For participants in the infielders and outfielders groups, the variables monitored include batting average, runs batted in (RBI), on-base percentage (OBP), on-base plus slugging (OPS), total number of errors, batting average on balls in play (BABIP), total number of hits, total number of singles, total number of doubles, total number of triples, total number of homeruns, and field percentage. All participants will also be monitored for wins above replacement (WAR), which is an overall statistic. These variables are all supported by the science of semantics. If any of them alter between the two time groups, then this could help prove or disprove the research hypothesis.

Data Analysis:

Several t-tests will be used to analyze the quantitative data. The observation period will be split into two periods, one for before the book and one for after the book. Means or medians of the measured variables will be used, depending on the distribution of each variable. If the distribution follows a normal curve, then the mean will be used. If the distribution follows a skewed curve, then the median will be used. The first test will be a paired t-test for each group to see if any participants in each group have changed their mean statistics between periods. So, if player A is a participant in the experimental group for the pitchers group, his mean statistics for the first period of time will be compared against his mean statistics for the second period of time. This will occur for each participant in each group. Afterwards, there will be a two-independent samples t-test to determine if there is a significant difference between members in the control group and members in the experimental group. This type of test will be done both at a collective level and at a position level. That means that for one test, all of the control group participants will be compared against all of the experimental group participants, and for the other set of tests, the control group participants for one position will be compared against the experimental group participants of that respective position.

For the qualitative data collected in the surveys, they will be used as categorical variables in the study and as counts for who agreed or disagreed with what question. Some parts of the surveys, such as height, weight, and age, will be considered as quantitative variables and will be checked to see if participants in either the experimental or control group responded differently to the study based upon each factor. Other parts of the surveys, such as throwing arm, batting side, and year in school, will be considered as categorical variables and will be checked to see if participants in either the experimental or control group responded differently to the study based upon each factor. The responses to the questions will be recorded. They will be noted to see if there is a significant difference between believers in mental readiness before and after the study, if participants found the study effective, and if the book was found useful.

Inclusion/Exclusion Criteria:

Participants are eligible if they are between the ages of 18 and 23 inclusive, are a member of UConn's varsity baseball team, are deemed athletically eligible, are deemed academically eligible, do not have outside factors in their life occurring that may negatively impact their mental capacity for the study (e.g. have a death in the family), do not reveal information from the book in the study, and are male.

Participants are not eligible if they do not comply with study rules, are removed from the study, share information from the book in the study, are not between the ages of 18 and 23 inclusive, are not male, are not a member of UConn's varsity baseball team, are deemed athletically ineligible, are deemed academically ineligible, and have outside factors in their life occurring that may negatively impact their mental capacity for the study (e.g. a death in the family).

Potential Harms/Risks and Inconveniences:

There are no known harms or risks for the study. There may be an inconvenience in the time it takes to complete the surveys and read the book.

Benefits:

As a result of the study, the performance of the players may improve so that they are almost always giving their best possible performances. If the study proves successful, it could be applicable to not only baseball, but also other sports and professions.

Risk/Benefit Analysis:

There are no known or assumed risks for the study. The benefits, while not proven, are likely. Therefore, there is a greater chance of benefitting from participation in the study than from suffering a risk.

Economic Considerations: The participants will not be subject to any costs. They also will not receive any compensation, as doing such would violate NCAA rules and regulations.

Data Safety Monitoring:

Survey results will be monitored by the PI and student investigator at the beginning and end of the study. Survey responses will be reviewed and recorded in a spreadsheet for both times. Throughout the study, the PI and student researcher will collect data and statistics from the coaching staff, as well as monitor their own variables. The monitored data include weight, height, age, year in school, position, throwing arm, batting side, ERA, pitches, strikes, strikeouts, speed of pitch, WHIP, SBA, walks, batting average, RBI, OBP, OPS, errors, BABIP, stolen bases, singles, doubles, triples, homeruns, hits, field percentage, and WAR. If data have problems, they will become censored or incomplete observations. The PI will communicate with the IRB when necessary and it will be the responsibility of the student researcher to make sure everything is up-to-date and ready for review.

Privacy/Confidentiality Part 1:

All of the data will be recorded in the student researcher's private computer that is up-to-date with anti-virus protection. All files will be encrypted using Windows 10 Pro encryption called BitLocker. They will be shared between the PI and student researcher through email and encrypted email. If a participant wishes to withdraw their information, declines to reveal information, or wishes their confidentiality, then that should be granted immediately.

Privacy/Confidentiality Part 2: Complete the Data Security Assessment

Form: [This form IS REQUIRED for ALL studies. The form is available here - <http://research.uconn.edu/irb/irb-forms-infoed/>. This form will be used to assess procedures for protecting confidentiality of data collected during the study and stored after closure. It will also be used to assess plans for storage and security of electronic data in accordance with University Best Practices. Review the document proving tips to complete the form located at <http://content.research.uconn.edu/pdf/storrs/rcs/irb/TipsDataSecurityAssessmentForm.docx>.

Informed Consent

As PI, you are responsible for taking reasonable steps to assure that the participants in this study are fully informed about and understand the study. Even if you are not targeting participants from "Special Populations" as listed on page 4, such populations may be included in recruitment

efforts. Please keep this in mind as you design the Consent Process and provide the information requested in this section.

Consent Setting:

The PI and student researcher will obtain consent. It will be obtained within a week of the meeting with the potential participants at Austin 315, giving the participants a week maximum to make a decision. Participants will be assigned a random number and referred to such in the study, keeping their privacy and making their identification a secret. Other potentially sensitive information will be encrypted.

Parent/Guardian Permission and Assent: Children will not be enrolled in the study.

Documentation of Consent: An adult consent form will be given to each participant. Each participant will receive one copy of consent for their keeping, and one consent form to complete and turn in.

***Waiver or Alteration of Consent:** [The IRB may waive or alter the elements of consent in some minimal risks studies. If you plan to request either a **waiver of consent** (i.e., participants will not be asked to give consent), an **alteration of consent** (e.g., deception) or a **waiver of signed consent** (i.e., participants will give consent after reading an information sheet), please answer the following questions using specific information from the study:]*

Waiver (i.e. participants will not be asked to give consent) or alteration of consent (e.g. use of deception in research):

- Why is the study considered to be minimal risk?
- How will the waiver affect the participants' rights and welfare? The IRB must find that participants' rights are not adversely affected. For example, participants may choose not to answer any questions they do not want to answer and they may stop their participation in the research at any time.
- Why would the research be impracticable without the waiver? For studies that involve deception, explain how the research could not be done if participants know the full purpose of the study.
- How will important information be returned to the participants, if appropriate? For studies that involve deception, indicate that participants will be debriefed and that the researchers will be available in case participants have questions.

Waiver of *signed* consent (i.e. participants give consent only after reading an information sheet):

- Why is the study considered to be minimal risk?
- Does a breach of confidentiality constitute the principal risk to participants? Relate this to the risks associated with a breach of confidentiality and indicate how risks will be minimized because of the waiver of signed consent.
- Would the signed consent form be the only record linking the participant to the research? Relate this to the procedures to protect privacy/confidentiality.
- Does the research include any activities that would require signed consent in a non-research setting? For example, in non-research settings, normally there is no requirement for written consent for completion of questionnaires.

References / Literature Review:

UConn[®]

BASEBALL

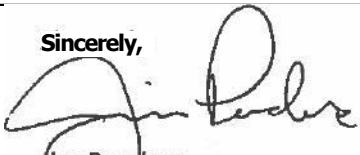
August 10, 2017

Dear Sir or Madam:

Kiera Dalmass has my permission to study our players and team statistics this year at the University of Connecticut. I'm looking forward to seeing the fruits of her labor at the conclusion of her research. She met with me in the spring of 2017 to seek approval, and I granted it at that time.

If you have any questions or concerns, please don't hesitate to contact me at james.penders@uconn.edu.

Sincerely,



**Jim Penders
Head Coach, UConn Baseball**

Thanks very much.

2111 Hillside Road, Unit 1078
Storrs, Connecticut 06269-1078

An Equal Opportunity Employer



PHONE 860-486-4
FAX 860-486-0

James.Penders@uconn.edu



Principal Investigator: Dr. Haim Bar

Student Researcher: Kiera Dalmass

Study Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game

Script for Email to Players

Dear [insert name],

My name is Kiera Dalmass and I am a member of the Honors Program. I'm an undergraduate student studying statistics, and as part of my senior year in the Honors Program, I am required to submit a final thesis paper. My thesis is regarding the effects of a mental preparation book on the performance of athletes, specifically baseball players. Baseball is a unique sport, since you can monitor nearly every variable, resulting in the science of sabermetrics. One of the exceptions to this, however, is that it is difficult to monitor the mental readiness of a player when he steps on the mound or digs his spikes into the dirt. My intention with this study is to analyze whether or not reading a book can help perfect a player's mental game so that his physical game is almost always at its best.

If you choose to participate, which would very much so benefit the reliability of the study, you would be doing so as a volunteer. Any compensation would violate NCAA rules and regulations.

If you are to participate, I would trust that you fill everything out by their individual expected due dates and answer everything to the best of your knowledge with complete honesty.

Thank you for your consideration. If you have any questions, please contact the principal investigator, Dr. Haim Bar, at 860-486-5455 or haim.bar@uconn.edu, or myself at 609-781-1397 or kiera.dalmass@uconn.edu.

Sincerely,

Student Researcher: Kiera Dalmass; PI: Haim Bar, Ph.D.

Protocol Number: H17-238

[insert signature]

Kiera Dalmass



Principal Investigator: Dr. Haim Bar

Student Researcher: Kiera Dalmass

Study Title: The Psychology of Baseball: How the Mental Game Impacts the Physical Game

Script for Presentation to Players

Hi everyone! My name is Kiera Dalmass and I am a member of the Honors Program. I'm an undergraduate student studying statistics, and as part of my senior year in the Honors Program, I am required to submit a final thesis paper. My thesis is regarding the effects of a mental preparation book on the performance of athletes, specifically baseball players. Baseball is a unique sport, since you can monitor nearly every variable, resulting in the science of sabermetrics. One of the exceptions to this, however, is that it is difficult to monitor the mental readiness of a player when he steps on the mound or digs his spikes into the dirt. My intention with this study is to analyze whether or not reading a book can help perfect a player's mental game so that his physical game is almost always at its best.

If you choose to participate, which would very much so benefit the reliability of the study, you would be doing so as a volunteer. Any compensation would violate NCAA rules and regulations.

If you are to participate, I would trust that you fill everything out by their individual expected due dates and answer everything to the best of your knowledge with complete honesty.

Thank you for listening. If you have any questions, you can ask them now or contact me or my research mentor. If you would like that information, please stick around.