

GRAHAM, ADAM D. Ed.D. HELPING PARENTS TO PITCH SMART: EVALUATION OF AN EDUCATIONAL PROGRAM FOR PARENTS OF LITTLE LEAGUE BASEBALL PLAYERS TO REDUCE INJURY RISK BEHAVIORS. (2022)

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Many youth athletes and their parents focus specifically on baseball with the belief that it will aid with obtaining a college scholarship and maybe even reach the professional level. However, evidence shows that this can increase injury risk and injury in these young developing skeletons. The literature also suggests that educating parents could reduce these injuries. Using a web-based survey and educational video, this study aimed at educating parents on injury risk and prevention guidelines. A total of 32 parents completed the pre-survey, answering questions about their familiarity with potential youth injuries, current practices, and familiarity and knowledge of the Pitch Smart guidelines. Parents were then asked to watch an educational video covering potential injuries and Pitch Smart guidelines. Once viewed, parents (n=8) completed the post-survey, which asked the same knowledge questions. To increase participants, college athletes were invited to participate as well; 13 started the pre-survey but only 4 completed the post-survey. Parents increased significantly on their overall knowledge score (pre-survey: 11.6 ± 2.77 , post-survey: 16.0 ± 1.60 , $t(7) = -5.79$, $p < .001$) as well as injury familiarity after the educational video, while there was little improvement in the college athletes. Responses on the post-survey evaluation were positive but suggested the video was too long and could have benefited from format changes. Further research with larger samples is needed to develop effective educational programs and delivery methods.

HELPING PARENTS TO PITCH SMART: EVALUATION OF AN
EDUCATIONAL PROGRAM FOR PARENTS OF LITTLE LEAGUE BASEBALL PLAYERS
TO REDUCE INJURY RISK BEHAVIORS

by

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Dr. Diane L. Gill
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DEDICATION

I would like to dedicate this to my wife. Without your love and support, I would not be who I am and where I'm at without you! Also to my daughter, Hattie, who was born at the start, and my son CJ, both of you keep me striving to be a better person!

APPROVAL PAGE

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CHAPTER I: PROJECT OVERVIEW

Many young athletes dream of playing the sport they love professionally, looking to their parents for guidance. This long road often starts with youth sports for most young athletes. As these children begin to show some skill, the athletes and parents may begin dreaming of college scholarships despite a small percentage of high school students receiving one (Ginsburg et al., 2014; Swindell et al., 2019). The young athlete may begin to focus solely on a single sport leading to early sport specialization and, along with their parents thinking it was paramount. One study found that some athletes, not specifically baseball, on average started specializing at eight years old (Padaki et al., 2017). Parents are likely to encourage specialization without understanding the possible injury implications. Although specialization may have benefits, for many youths, it may result in their careers coming to an early end due to burnout or injury (Ginsburg et al., 2014).

Overuse injuries, such as ligament injury, stress fractures, and loose bodies in the joint, have been identified as potential injuries resulting from specializing in a sport at an early age (DiFiori et al., 2014; Jayanthi et al., 2015). Specifically, in baseball, current research indicates that between 26% and 35% of pitchers will experience shoulder or elbow pain each year (Popchak et al., 2015). Approximately 5% of Little League participants suffer an injury that leads to surgery or retirement from baseball (Popchak et al., 2015). Based on research on injury risk behaviors (Fleisig et al., 2011; Fleisig & Andrews, 2012; Yang et al., 2014), Little League baseball and Major League Baseball teamed up to create the MLB Pitch Smart program to educate these young athletes, coaches, and parents on the recognized risky behaviors that can lead to injury (MLB, 2019). Nevertheless, youth baseball pitchers continue to participate in these

behaviors. This project addresses this issue by developing and evaluating an educational resource for parents on injuries, risky behaviors, and the recommended guidelines.

Background Literature

Despite the belief that athletes should specialize at a young age, an investigation of early-round MLB draft picks and their sport specialization practices as a child demonstrated that those who participated in more than one sport played in more minor-league and major-league games than those who were single-sport athletes (Confino et al., 2019). Additionally, some professional and amateur pitchers who sustained an Ulnar Collateral Ligament (UCL) injury during their professional careers had elbow injuries as a youth player (Vance et al., 2019). These pitchers also believed that fatigue from the season could increase the likelihood of sustaining a UCL injury (Vance et al., 2019).

The question bears asking, what or who is driving these young athletes to participate in the potentially risk-prone activities? Although well-intentioned, many parents do not know or follow the MLB Pitch Smart guidelines (Zabawa & Alland, 2019). According to one study, only about 60% of parents know the MLB Pitch Smart Guidelines, and some may be aware of them but do not follow them (Zabawa & Alland, 2019). Furthermore, the children of parents who did follow the guidelines were less likely to sustain an arm injury (Zabawa & Alland, 2019). Increasing parents' knowledge and understanding of the MLB Pitch Smart guidelines, the injuries, and risk behaviors could aid in reducing injuries sustained by these young pitchers.

The Guidelines

In 2014, MLB and USA Baseball unveiled their new Pitch Smart initiative. This initiative intends to inform youth athletes, coaches, and parents about approaches to help prevent injuries. Using some of the most recent data, a group of medical professionals, including orthopedic

surgeons and researchers from the American Sports Medicine Institute, developed these guidelines. The current guidelines suggest that 9 to 12-year-old pitchers should not pitch more than 80 innings in a year, complete a proper warm-up, follow pitch count guidelines, throw fastballs and changeups, not play for more than one team, not catch in the same game that they pitch, should not pitch in different games on the same day, should not focus on just one sport and should play multiple sports, should not return to the same game as a pitcher, and should not pitch on consecutive days (MLB, 2019; Yang et al., 2014). While several guidelines are listed, a common theme is that many of the behaviors lead to fatigue and subsequent injury.

The Role of Fatigue

Early studies determined that for every 10 pitches thrown, the risk of elbow pain increased 10%, reaching 50% at 75 pitches, with those pitchers throwing more than 75 pitches three times more likely to develop shoulder pain when compared to those who threw less than 75 (OR = 3.2, $p < .01$) (Lyman et al., 2001). Hence, Little League baseball elected to switch from an innings pitched limit to now use pitch count limits (Lyman et al., 2001). Though there has been a shift from innings to pitch count limits, pitching too many innings and games over the course of a year continues to be a risk factor (Fleisig & Andrews, 2012; Matsuura et al., 2013).

In addition to throwing too many pitches throughout a game and a season, not taking adequate time off from pitching during a calendar year has also been linked to increased arm pain. A recommendation made in 2012 (Fleisig & Andrews, 2012) suggests that pitchers take at least three months off from throwing. Pitching for more than eight months in a calendar year increased arm injury risk five times (OR = 5.05) compared to a non-injured group pitching for 5.5 months (Olsen et al., 2006). More recently, however, other studies (Chalmers et al., 2015; Yang et al., 2014) could not replicate these findings. Nevertheless, the goal is to decrease fatigue,

meaning that as the months of pitching increase, their total pitch count, innings, and games would all reach numbers that have been shown to lead to fatigue and possible injury.

Given that fatigue is subjective, many studies have examined fatigue through surveying. Regardless of survey timing, many pitchers (69%-82%) experienced arm fatigue (Register-Mihalik et al., 2012; Yang et al., 2014), and half of the pitchers from another study (52%) pitched despite arm fatigue (Olsen et al., 2006). Those that pitch while fatigued are almost six times more likely to develop pain at the shoulder (OR = 5.94, $p < .01$) and four times more likely to develop pain at the elbow (OR = 4.04, $p < .01$) (Lyman et al., 2001). Moreover, another study found that those who pitched despite arm fatigue were 36 times more likely to develop an arm injury (Olsen et al., 2006). More recent studies found that those who sometimes or often pitched with arm fatigue or tiredness were 3.71 times and 7.88 times more likely to develop an arm injury (Yang et al., 2014). It could be argued that pitching in too many games, pitching too many games per year, or too many innings per year and not taking enough time to allow their young skeletons to rest cause these problematic fatigue levels.

Gameday Risk Factors and Guidelines

Pitching on consecutive days (Yang et al., 2014), playing catcher (Fleisig et al., 2011), playing for more than one team (Chalmers et al., 2015; Lyman et al., 2001), and participating in a showcase have all been linked to a possible increase in arm fatigue and the development of arm pain. Those who pitched on back-to-back days were four times (OR = 4.36) more likely to develop arm fatigue and 2.5 (OR = 2.53) times more likely to develop arm pain (Yang et al., 2014). Further, pitching in multiple games per day increased the likelihood of developing arm pain (OR = 1.89) (Yang et al., 2014). Approximately 30% of respondents indicated that they pitched for more than one team during a calendar year (Yang et al., 2014). Participants in Yang

et al. (2014) were over three times (OR = 3.37) more likely and almost doubled their (OR = 1.85) chances to develop arm tiredness and arm pain, respectively.

One study (Register-Mihalik et al., 2012) demonstrated that pitching in a showcase could lead to an elbow injury and shoulder pain in Little League participants. The author did not provide a thorough explanation; however, this primary investigator speculates that these showcases could occur on the same day or the next day after a pitcher had pitched or may occur when they had little rest. Additionally, these events can also occur during the off-season when these pitchers are not adequately conditioned to pitch (Olsen et al., 2006). From personal experience, two additional explanations could be the use of a radar gun causing these young pitchers to throw the ball harder to impress and are not given ample time to warm up.

Despite some literature (Olsen et al., 2006; Register-Mihalik et al., 2012) and biomechanical studies' inability to determine an increase in torque at the elbow (Yang et al., 2014), recommendations remain for Little League pitchers to avoid throwing breaking pitches such as curveballs and sliders. Support for this comes from studies (Lyman et al., 2002; Yang et al., 2014) demonstrating that throwing breaking pitches can increase injury. Given this discrepancy, this guideline continues to be included in the MLB Pitch Smart guidelines.

Overuse Injury

As previously discussed, speculation is that the repeated pitching motion leads to tiredness or fatigue, potentially resulting in overuse injury (Lyman et al., 2001; Norton et al., 2019; Yang et al., 2014). This injury could significantly impact the developing skeletal bone of these young pitchers (Lyman et al., 2001; Olsen et al., 2006), primarily at the elbow and shoulder's physal plates, where the bone is still growing (Popchak et al., 2015). In these immature skeletons, the bones have less mineral content and a less rigid structure resulting in a

weaker bone, but one that is also more able to absorb energy (Popchak et al., 2015). These structures can handle tensile loads, however, they do not tolerate distraction or rotational forces, which can lead to injury (Popchak et al., 2015; Sabick et al., 2005). Repeatedly taking their arms forcefully into external rotation causes bone remodeling at the shoulder resulting in a rotational change in the formation of the bone. If not managed, this causes a fracture in the proximal humeral physis, called Little League Shoulder, prevalent in 12-13 year-olds (Heyworth et al., 2016; Sabick et al., 2005).

From 1994 through 1998, youth and high school pitchers accounted for 10 of the 124 Ulnar Collateral Ligament (UCL) surgeries performed at the Andrews Sports Medicine clinic, which then rose to 41 of 131 by 2010 (Fleisig & Andrews, 2012). Additionally, a study examining the National Electronic Injury Surveillance system reports from 2006 to 2016 found over 650,000 baseball injuries occurred to those under 18, with the average age of injury at 11.5 (Trofa et al., 2019). Overall, baseball injuries decreased towards the end of 2016, however, the incidence of elbow injuries due to overuse from throwing increased. Arm injuries continue to occur, and some of the basic recommendations that have been made previously, such as pitch and innings counts, may not be enough.

Purpose

The purpose of this study is to develop and evaluate an educational program to help parents understand behaviors that increase the risk of injuries in baseball, and the guidelines recommended to address these behaviors.

Specific Aim #1: Determine the current parent knowledge of baseball-related youth injuries and the MLB Pitch Smart program.

Specific Aim #2: Develop an evidence-based educational program on baseball-related youth injuries and the MLB Pitch Smart program.

Specific Aim #3: Determine the impact of an educational program on parents' knowledge of baseball-related youth injuries and the MLB Pitch Smart program.

Methods

This project investigated the effect of an educational program on parents' knowledge of behaviors that increase the risk of injury and the recommended guidelines to reduce injury risk in youth baseball. Knowledge was assessed via a survey before and after an educational program designed to educate parents about the established MLB Pitch Smart guidelines and potential injuries that could be sustained.

Participants

Primary participants were parents of Little League baseball athletes focusing on 10 & under and 12 & under leagues. Emails were sent to league directors containing a brief overview of the study, a link to the survey, as well as the IRB information sheet. Additionally, the League director posted the recruitment information to the League's Facebook page. The survey was anonymous and asked for the last four digits of a phone number to track the pre and post responses.

Due to a lack of responses, new recruitment materials were drafted to include all the necessary links to the pre-survey, educational video, and post-survey and no longer required the email submission. In addition to the recruitment materials, the pre-survey and video contained links to the next phase of the study. These new recruitment materials were sent again to league directors, travel ball, and baseball-focused facilities and shared with parents through several other mass distributions.

The pre-survey received 62 responses, but only 32 completed the entire survey. Their ages were distributed across age categories from 18 to 51 and over. Of these, 17 were female, and 15 were male. Eight indicated they were also a coach, with 6 coaching 12 year-olds and below, and only 3 have any training or certification. All but 1 of the 32 had at least one child that played Little League, with a majority playing in the 12 & under (n=5) and 10 & under (n=14) groups combined, while 8 played in the 13-18 group and 4 played in the 8 & under group. Additionally, 10 indicated that they had another child that also played Little League. When asked what position their child played, 21 of the participants indicated that their child pitched with some playing other positions as well (n=19), and 22 indicated that their child also played another sport.

Of the 32 who did the pre-survey, only 8 completed the post-survey. The ages ranged from 31 to 50, with half aged 46-50 (n=4). Three were male, and 5 were female. Of these 8 only 2 coached, 1 for the 10 & under, the other in the 12 & under, and 1 had received training. Most had children who played in either the 12 & under league (n=1) or the 10 & under league (n=5), while the other two played in the 13-18 league. Additionally, 1 parent indicated that they had another child that played Little League. When asked about what position their child played, 6 indicated that their child pitched and played some infield while the other two were position players only, and all 8 played other sports.

To expand the sample, a secondary group of collegiate baseball athletes was recruited. The information was sent to five collegiate baseball head coaches. The pre-survey received 16 responses, of which 13 completed the entire survey. The average age was 20.3 ± 1.65 , with a majority white (n=12) and one Hispanic individual. All 13 played in the 12 & under age group, while nine played in both the 10 & under and 8 & under age groups, and most (n=11) played at

least one other sport as a child. Of the 13 who completed the pre-survey, only 4 completed the post-survey. The average age was 20.0 ± 1.63 , three of the four were white and one was Hispanic. All had played in the 12 & under league, and three played in the 8 & under.

Surveys

Surveys were developed specifically for this study and completed using Qualtrics. Previous studies assessing parents' knowledge of the Pitch Smart guidelines served as a guide in survey development (Arnold et al., 2019; Zabawa & Alland, 2019). The pre-survey started with demographic information and questions about their child, such as league age division, position played, and other sports played. Additional questions asked their familiarity with the Pitch Smart guidelines, common injuries, and current practices. Both surveys assessed parents' knowledge with questions related to the Pitch Smart guidelines. There were two multiple-choice questions and one true/false question on specific Pitch Smart guidelines. The other two questions were "select all that apply." The first asked to identify risk factors identified by the Pitch Smart guidelines, and the second asked them to identify the recommended guidelines. On the first question, there were nine options, with six being correct, and for the second, there were 13 with nine being correct. Altogether a perfect score was 18. Complete pre and post surveys can be found in appendix A and B respectively. The post-survey had the same series of questions with additional questions to evaluate the educational video using ratings of the speaker and presentation and open-ended questions about what was liked or disliked.

The survey that was sent to the collegiate baseball athletes used most of the same questions. Specifically, it included the same injury familiarity and knowledge questions but asked them additional questions about their Little League participation.

Educational Video

An educational video covering potential youth injuries and the Pitch Smart guidelines was developed for the study. The educational video attempted to meet the assumptions of andragogy specifically by focusing on what they need to know, their readiness to learn, their orientation to learning and making it immediately applicable for parents (Chametzky, 2014; Ozuah, 2016). Primarily focusing on the parents' readiness to learn, The video was approximately 19 minutes long, with a PowerPoint presentation, and recorded via Zoom. The video was then uploaded to YouTube. The educational program began by introducing the presenter and their related background. Additional sections included the potential injuries youth athletes can sustain, structures involved, and their incidence rates. The final portion covered the Pitch Smart guidelines as presented on the MLB Pitch Smart website. The video was made as interactive as possible by presenting scenarios and asking parents to pause the video and identify the guidelines not being followed. The scenarios intended to connect how the risky behavior can lead to repetitive trauma, subsequent injury, and any appropriate injury rates and risk ratios. Below is an example of one of the scenarios:

William is a 12-year-old and one of the best pitchers in the league. He pitches every opportunity for his Little League team. While William, his coach, and his parents follow the appropriate rest in between outings, he still amasses a large number of innings. He then goes and pitches for his travel ball team. He amasses 100 innings through the year. With it being such a busy year and doing well, he doesn't really get much time off and only gets a few weeks here and there in between each Leagues respective seasons.

Analysis

Much of the analysis was descriptive. Responses to the knowledge-related questions were coded as correct/incorrect to calculate an overall knowledge score. Paired t-tests were used to compare pre and post-knowledge scores and pre-post scores on familiarity items for those who completed both surveys. Frequencies and common responses were identified for the ratings and open-ended responses on the post-survey evaluation of the educational intervention.

Results

The pre-survey sample's descriptive findings for the familiarity, current practices, and knowledge scores, including both parents and college athletes, are presented first. Then pre-post comparison in those same questions and lastly, the evaluation of the educational video by both samples.

Pre-Survey

The primary focus of this study was the parents' knowledge of the MLB Pitch Smart guidelines and their familiarity with injuries youth baseball athletes could sustain. Parents' familiarity scores with the three different injuries were distributed across the range from very to not all for Little League Shoulder and elbow, however, most parents were not familiar at all with osteochondritis dissecans. Parents' level of familiarity with and if they follow the Pitch Smart guidelines were of significant interest. 31% indicated that they were not familiar at all with the pitch smart guidelines; however, over half indicated they followed them. Parents were also asked about some of their current practices, which can be found in table 1 and table 2. All but 3 parents indicated that their league followed pitch counts, while 3 did not know, and a majority indicated that the coaches were the ones keeping the counts. On the other hand, close to half of parents stated that they did not keep a weekly innings count.

Table 1. Pre-survey Parents' Familiarity Responses.

	Very Familiar (1)	Moderately Familiar (2)	Slightly Familiar (3)	Not Familiar at all (4)	Mean (SD)
How familiar are you with Little Leaguer's Shoulder?	4	10	7	11	2.8 ± 1.07
How Familiar are you with the term Little Leaguer's Elbow?	10	6	7	9	2.5 ± 1.22
How Familiar are you with the term Osteochondritis Dissecans?	3	3	4	22	3.4 ± 1.01
How Familiar are you with the Pitch Smart Guidelines?	5	5	12	10	2.8 ± 1.05

Table 2. Pre-survey Parent Current Practices

	Yes	I don't know	No
Do you follow the Pitch Smart guidelines?	16	14	2
Do you keep a weekly innings count	15	2	14

The primary measure was the parents' knowledge. Most of parents missed the multiple-choice questions, 71% and 62% respectively, while 78% answered the true-false question correctly. On the select all that apply questions, parents were a little better at identifying the risk factors scoring 4.2 of a possible 6, compared to 5.8 of 9 identifying the guidelines. Their average total knowledge score, combining MC, T/F and select all that apply, was 11.5 of a possible 18.

Table 3. Pre-survey Parents' Knowledge Scores.

	Correct/ Score	Wrong	Mean Score (SD)
How many days rest should a 9-12-year-old pitcher have?	9	23	n/a
Play for more than one team at the same time (True/False)	25	7	n/a
Youth Pitchers are most at risk for injury when they:	12	20	n/a
Which of the following are risk factors for injury in Little League Pitchers. Select all that apply. (6 possible)	n/a	n/a	4.2 (1.17)
Which of the following are Pitch Smart Guidelines for those aged 9-12? Select all that apply. (9 possible)	n/a	n/a	5.8 (2.18)
Knowledge Total	n/a	n/a	11.5 (2.90)

Total knowledge scores out of possible 18.

College Athletes Pre-Survey

Most of the collegiate baseball athletes who completed the pre-survey (n=13) were not very familiar with the three injuries as responses were mainly not familiar at all. When asked to

reflect on their youth, responses were evenly distributed for how familiar they were with and if they followed the Pitch Smart guidelines. For most athletes, the coaches and parents kept track of their pitches in a game and for a week, respectively. However, most either did not know or said their parents did not track weekly innings.

The college athletes were asked the same questions to assess their knowledge of the Pitch Smart guidelines, and the full results can be seen in the table in appendix D. Overall, the college athletes did not do well on the MC as only 1 out of 13 correctly answered the question about how many rest days are needed after throwing 36-50 pitches, and just over 50% got the T/F question correct. On the question asking them to identify risk factors, they did well selecting 5.3 ± 1.18 out of 6 correct answers, but also selected 2.1 ± 1.19 out of 3 wrong. For the second select all that apply, they selected the correct answers with fewer of the wrong options. Once all scores were combined, the average was 10.2 ± 3.27 out of a possible 18.

Pre-Post Comparisons

This section presents the results of the paired t-tests comparing the parents' scores on knowledge and the familiarity items from the pre-survey to the post-survey. Only 4 athletes completed both surveys, and no statistics were calculated.

Parents were more familiar with the injuries on the post-survey. Paired t-tests indicated that familiarity scores increased significantly, and there were fewer parents who were not familiar at all with each injury (see table 4 and 5). The responses were distributed across several options for Pitch Smart guideline familiarity; however, none felt not at all familiar. Their overall knowledge scores improved significantly, $t(7) = 5.79$, $p < .001$, from 11.6 to 16.0 out of a possible 18. Parents improved on the MC and T/F questions, and scored significantly better on both select all that apply questions asking parents to identify the risk factors and Pitch Smart guidelines.

Also of note, the effect sizes (Cohen's d) for all the significant increases found on injury familiarity and the knowledge scores are quite large and well over the suggested cut-off for large effects of .8. This suggests that these are true differences despite the low sample size. Although the t-test on injury familiarity for Little Leaguers elbow was not statistically significant, the effect size (.78) was large.

Table 4. Parent Pre-Post Familiarity Ratings, with Paired t-test Results.

	Pre	Post	t(7)	p	Cohen's d
How familiar are you with Little Leaguer's Shoulder?					
Very Familiar (1)	1	4			
Moderately Familiar (2)	2	2			
Slightly Familiar (3)	2	2			
Not Familiar at all (4)	3	0			
Mean (SD)	2.9 (1.13)	1.8(0.89)	2.55	.019	1.23
How Familiar are you with the term Little Leaguer's Elbow?					
Very Familiar (1)	3	4			
Moderately Familiar (2)	1	2			
Slightly Familiar (3)	1	2			
Not Familiar at all (4)	3	0			
Mean (SD)	2.5 (1.41)	1.8 (0.89)	1.43	.099	0.78
How Familiar are you with the term Osteochondritis Dissecans?					
Very Familiar (1)	2	3			
Moderately Familiar (2)	0	3			
Slightly Familiar (3)	0	1			
Not Familiar at all (4)	6	1			
Mean (SD)	3.3 (1.39)	2.0 (1.07)	2.38	.025	1.21

Table 5. Parent Pre-Post Knowledge scores, with Paired t-test Results.

	Pre	Post	t(7)	p	Cohen's d
How many days rest should a 9-12 year old pitcher have?	3*	5*	n/a	n/a	n/a
A youth Pitcher should not play for more than one team at the same time (True/False)	3*	6*	n/a	n/a	n/a
Youth Pitchers are most at risk for injury when they:	4*	8*	n/a	n/a	n/a
Which of the following are risk factors for injury in Little League Pitchers. Select all that apply. (6 possible)	4.0(0.93)	5.5(0.76)	7.51	<.001	1.97
Which of the following are Pitch Smart Guidelines for those aged 9-12? Select all that apply. (9 Possible)	6.4(1.92)	8.1(0.99)	2.88	.012	1.72
Knowledge Total average (18 possible)	11.6(2.77)	16.0(1.60)	5.79	<.001	2.75

* number of correct answers for these questions (n=8).

Given the low numbers, no statistical analyses were run on the collegiate athletes, and the full results can be found in appendix D. The athletes were more familiar with Little League shoulder, and Little League Elbow injuries at post as their familiarity scores increased from 0 or 1 to 3. They improved on the T/F and the days of rest questions but did worse on the injury risk question. Their scores on the risk behaviors select all that apply question, and the Pitch Smart guideline selection improved slightly. Overall, their knowledge scores increased minimally from 11.5 ± 3.70 to 13.0 ± 2.45 .

Evaluation

Parents reported that they were likely to follow the Pitch Smart guidelines and keep track of weekly innings. Most parents agreed that they knew of the Pitch Smart Guidelines and the injuries before the study. They also reported that the educational program helped them see the importance of the guidelines. All 8 indicated they would follow and 7 indicated they would encourage others to follow them. Most felt that the educational program was extremely informative and that the presenter was extremely knowledgeable. The lowest rating, although still positive, pertained to the video format; these can be seen in tables 6 and 7.

The collegiate athletes were asked similar questions, and two of the four indicated that they somewhat disagreed that they knew about the Pitch Smart guidelines prior to the study but either "somewhat agreed" (n=2) or "strongly agreed" (n=2) that they knew of the potential injuries. All four did "strongly agree" that they would encourage LL athletes to follow the Pitch Smart Guidelines. All athlete respondents (n=4) felt that the presenter was extremely knowledgeable and that the video was informative. Three out of four stated they were highly likely to recommend the educational video to a friend or colleague. In contrast to the parents, most of the athletes (n=3) still rated the video extremely high.

Table 6. Post Educational Evaluation Guidelines.

	Strongly Agree (4)	Somewhat agree (3)	Somewhat disagree (2)	Strongly disagree (1)	Mean (SD)
Prior to this study, I knew about the Pitch Smart guidelines.	2	3	0	3	2.5 (1.31)
Prior to this study, I knew about the injuries that Little League baseball athletes could sustain.	2	5	1	0	3.1 (.641)
After the educational video, I see the importance of the Pitch Smart Guidelines.	7	1	0	0	3.8 (.354)
After the educational video, I am more likely to follow/encourage following of the Pitch Smart Guidelines.	7	1	0	0	3.8 (.354)

Table 7. Post Educational Evaluation Video.

Scale	0 - Not at all	1	2	3	4	5 - Extremely
How Informative was the educational video?	0	0	0	1	0	6
How knowledgeable was the presenter during the video?	0	0	0	0	0	7
How likely are you to recommend this video to a friend or colleague?	0	0	0	0	1	6
How would you rate the format of the educational video?	0	0	0	0	4	3

Participants were also asked a few open-ended questions. Of the 8 parents, 5 answered the open-ended questions, and all 4 of the college athletes provided a response to most of the questions. The first relates to "the strengths of the educational video." Many of the strengths were on the visual evidence and information of the injuries stating: *"Visual evidence of what happens to elbows and arms, especially in the growth plate (P1)* and *"The X-rays showing the injury"(P2)* with others including: *"Communicating risk factors outside of just tracking pitches,"(P8)*, *"The examples added good life application,"(P6)*, and *"Everything was explained very well, which made it easy to understand,"(A3)*.

When asked to identify some of the weaker aspects of the video, a few politely said none, while others indicated a few criticisms of the guidelines. Others focusing on the presentation noted: *"Some of the slides were very wordy and busy"(P6)*, *"Video of presenter covered some*

words”(P4), *“Long Video”(A3), and “Information overload, too much on the slides, distracting”(A2).*

Next, participants were asked what changes they would recommend. Again, a few parents felt it was great and did not need altering, while others felt that it could have benefited from a better slide layout, the presenter not being quite as monotone, and shortened the video. Comments included: *“Move video to bottom left corner”(P4), “It was a great video as is without any improvements. It got across the message”(P6), “Shorten the video”(A4), and “It’s Great.”(P2).* One other comment focused more on the criticism of the Pitch Smart guidelines, and areas that would be beneficial, but were outside the scope of this current study.

The last questions offered the participants an opportunity to share any other information with us. Most declined the option. While two parents made some excellent points, they were again more directed at the Pitch Smart guidelines unrelated to the educational video stating: *“I think the Pitch Smart Guidelines should also include the importance of regular long toss in keeping arms strong. I think it should be considered part of arm strength and conditioning. You did a great job with the video”(P2).* One of the athletes commented on his injury history stating: *“I had an elbow injury not too long ago that required surgery, and I just learned a lot about where it potentially could have originated from. Very useful information”(A1).*

Discussion

The purpose of this study was to inform parents via an educational video about guidelines intended to decrease behaviors linked to an increase in injury. Half of the parents indicated that they followed the Pitch Smart guidelines, which is in line with the findings of Zabawa and Alland (2019), who found that 65% of parents knew of the MLB Pitch Smart Guidelines. Their low knowledge score from the pre-survey was reflective of the lack of familiarity. It is plausible

that parents believed that the Pitch Smart guidelines they thought they knew were just pitch count recommendations.

The results indicate that the educational video increased parents' knowledge of the guidelines and their injury familiarity. Although the sample size for parents was relatively small, the parents did significantly ($p < .001$) better from pre to post on their overall knowledge scores. If this were a score on a test, they would have improved from 64.6% (11.6 out of a possible 18) compared to 88% (16 out of a possible 18). Furthermore, it is also evident that the educational video increased their familiarity with the guidelines. This could aid in parents more fully understanding what participation in these risky behaviors could lead to. Also, all ($n=8$) parents indicated that they were now "very likely" to follow the Pitch Smart guidelines.

Most were pleased with the educational video and felt the presenter was knowledgeable and they learned from the video. However, it was not without its weaknesses. Several felt it was too long, while others felt some slides were too busy, and the presenter needed to have some inflection and not sound as "monotone." Responses from both groups indicate that the video was informative, but the format and delivery could be improved.

Limitations

One significant limitation that impacted this study was the COVID-19 pandemic. The initial study plan was face-to-face but was forced to be done virtually. A face-to-face meeting likely would have created greater parent involvement and better buy-in. Additionally, parents could have completed the survey at the meeting. Going virtual created some disconnect for parents, but it may have also added something to the study. Specifically, it provided an opportunity to evaluate if technology and virtual programs can be helpful to educate parents. Many organizations put sports on hold for an extended period, and with the continuing strain

from the pandemic, many individuals who had agreed to help stopped communications. COVID likely added further stressors for parents, making them less likely to take time for the study.

Low participation numbers may be related to the overall process. The pre-survey had 62 open the link, but only 32 completed the survey. The video had 41 views, and only 8 completed the post-survey. The recruitment process went through multiple variations, including a form letter, a QR code flyer, and finally a more engaging infographic, but continued to receive limited participation. The initial process was altered to include the video and post-survey links at the end of the pre-survey and video, respectively. Lastly, recruitment materials were sent to facilities that provided hitting and pitching lessons. These changes increased pre-survey participation, but still few parents completed the entire project. Possible explanations include multiple steps, going back and forth clicking on links, time commitment, lack of interest, and video length. Other delivery methods such as an infographic or a shorter video to highlight the guidelines could be used. A complete review of the primary investigator's reflection on the process can be found in appendix E.

Lessons Learned

Reflection can be a crucial piece of the research project. What worked, what did not, what will be changed next time. This study is no different. The primary investigator was able to take several learning points away from this process. Much of the lessons relate to the methods and can be summed up as "be mindful of the target population." The initial recruitment materials were likely dull and easily skipped over. Participants were asked to go back and forth to find the different steps instead of having everything in one place. Lastly, parents are very busy, and asking them to take 40-45 minutes to complete a project is a lot of time. Moving

forward, similar programs need to consider the target audience when recruiting them, ensure the process is streamlined and easy to complete, and that the time commitment is reasonable.

Overall, despite the limited participation, the results suggest that an educational program can help parents learn about the Pitch Smart guidelines. Undoubtedly, future programs need other recruitment methods to gain more participants. Similarly, other mediums for the educational intervention (e.g., websites, face-to-face) could reach more participants and be more impactful.

Conclusion

Education of parents has been highlighted in the literature to help reduce injury in Little League baseball athletes. The Pitch Smart guidelines were developed to assist with this. However, their dissemination may not be reaching all of its intended targets. The educational video from this study significantly increased parents' knowledge of injury risk factors and the Pitch Smart guidelines. However, there is still room for improvement in educating parents. Future research should continue to evaluate the best methods of parent education for injury prevention in youth sports. Specifically, this study could be carried out again with improved recruitment materials and a shorter educational intervention. Additionally, although COVID-19 significantly impacted the study, forcing the study to go virtual allowed the opportunity to evaluate the use of technology to educate parents.

CHAPTER II: DISSEMINATION

The primary target audience is parents of Little League and travel ball athletes, specifically those in the 12 and under and 10 and under age groups, and secondly, those in the eight and under through the high school ages. The goal of the Pitch Smart program is to reach youth baseball athletes of all ages. By introducing the Pitch Smart guidelines to this age group, they can be more familiar with them as they progress in their youth baseball careers. To disseminate the findings, I will develop a presentation for my local Little League officials. I will have the PowerPoint slides (found in appendix C) with space available to take notes and refer back to later. While this project focused on a specific age group, this presentation and informational handout could easily be adjusted for the different age groups. The presentation will follow the script below.

Presentation Script

Slide #1: Title slide

Hello, my name is Adam Graham, and you are here because you want to learn how to help your child Pitch Smart. We'll see what that means here shortly.

Slide #2: Introduction

I've been an athletic trainer since 2008. If you're not familiar with the role of an athletic trainer, we are employed in many different settings, most notably professional and collegiate athletics. We are the ones who evaluate an injury immediately after it happens then help them rehab and return to participation. I completed my bachelor's degree at Western Carolina University and master's degree from West Virginia University. I recently completed my doctorate of education at the University of North Carolina at Greensboro. I've worked at big

division I institutions, done a summer internship with a professional baseball team, and been with a team that made it to super regionals of the NCAA baseball tournament. In all, I have roughly ten years of baseball experience.

Slide #3: Overview

Here is an overview of what we will be covering today. First, we will briefly review the study I executed and discuss some of the results and take-homes from the study. Next, based on the study that I completed, I have developed a new educational presentation based on feedback from the participants. This will include the background of the guidelines, the injuries, the risk factors, and how the guidelines work using scenarios.

Slide #4: My Study

The purpose of my study was to develop and evaluate an educational program to help parents understand behaviors that increase the risk of injuries in youth baseball and the guidelines recommended to address these behaviors. First, I wanted to determine the current parent knowledge of baseball-related youth injuries and the MLB Pitch Smart program. Second, I wanted to develop an evidence-based educational program on baseball-related youth injuries and the MLB Pitch Smart program. Lastly, I wanted to determine the impact of an educational program on parents' knowledge of baseball-related youth injuries and the MLB Pitch Smart program.

I sent out emails and used social media to reach parents. They were asked to complete a pre-survey, watch the educational video, then complete a post-survey. The surveys contained questions that evaluated parents' knowledge of the risk factors and guidelines to assess the educational video.

Slide #5: Results

I had 64 parents open the link, however, only 32 finished enough to be used. Of those 32, only eight completed the post-survey, despite the video getting over 40 views. Approximately 50% stated that they followed the Pitch Smart guidelines but scored poorly on the pre-survey knowledge questions. Here, you can see their pre-survey scores and the increased post-survey scores on the multiple-choice and true-false questions. Then parents were asked to select all the risk factors, which parents did poorly on the pre-survey, scoring a 4.0 out of 6, but then significantly increased their scores on the post-survey to a 5.5. Lastly, they were asked to select the guidelines and scored a 6.4 out of 9 on the pre-survey, but significantly increased that to an 8.1. They also increased their knowledge score from an 11.5 to a 16, which combined the multiple-choice, true/false, and select all that apply question, which combined for a total of 18.

Slide 6#: Discussion

As a reminder, the purpose of this project was to develop and evaluate an educational program on behaviors that increase the risk of injuries in baseball and the guidelines recommended to address these behaviors. Despite half stating that they followed the Pitch Smart guidelines on the pre-survey, their scores did not reflect this; they would have scored 64% if this were a test. Therefore, it is plausible that parents felt that simply following pitch counts was the Pitch Smart guidelines and enough to limit injury risk.

Based on the results, the video effectively educated parents about the guidelines. I saw significant improvement in their individual and combined knowledge scores.

There were, however, some limitations of the study. Much of it was related to a lack of participants, which the process was likely to blame. I could have used better recruitment materials, streamlined the process, and limited the number of steps to completion. Another

likely explanation is the video was too long, given that participants in the post-survey evaluation stated that the informative video was long.

Slide #7: Study Conclusion

From my study, we saw that the educational video was informative, significantly increased parent knowledge of the risk factors and guidelines, and increased their familiarity with potential injuries. Becoming more familiar with the potential injuries may help parents understand the rationale for the guidelines and see their importance. Overall, participants felt the video provided good information, and they learned there were other factors aside from pitch counts, but the video needed to be shortened and cleaned up. Next, we are going to get into the educational program itself.

Slide #8: Prevention History

Injuries in youth pitchers have been an issue for decades. To combat this, they first tried innings counts as a means of injury prevention in the 1960s. Innings create an issue because we know a pitcher could throw three or 33 pitches. So, in the '90s, they switched to pitch counts, however, this still did not seem to fix the issue, and further research discovered additional factors that increased their risk of injury. The MLB and the American Sports Medicine Institute developed the Pitch Smart Guidelines based on this research. As we'll see, these guidelines are a list of recommended practices such as taking enough time off throughout the year, not playing for more than one team, not pitching while fatigued, and focusing on learning the game, to name a few. However, According to Zabawa and Alland (2019), only 65% of parents from their study were aware of the Pitch Smart Guidelines. Apparently, the guidelines are not reaching their target, and can educating parents about the guidelines help to reduce the risk of injury?.

Slide #9: Scenario 1

Let's now look at a possible scenario to see what we're talking about. As we read through this, I want you to look for some standard practices if you agree with them or disagree:

William is a 12-year-old and one of the best pitchers in the League, and he pitches every opportunity for his Little League team. While William, his coach, and his parents follow the appropriate rest in between outings, he still amasses a large number of innings. He throws in several weekend showcases. He amasses 100 innings through the year, not including his weekly pitching lessons and practices. With it being such a busy year and doing well, he doesn't really get much time off and only gets a few weeks here and there in between each League's respective seasons. He starts to notice some discomfort in his elbow but thinks he needs to throw through it, that it's just some soreness. He continues to pitch, and the pain gets worse. He goes to the doctor, where they show William and his parents the x-ray, and he's diagnosed with Little Leaguers Elbow.

(Ask parents to answer) Which practices do you think are okay? Are there any you think could be dangerous?

Slide #11: Picture of Little Leaguers Elbow x-ray for case study

(no script for this slide, just showing the x-ray for support of case study.)

Slide #10: Guidelines

Here are the guidelines. Think back to our scenario as we briefly discuss them. There are quite a few, and I want to highlight some of the important ones. They can all be found at the MLB Pitch Smart website. While innings alone may not be the best method, as highlighted before, innings over a year can still provide a good measure of how much an athlete is throwing. But this is more than just innings in a game. This includes lessons, camps, and working on some

pitches in the backyard. These are all events where they are stressing the arm. Another important one is taking at least four months off from throwing every year and having 2-3 of those months consecutive. Avoid playing for multiple teams, keep up with pitch counts and the recommended days off, and watch for signs of fatigue are a few others. Does your child mention their arm being sore or tired, are they not able to throw as hard, or are they throwing wild? These could be signs of fatigue. The overall goal is to reduce fatigue and let these structures have time to heal.

Slide #11: Scenario 1 follow up

Let's go back to that scenario now and apply the guidelines. We can see that he is throwing too many innings. The guideline is 80, and he threw 100. The research has shown that those that throw more than 80 innings are 3.5 times more likely to develop an injury. We see that he also had pitching lessons and practice. All throwing counts towards that overall innings limit. With all of this, he didn't get the recommended time off of 2-3 months consecutive, and the research shows that those who pitched more than eight months a year were five times more likely to develop an injury. Also, the weekend showcases can pose potential problems because he may not have had the proper amount of rest after his last outing, he didn't get a proper warm-up, or they had a radar gun, so he was trying to ramp it up and throw harder.

Slide #12: Possible Injuries

So why does this matter? These are a few injuries that youth athletes can sustain, and many of these injuries occur due to the repetitive trauma of pitching. This repetitive trauma can cause damage to young skeletons, primarily at the growth plates.

Slide #13: Little League Elbow

Remember William from the first scenario, here is his x-ray. We can see the medial epicondyle already avulsed from the rest of the bone. It should more closely resemble these other

portions where there is a gap, but it should not be separated. In the image on the right, we can see it beginning to heal, and hopefully, the body will be able to fuse the two pieces back together. This occurs because the forearm muscles attached here constantly pull on the bone while throwing, similar to Osgood Schlatter in the knee. The other potentially significant issue is that this is also where the Ulnar Collateral Ligament attaches. While they may not have UCL issues now, they could develop issues later.

Slide #14: Little League Shoulder

This x-ray shows that image B is a normal healthy shoulder with normal growth plates. They can handle tensile loads or loads that pull and compress, but they do not withstand rotational forces very well. If left unmanaged, the humerus can develop with this added rotation in the bone.

Slide #15: Osteochondritis Dissecans

This is obviously a depiction and not an actual x-ray or any other type of medical scan. What happens is that a piece of the cartilage will be chipped off and begins to float through the elbow. I had a college pitcher who had one of these, and he threw, and it became dislodged, and it floated around like a piece of shrapnel creating additional pieces of cartilage, and in surgery, it looked like a bomb went off in the elbow.

Slide #16: Scenario 2

Here is another scenario and briefly practice this one on your own.

Derek is an aspiring 12-year old pitcher. He pitches for his Little League team, and his coach follows the pitch count guidelines and appropriate rest set forth by Little League Baseball. The coach doesn't know that Derek also pitches for his travel ball team in between his Little League outings. When he is not pitching, he is playing other positions,

including catcher. During the week, he also has a pitching lesson. He loves pitching and pitches most of the year without many breaks, and during the colder months, he continues with his pitching lessons. He starts to notice some arm fatigue but doesn't think anything of it and thinks he should push through it to get stronger.

Slide #17: Scenario 2 follow up

So which guidelines are not being followed here? (ask parents here to throw out which behaviors are risky and which guidelines are not being followed). The first thing we see is that he is playing for more than one team at a time. The research indicates that those who practice this have a 22% increased risk of injury. Next, we can see that he also plays catcher when not pitching. Though not all-out effort, it is a lot of throwing with a few scattered all-out maximal effort throws. Individuals who also caught were 2.7 times more likely to develop an injury. With all of this, he didn't get the recommended time off 2-3 months consecutive of consecutive rest, and the research shows that those who pitched more than eight months a year were five times more likely to develop an injury. Lastly, and potentially most potentially dangerous, is pitching and throwing through fatigue. Those that threw through fatigue were 36 times more likely to develop arm injury.

Slide #19: Conclusion – Take Home

So, these are the big points I want you to take with you today. Fatigue is one of the biggest contributors to potential injury. How do we reach fatigue? Throwing too much, so keep those rest days, keep track of the weekly, monthly and yearly innings thrown. Fatigue can be how tired a child feels, but more importantly, it is the fatigue of the structures in the elbow and shoulder.

Interesting side note, the higher draft picks did not specialize in baseball alone. Another study found that those who did specialize in baseball at an early age ended up missing more games once they made it to the professional level. Rest is essential, and even the pros take a few months off from throwing every year! My goal with the educational program is not to say that Travel ball, LL, having lessons, or showcases are all bad. But we must be aware of how much these young skeletons are throwing and is setting them up for failure and potential injury before they can even get out of high school.

Slide #20: Thank you

Are there any questions (Will leave 15 minutes for Q&A)?

Thank you for taking the time today to learn how to help your child.

Please feel free to contact me if you have any further questions.

CHAPTER III: ACTION PLAN

The primary focus is to help educate parents on the Pitch Smart guidelines versus educating the scientific community. Therefore, the first step will be to present to the parents in the Little League organization who helped with this study and follow the steps outlined in Chapter II. If parents are unable to make the first in-person presentation, they will be able to access the recording of the presentation. All of the materials outlined below will also be provided to this organization.

Further plans for dissemination will be to continue to educate parents in the northeast Georgia Little League organizations. The first of which will be the same in-person presentation offered to the study participants. Given the feedback from the study participants stating that the video from the study was too long, I will also create two shorter videos with one focusing on the guidelines, important details, and where they can find more information on the Pitch Smart guidelines. The second video will focus on the other portions, specifically the potential injuries.

Another medium for delivery will include an infographic that could be sent to the league officials. The infographic could be sent to parents, posted on their social media accounts, or posted at their parks. The infographic will have three parts, the first will focus mainly on the risk factors, with a few highlighted with the injury risk ratios. The second part will focus on a few of the guidelines to not have too many words. Lastly, some of the findings from the study will be included, and a link to the videos on YouTube. Additionally, working with the local organization, we can develop social media posts regularly that highlight different aspects of the Pitch Smart guidelines.

Aside from continuing to distribute materials to local organizations, I will also attempt to work with the parent Little League organization. The parent website has a section for parents

titled “Forms and Publication” on their website. This section covers other information that these educational materials would fit well. In addition to parents, there are also pages designed for coaches and league officials. Additional options will include partnering with middle schools, YMCAs, and even colleges hosting camps to have an informational session. This session could be offered as a standalone informational session or a separate session for parents at camps where kids and parents are taught arm care exercises, and the Pitch Smart guidelines could.

A potentially lofty plan would be to work with a hitting and lesson facility. They could create a separate area where athletes can learn and perform their arm care exercises. While they are doing this, parents could be presented with the Pitch Smart guidelines creating an opportunity to discuss their current practices. Having this additional component to their facility could help them stand out and gain additional customers.

Lastly, the American Sports Medicine Institute, a partner in developing the MLB Pitch Smart Guidelines, has several educational avenues to pursue to disseminate. While their website does not specifically identify a method for submitting abstracts for presentation, I have communicated with one of the lead researchers.

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APPENDIX A: PRE-LITTLE LEAGUE PARENTS SURVEY

Introduction

Hello!

You've arrived at the survey for Helping Parents to Pitch Smart educational program. In this survey you will be asked to answer a few questions about yourself, your child/children that play Little League Baseball, and then demonstrate your current knowledge and/or awareness of the MLB Pitch Smart Guidelines.

This is a research study and my goal is to determine the effectiveness of my educational program, therefore, I ask that you please do not seek out the MLB Guidelines in an attempt to learn about them or to get the questions right. This is not for a grade and is entirely anonymous so please just answer the questions to the best of your ability and then you'll have an opportunity to demonstrate how much you learned about the guidelines from the educational programming. On the next page you will see the consent and a little more about the study. Please read it carefully.

Thank you in advance for taking the time to help me with my research study!

Start of Block: Parent Demographics

In the following section you will be asked general demographic information about you

What is your Age?

- 18-25 (1)
- 26-30 (2)
- 31-35 (3)
- 36-40 (4)
- 41-45 (5)
- 46-50 (6)
- 51 & over (7)

What is your gender?

- Male (1)
- Female (2)
- Other (3) _____
- Prefer not to answer (4)

Are you also a coach for a Little League team?

- yes (1)
- no (2)

Skip To: End of Block If Are you also a coach for a Little League team? = no

what age do you coach?

- 8 & under (1)
- 10 & under (2)
- 12& under (3)
- 13-18 (4)

Have you received training or certification for coaching Little League?

- Yes (1)
- Don't Know (2)
- No (3)

Start of Block: Information about your Child

In this section you will be asked questions about your child

Do you have at least one child participating in one of the following Little League Baseball leagues (8 & under, 10 & under, 12 & under, 13-18)?

- No (1)
- Yes (please answer the following questions for one child) (2)

Which of the Little League Baseball leagues does that child participate in?

- 8 & under (1)
- 10 & under (2)
- 12 & under (3)
- 13-18 (4)

What gender is your child?

- Male (1)
- Female (2)
- Other (3) _____
- Prefer not to answer (4)

What position does your child play?

- pitcher (1)
- infield (2)
- outfield (3)
- pitcher and catcher (4)
- pitcher and infield (5)
- pitcher and outfield (6)

Does your child participate in any other sports during the year?

- No (1)
- Yes (please list the other sports): (2)

Do you have another child that plays in Little League Baseball

- Yes (1)
- No (2)

Skip To: End of Block If Do you have another child that plays in Little League Baseball = No

Which of the Little League Baseball leagues does that child participate in?

- 8 & under (1)
- 10 & under (2)
- 12 & under (3)
- 13-18 (4)

What gender is your child?

- Male (1)
- Female (2)
- Other (3) _____
- Prefer not to answer (4)

What position does your child play?

- pitcher (1)
- infield (2)
- outfield (3)
- pitcher and catcher (4)
- pitcher and infield (5)
- pitcher and outfield (6)

Does your child participate in any other sports during the year?

- No (1)
- Yes (please list the other sports): (2)

Does one child "coach" the other? (coaching: try to teach them to throw new pitches, methods to throw faster, other means to gain a competitive edge)

- Yes (1)
- Don't know (2)
- No (3)

Do you have any other children that play in Little League Baseball? If yes - how many?
(please write in the number)

- Yes (1) _____
- No (2)

Start of Block: Injuries in youth pitchers

The next three questions will ask you about a few injuries that youth pitchers can sustain

How familiar are you with the term Little Leaguer's shoulder?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

How familiar are you with the term Little Leaguer's Elbow?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

How familiar are you with the term osteochondritis dissecans?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

Start of Block: Pitch Smart Guidelines

The following section will ask about your familiarity and knowledge of the Pitch Smart guidelines. Please do not Google and look up the answers, do your best and answer the question to the best of your ability.

How familiar are you with the Pitch Smart Guidelines?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

Do you follow the Pitch Smart Guidelines?

- Yes (1)
- Don't Know (2)
- No (3)

Does your League observe pitch count rules? (pitch count: a limit on the number of pitches a pitcher can throw in an outing)

- Yes (1)
- Don't Know (2)
- No (3)

Who monitors pitch count?

- Coach (1)
- Umpire (2)
- Child (3)
- Don't Know (4)

As the parent do you keep a weekly innings count including any game outings, lessons, showcases/camps for your child?

- Yes (1)
- Don't Know (2)
- No (3)

After throwing 36-50 pitches in a game, how many days rest (no pitching) should a 9-12 year old pitcher have?

- 0 Days (1)
- 1 Day (2)
- 2 Days (3)
- 3 Days (4)
- 4 Days (5)

A youth pitcher should not play for more than one team at the same time (True/False)

- True (1)
- False (2)

Youth pitchers are MOST at risk for injury when they:

- Pitch while fatigued (1)
- Pitch for more than one team (2)
- Throw too many innings (3)
- Catch when not pitching (4)

According to the Pitch Smart Program, and based on related research, which of the following are risk factors for injury in Little League Pitchers. Select all that apply

- Pitching on consecutive days (1)
- Pitching while fatigued (2)
- Throwing more than 100 innings (3)
- Playing both pitcher and outfield position (4)
- Playing for multiple teams at the same time (5)
- Not following proper strength and conditioning routines (6)
- Inadequate rest after an outing (7)
- Not throwing often enough (8)
- Playing other sports during the year (9)

The Pitch Smart guidelines were developed to reduce the risk of injury in pitchers in 8 & under leagues up to 19-22 year olds. Which of the following are Pitch Smart Guidelines for those aged 9-12? Select all that apply.

- Focus on athleticism, physical fitness and fun (1)
- Should pitch at least 80 innings in a year (2)
- Avoid playing for multiple teams at the same time (3)
- Players should not pitch in multiple games on the same day (4)
- Make sure to properly warm up before pitching (5)
- Play other sports during the course of the year (6)
- Focus specifically on baseball (7)
- Pitchers once removed from the mound may not return as pitchers (8)
- Avoid throwing fastballs and change-ups (9)
- Take at least 4 months off from throwing every year, with at least 2-3 of those months being consecutive (10)
- Set and follow pitch-count limits and required rest periods (11)
- Watch for any signs of fatigue (12)
- Throw often when not pitching to keep the arm strong (13)

Thank you for taking the time to complete this survey! At the end of this message, you will find a link that will take you to the educational video. Once you've watched the video you can return to the original email you received to click on the post-educational video survey or click on the link in the description under the video.

[Link to educational video](https://youtu.be/0cbmnhGuOEU)

<https://youtu.be/0cbmnhGuOEU>

If you prefer, there is a link that will take you to a google form to provide your email address. I will then send an invite to the educational video and the post-educational survey. I appreciate your involvement and hope you will continue to be involved. Again, if you have any questions please feel free to email me at adgraha2@uncg.edu.

[link to email submission](#)

link for email

submission: https://docs.google.com/forms/d/e/1FAIpQLSd9Odhy9aI8wR11T76gVkxvJZKyS6vbYIfVnKxLiA-K6PG-2Q/viewform?usp=sf_link

APPENDIX B: POST-EDUCATIONAL PROGRAM SURVEY

Introduction

Hello!

First I would like to thank you for taking time out of your busy schedules to complete my research project! You've arrived at the survey for Helping Parents to Pitch Smart educational program post-survey. In this survey you will be asked to answer a series of questions similar to those on the pre-survey related to the MLB Pitch Smart Guidelines, and also some questions about the educational session.

As a reminder, this is a research study and my goal is to determine the effectiveness of my educational program, therefore, I ask that you please do not seek out the MLB Guidelines in an attempt to learn about them or to get the questions right. This is not for a grade and is entirely anonymous so please just answer the questions to the best of your ability. I am interested in how much you learned about the guidelines and how I can improve the educational programming.

Thank you again for taking the time to help me with my research study!

Start of Block: Injuries in youth pitchers

The next three questions will ask you about a few injuries that youth pitchers can sustain.

How familiar are you with the term Little Leaguer's shoulder?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

How familiar are you with the term Little Leaguer's Elbow?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

How familiar are you with the term osteochondritis dissecans?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

The following section will ask about your familiarity and knowledge of the Pitch Smart guidelines. Please do not Google and look up the answers, do your best and answer the question to the best of your ability.

How familiar are you with the Pitch Smart Guidelines?

- Very familiar (1)
- Moderately familiar (2)
- Slightly familiar (3)
- Not familiar at all (4)

How likely are you to follow the Pitch Smart Guidelines?

- Very Likely (1)
- Somewhat Likely (2)
- Not likely (4)

Does your League observe pitch count rules? (pitch count: a limit on the number of pitches a pitcher can throw in an outing)

- Yes (1)
- Don't Know (2)
- No (3)

Who do you feel is most responsible for monitoring pitch count?

- Coach (1)
- Umpire (2)
- Child (3)
- Don't Know (4)

How likely are you as the parent to track a weekly innings count including any game outings, lessons, showcases/camps for your child?

- Very Likely (1)
- Somewhat likely (2)
- Not Likely (3)

After throwing 36-50 pitches in a game, how many days rest (no pitching) should a 9-12 year old pitcher have?

- 0 Days (1)
- 1 Day (2)
- 2 Days (3)
- 3 Days (4)
- 4 Days (5)

A youth pitcher should not play for more than one team at the same time (True/False)

- True (1)
- False (2)

Youth pitchers are MOST at risk for injury when they:

- Pitch while fatigued (1)
- Pitch for more than one team (2)
- Throw too many innings (3)
- Catch when not pitching (4)

According to the Pitch Smart Program, and based on related research, which of the following are risk factors for injury in Little League Pitchers. Select all that apply

- Pitching on consecutive days (1)
- Pitching while fatigued (2)
- Throwing more than 100 innings (3)
- Playing both pitcher and outfield position (4)
- Playing for multiple teams at the same time (5)
- Not following proper strength and conditioning routines (6)
- Inadequate rest after an outing (7)
- Not throwing often enough (8)
- Playing other sports during the year (9)

The Pitch Smart guidelines were developed to reduce the risk of injury in pitchers in 8 & under leagues up to 19-22 year olds. Which of the following are Pitch Smart Guidelines for those aged 9-12? Select all that apply.

- Focus on athleticism, physical fitness and fun (1)
- Should pitch at least 80 innings in a year (2)
- Avoid playing for multiple teams at the same time (3)
- Players should not pitch in multiple games on the same day (4)
- Make sure to properly warm up before pitching (5)
- Play other sports during the course of the year (6)
- Focus specifically on baseball (7)
- Pitchers once removed from the mound may not return as pitchers (8)
- Avoid throwing fastballs and change-ups (9)
- Take at least 4 months off from throwing every year, with at least 2-3 of those months being consecutive (10)
- Set and follow pitch-count limits and required rest periods (11)
- Watch for any signs of fatigue (12)
- Throw often when not pitching to keep the arm strong (13)

Start of Block: Block 5

The following section includes several statements related to the Educational program and Pitch Smart guidelines. Please indicate the extent to which you agree or disagree with each statement. There are no right or wrong answers.

Prior to this study I knew about the Pitch Smart guidelines.

- Strongly Disagree (1)
- Somewhat Disagree (2)
- Somewhat Agree (3)
- Strongly Agree (4)

Prior to this study I knew about the injuries that Little League baseball athletes can sustain.

- Strongly Disagree (1)
- Somewhat Disagree (2)
- Somewhat Agree (3)
- Strongly Agree (4)

After the educational video I see the importance of the Pitch Smart guidelines.

- Strongly Disagree (1)
- Somewhat Disagree (2)
- Somewhat Agree (3)
- Strongly Agree (4)

After the educational video I am more likely to follow the Pitch Smart guidelines.

- Strongly Disagree (1)
- Somewhat Disagree (2)
- Somewhat Agree (3)
- Strongly Agree (4)

Start of Block: Block 4

The following section asks you to evaluate the educational video you watched, Helping Parents to Pitch Smart. Some questions ask you to rate on a scale of 0-10 and others are open-ended allowing you to provide feedback. Please give honest feedback as your responses will help us improve the program.

How informative was the educational video? (0 - not informative at all, 5 - Extremely informative)

- (0)
- (1)
- (2)
- (3)
- (4)

How knowledgeable was the presenter during the educational video? (0 - not knowledgeable at all, 5 - Extremely knowledgeable)

- (0)
- (1)
- (2)
- (3)
- (4)

How likely are you to recommend this educational video to a friend or colleague? (0 - not likely at all, 5 - Extremely likely)

- (0)
- (1)
- (2)
- (3)
- (4)

How would you rate the format of the educational video? (0 - did not like the format at all, 10 - great - would not change anything about the format)

- (0)
- (1)
- (2)
- (3)
- (4)

What were the strongest parts of the educational video?

What were the weakest parts of the educational video?

What changes would you like to see to improve the educational video?

Is there anything else you would like to share with us?

Thank you for taking the time to complete my research program! Should you have any questions, additional comments or concerns please feel free to contact me (adgraha2@uncg.edu).

Helping Parents to Pitch Smart

Adam Graham MS, LAT, ATC, NASM-CES
adgraha2@uncg.edu



Who am I?

Personally

From Chapel Hill, NC
WCU → WVU → UNCG
Obtained my EdD at UNCG



Professionally

Certified ATC since 2008
GT → WVU → TTU Piedmont
Baseball - 10 years of experience
Including professional internship and
a super regional appearance with
TTU



Overview

- My study and results
- The new educational program
 - Background leading to guidelines
 - Scenarios
 - Guidelines
 - Possible Injuries
- Take Home points



My Study

- **Purpose:** The purpose of this study is to develop and evaluate an educational program to help parents understand behaviors that increase the risk of injuries in baseball, and the guidelines recommended to address these behaviors.
- Sent emails and used social media posts
- Pre-survey, educational video, postsurvey
- Knowledge assessment



	Pre-survey (n=32) Correct/Wrong	PreSurvey Pairs to Post (n=8) correct	Post Survey (n = 8) correct	t-score
How many days rest should a 9-12 year old pitcher have?	9/23	3	5	
A youth Pitcher should not play for more than one team at the same time (True/False)	7/25	3	6	
Youth Pitchers are most at risk for injury when they:	12/20	4	8	
Which of the following are risk factors for injury in Little League Pitchers. Select all that apply. (6 possible)	4.2 (1.17)	4.0 (.93)	5.5 (.76)	t(7)=-7.51, p<.001
Which of the following are Pitch Smart Guidelines for those aged 9-12? Select all that apply. (9 Possible)	5.8 (2.18)	6.4 (1.92)	8.1 (.99)	t(7)=2.88, p=.012
			16.0	
Knowledge Total average	11.5 (2.90)	11.6 (2.77)	(1.60)	t(7)=-5.79, p<.001



Discussion

- Increase of injury familiarity
- Significant ($p < .05$) improvement
 - Injury risk factor identification
 - Guideline identification
 - Total knowledge score
- Low pre-survey scores for 16 saying they follow guidelines
 - Pitch Counts = Pitch Smart
- Limitations
 - Process
 - Video Length



Conclusion

- Parents prior to the study, stated they followed the guidelines, but may have only been following pitch counts
- Video format is beneficial for education of parents
 - Use of technology
 - Length
- Evaluation showed the video was informative, and viewers would recommend to others



Background

- Little League injuries have been a problem for decades
 - Innings counts started in 1960's (Popchak et al., 2015)
 - Changed to pitch counts in Mid 90's (Popchak et al., 2015)
 - Research revealed other potential risk factors for injury (Fleisig and Andrews, 2012; Yang et al., 2014)
- 2014 MLB Pitch Smart Guidelines developed
- Injuries continue
- Only 60% of parents are aware of guidelines (Zabawa & Alland, 2019)
- Are the guidelines reaching their intended audience?
- Can educating parents help injury prevention?



Scenario 1

William is a 12-year-old and one of the best pitchers in the League, and he pitches every opportunity for his Little League team. While William, his coach, and his parents follow the appropriate rest in between outings, he still amasses large number of innings. He throws in several weekend showcases. He amasses 100 innings through the year, not including his weekly pitching lessons and practices. With it being such a busy year and doing well, he doesn't really get much time off and only gets a few weeks here and there in between each League's respective seasons. He starts to notice some discomfort in his elbow but thinks he needs to throw through it, that it's just some soreness. He continues to pitch, and the pain gets worse. He goes to the doctor, where they show William and his parents the x ray, and he's diagnosed with Little Leaguers Elbow.



Little Leaguer's Elbow



<https://orthokids.org/Sports-Injury-Prevention/Throwing-Injuries>

Pitch Smart Guidelines for 9-12 year-olds

Pitching Guidelines | Ages 9-12

- Focus on athleticism, physical fitness, and fun
- Focus on learning baseball rules, general techniques, and teamwork
- Do not exceed 80 combined innings pitched in any 12 month period
- Take at least 4 months off from throwing every year, with at least 2 -3 of those months being continuous
- Make sure to properly warm up before pitching
- Set and follow pitch -count limits and required rest periods
- Avoid throwing pitches other than fastballs and change -ups
- Avoid playing for multiple teams at the same time
- Avoid playing catcher while not pitching
- Players should not pitch in multiple games on the same day
- Play other sports during the course of the year
- Monitor for other signs of fatigue
- Pitchers once removed from the mound may not return as pitchers
- No pitcher shall appear in a game as a pitcher for three consecutive days, regardless of pitch counts
- Daily max pitches:
9-10: 75 pitches
11-12: 85 pitches



Scenario 1 follow up

Too many innings (3.5 times more likely to develop injury)

Not enough rest through the year (pitch >8 months/yr, 5 times more likely to develop injury)

Not enough consecutive time off

All innings count, not just games

Playing for more than one team



Possible Injuries

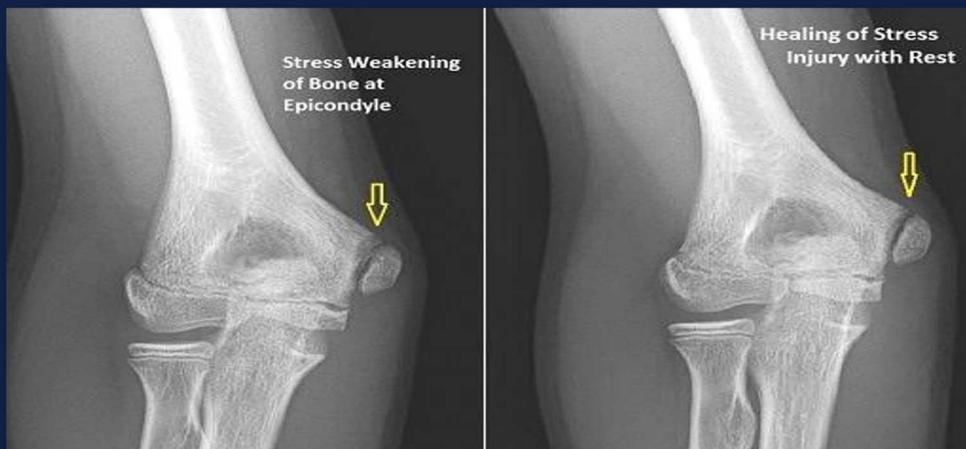
Little Leaguer's Elbow

Little Leaguer's Shoulder

Osteochondritis dissecans



Little Leaguer's Elbow



<https://orthokids.org/Sports-Injury-Prevention/Throwing-Injuries>

Little Leaguer's Shoulder



A Little League Shoulder



B Normal



<https://www.bsphysicaltherapy.com/2018/02/05/little-league-shoulder-coaches-parents/>

Osteochondritis Dissecans



Picture https://www.physio-pedia.com/Osteochondritis_Dissecans_of_the_Elbow

Scenario 2

Derek is an aspiring 12year old pitcher. He pitches for his Little League team and his coach follows the pitch count guidelines and appropriate rest set forth by Little League Baseball. What the coach doesn't know is that Derek also pitches for his travel ball team in between his LL outings. When he is not pitching he is playing other positions including catcher. During the week he also has a pitching lesson. He loves pitching and pitches most of the year without many breaks, and during the colder months he continues with his pitching lessons. He starts to notice some arm fatigue but doesn't really think anything of it and thinks he should push through it to get stronger.

Which guidelines are not being followed here?



Scenario 2 Followup

Pitching for more than one team at a time (22% risk increase)

Playing catcher (2.7 times more likely to develop injury)

Inadequate rest over the year (>8 months, 5 times more likely)

Pitching through fatigue (36 times more likely)



Take Home Points

- Watch for fatigue!
 - 36 times more likely to undergo shoulder or elbow surgery.
- Observe Pitch Counts and rest days!
 - Shown to aid in decreasing injury
 - Be aware of innings and what counts as innings
 - Pitchers who threw more than 100 innings were 3.5 times more likely to be injured.
 - 9-12 year old limit is 80 innings
- What do all of these add up to?
 - Overuse and eventual fatigue
- Not against travel ball or Little League
 - Professional pitchers with UCL injury, elbow injury as kid, inadequate rest (Lance et al)
 - Early specialization (<14) not needed (Swindell et al)



Thank you so very much

I hope you've found this beneficial and can carry it forward as your child progresses through their careers.

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Adam Graham



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APPENDIX D: ALL COLLEGE ATHLETE TABLES

Pre-survey Athlete familiarity

n = 13	Very Familiar (1)	Moderately Familiar (2)	Slightly Familiar (3)	Not Familiar at all (4)	Mean (SD)
Little Leaguer's Shoulder?	0	2	5	6	3.3 (0.75)
Little Leaguer's Elbow?	1	2	4	6	3.2 (0.99)
Osteochondritis Dissicans?	0	0	1	12	3.9 (0.28)
Pitch Smart guidelines?	2	3	3	5	2.9 (1.14)

Youth participation

	Yes	No	I don't Know
Did you follow Pitch Smart Guidelines	4	5	4
Did coach keep pitch count?	12	1	0
Did parents keep weekly pitch count?	7	4	2
You or parents keep weekly innings count?	3	6	4

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
Behaviors that could increase injury risk?	2	5	6	0

College Athlete Pre-Survey Knowledge

n = 13	Correct/Score	Wrong	Mean Score (SD)
How many days rest should a 9-12 year old pitcher have?	1	12	n/a
A youth Pitcher should not play for more than one team at the same time (True/False)	7	6	n/a
Youth Pitchers are most at risk for injury when they:	6	7	n/a
Which of the following are risk factors for injury in Little League Pitchers. Select all that apply (6 Possible)	n/a	n/a	3.2 (1.09)
Which of the following are Pitch Smart Guidelines for those aged 9-12? Select all that apply (9 Possible)	n/a	n/a	5.9 (2.43)
Knowledge Total average	n/a	n/a	10.23 (3.27)

College Athlete Pre-Post Familiarity Comparison

	Pre-Survey Pairs to Post (n=4)	Post Survey (n=4)
How familiar are you with Little Leaguer's Shoulder?		
Very Familiar (1)	0	3
Moderately Familiar (2)	1	0

Slightly Familiar (3)	2	1
Not Familiar at all (4)	1	0
Mean (SD)	3.0 (0.82)	1.5 (1.00)
How Familiar are you with the term Little Leaguer's Elbow?		
Very Familiar (1)	1	3
Moderately Familiar (2)	1	0
Slightly Familiar (3)	2	1
Not Familiar at all (4)	0	0
Mean (SD)	2.3 (0.96)	1.5 (1.00)
How Familiar are you with the term Osteochondritis Dissecans?		
Very Familiar (1)	0	2
Moderately Familiar (2)	0	1
Slightly Familiar (3)	1	1
Not Familiar at all (4)	3	0
Mean (SD)	3.75 (0.50)	1.8 (0.96)

College Athlete Pre-Post Knowledge Comparison

	Pre-survey pairs to post (n=4)	Post Survey (n=4)
How many days rest should a 9-12 year old pitcher have?	1	2
A youth Pitcher should not play for more than one team at the same time (True/False)	2	4
Youth Pitchers are most at risk for injury when they:	3	2
Which of the following are risk factors for injury in Little League Pitchers. Select all that apply (6 possible)	3.5 (1.00)	3.75 (0.50)
Which of the following are Pitch Smart Guidelines for those aged 9-12? Select all that apply (9 Possible)	6.5 (1.73)	7.25 (1.71)
Knowledge Total average	11.5 (3.70)	13.0 (2.45)

APPENDIX E: REFLECTION PAPER

Given that my research project lacked participants, it is necessary to take the time and reflect on the process and project. At the moment, I addressed the recruitment methods multiple times; however, there was a lack of rigorous self-evaluation and reflection on the project as a whole. My primary focus was what can I do to increase my responses. Now that the study has concluded, I can take this time to reflect on my project. Using the Gibbs Reflective Cycle, I hope to discern from my reflection what worked, what could have been and improved, and what I might do differently. The Gibbs Reflective Cycle is broken into six parts: 1) description of the experience, 2) feelings and thoughts about the experience, 3) evaluation of the experience, 4) analysis to make sense of the situation, 5) conclusions about what was learned and what could be done differently, and 6) the action plan for how I would deal with any similar situations in the future (*Gibbs' Reflective Cycle*, 2020).

Description

The first step of the Gibbs Reflective Cycle is describing what happened. The original design of my study was not too far off from the study that I attempted to complete. It was a pre-post-educational intervention with a pre-survey, educational intervention, and a post-survey. My target population was the parents of 12-and-under(12U) and 10-and-under(10) Little League baseball athletes. To aid in distributing my recruitment material, I contacted a youth baseball director for a local county organization in the Fall of 2019. He wanted to discuss my study further over the phone. As we wrapped up the call, he seemed excited about the idea and thought it would be helpful for the organization and parents in the area. He told me that he would be getting in touch with the rest of the league directors and be in touch after he spoke with them.

The methodology was for the League directors to email parents a recruitment email containing a brief description of the study, the IRB information sheet, and the link to the pre-survey. The pre-survey was to be completed prior to the educational presentation. Once most had completed the pre-survey, they submitted their email address for future correspondence and set a date for the educational presentation. At least one in-person 30-minute presentation was planned, with additional ones as needed. A recording of the video offered the opportunity for those who could not make it to the presentation a chance to watch it and complete the study. I planned to create a few short videos sent in emails to parents as reminders and continue the educational program from the recording. The program was designed to be more interactive and include some of the principles of andragogy to make it as beneficial for parents as possible. Upon the conclusion of the educational presentation, parents would then have to fill out the post-survey. Over the next four weeks, parents would receive a weekly email containing a video and information about a portion of the Pitch Smart guidelines. After the four weeks, parents would complete a final survey to evaluate their ability to retain the information from the educational presentation.

Covid

As the Spring Semester of 2020 rolled around, the world faced a pandemic, and much of everything was shut down, including outdoor sports. I attempted to communicate with the League directors about when they expected to return possibly. In the meantime, I started to prepare a new avenue of delivery for the educational presentation. I elected to keep the same pre-post survey and four-week follow-up. However, for the educational presentation, I elected to go virtual like much of everything else at the time. I created a synchronous webinar using ZOOM and added a few questions that parents could respond to in real-time during the webinar. I was

prepared and ready for participants. However, I had yet to hear back from the League directors. I attempted to post it to their Facebook page and had the League post it for me. There were no participants from this first round.

Plan B

After some discussion with my committee, we determined that I might need to alter the delivery and shorten the experience. Therefore, instead of a live webinar, I created a short video that ended up being approximately 19-minutes. We eliminated the four-week follow-up, but the recruitment email and social media post contained the link to the pre-survey and remained unchanged. After completing the survey, parents provided their email addresses to send the link to the educational video and post-survey. The recruitment email was sent to the League Directors again and posted to social media on the Leagues page and my own. This recruitment method led to few responses. Ultimately, the problem that seemed to arise was that participants would complete the pre-survey but not submit their email after the survey.

Around this time, I changed jobs in December of 2020. This move created an opportunity to reach out to new league directors. I was able to get one of them to respond, and he was willing to help and send this to his coaches and post it to the Facebook page. Admittedly, over the summer of 2021, I had difficulty staying focused and took an extended time off from the process. Later in the summer, I attempted to rewrite the recruitment email to make it more personal, appealing, and less formal. This combination obtained a few more responses but continued to run into the same issue where participants did not submit their emails. The focus continued to be on how to get the email and social media recruitment to work and what new avenues can I use. I thought a flyer posted in businesses where individuals give baseball lessons might provide more responses. The flyer had similar information and format as the recruitment email. It contained a

QR code that parents would scan using a smartphone to access the pre-survey immediately and then submit their email at its conclusion. I gave the flyer to a couple of facilities where lessons were performed and sent to a park where Little League teams practiced.

Plan C and Final attempts

Regardless of the changes made in the recruitment material, the number of participants submitting their email was not working. At this point, I remembered another cohort member had a similar study design and placed all three links into one correspondence. I felt this method might help with my current situation and parents' unwillingness to provide their emails. Therefore, I created another new recruitment email, social media post, and a flyer that contained all three links. In addition to the new recruitment materials, at the end of the pre-survey, I included the link to the educational video and a link to the post-survey in the comments section of the video.

Additionally, in a previous meeting, Dr. Ross mentioned that I could reach out to College Baseball athletes to reflect on their Little League time. I developed a new pre-survey and post-survey to execute this. In the Fall of 2021, I posted my recruitment information to Facebook, sent out emails with all three links, and started getting more responses for the post-survey. I attempted to contact the league director that had been so helpful earlier. However, he had stopped responding. Later, I learned he had contracted Covid and had a significant reaction for a few weeks. I sent the College Baseball survey to five universities. Around the same time, I reached out to some old friends who were giving lessons, and they were able to post it on Facebook and ask their clients to consider participating. Responses started to increase, and I thought for sure that this was finally going to work. Over a week or two, the responses would go up by one or two every few days. As these numbers started to taper, I sent my email to a broader

range of individuals to reach more potential participants. There was a tryout day for a local travel ball team, and I attempted to talk to parents and gave them my original flyer. Although neither of these efforts helped much, I received a suggestion to make a new flyer and make it more eye-catching, so I created yet another recruitment media. I posted this new flyer to social media and sent the email to the league director only to learn he no longer was affiliated with the program. He forwarded my email to the travel ball coach, and we exchanged an email or two, then I sent him the recruitment materials. He then informed me that they were putting the travel ball team on hold and did not have contact with those parents.

Feelings

Ready to Get Started

The next phase of the Gibbs Reflective Cycle examines the feelings during this time. As the research project started, I felt very excited and confident that the initial League directors would help get the parents to participate in the study. As I started to prepare, Covid started to take over, and as things started to close down, I started to worry about how it would fully impact my ability to get in front of the participants. In addition to the shutdown, the League Directors I talked to would not return any of my communication. At this point, I was very fearful about how I would move forward. The first step would be to make necessary modifications to meet the new standards Covid created. As I moved into the fall of 2020, I was still trying to get participants by emailing the local league directors and posting to Facebook multiple times. They were attempting to have a fall season which made me hopeful that I could get more responses. Around December of 2020, I started a new job in a new state which instilled a new hope to reach out to more league directors. Not to mention that the change in jobs helped me from a mental health standpoint. I felt trapped and seeing my study not succeed added to this feeling and poor mental

health. I felt recharged with the start of the new job and the prospect of new participant pools. One league director told me they would be happy to, but I never heard back from him after that. Another one wanted to discuss the study further but had to run it by his board to discuss. Shortly after that, he agreed to send it out and post it to Facebook. Again, I was hopeful and thought that for sure this would get the participants I needed.

Defeated

The summer of 2021 rolled around, and I had just watched much of my cohort go through their defense. I felt as though this might not happen. I was pretty defeated. My last effort had led to more participants completing the pre-survey, but only one or two submitted their email for the educational program. I took some time away to recharge as I had my first taste of life with no contracted work over the summer months. In July, I returned to my committee to discuss new options on what I could do. After this meeting, I again thought we had a new plan that would help get my participants and even a potential change in my target participants. As I made some more changes in August and September, I got some more participants, saw a rise, and was very excited. It seemed it was finally working as my numbers started to trickle in. Then numbers for both participant pools stopped. I had revamped everything, changed my recruitment email, broadened my delivery network, and yet my number of post-survey completion would not increase. I reached out as the fall 2021 semester was wrapping up with nowhere left to turn. The one league director who had helped so much was no longer associated with the group. Many were graciously sharing my Facebook posts, but I was not getting any more responses.

As I look back through this, it was the cliché roller coaster of emotions. Excitement and hope followed by the angst of no responses. I expected obstacles during my process, but no one could anticipate a global pandemic and its challenges. I attempted to remain optimistic that I

would complete my project despite the numerous changes to the methodology, recruitment materials, and IRB modifications. However, I was often fearful that this might not happen, and I may not complete my dissertation. I am grateful for my committee for sticking with me and offering so much help and all the individuals who shared my post on Facebook.

Evaluation

Biggest Weakness

With all of the emotions flowing at the moment, it was hard to evaluate what was and was not working. Fortunately, with this reflection and putting the feelings on paper, I can move forward and evaluate my study. When it was time to develop my recruitment email and social media post, I assumed I needed a crisp, streamlined, formal-looking document that was straight and to the point. I created a word document that resembled a cover letter for a job application. It contained a bit about me, my study, and what they needed to do. It looked rather uninteresting, and if I received this email or saw this post as a parent, I would be unlikely to participate. After not receiving many responses, I changed some wording to make it more attractive and tried to connect with the local parents by discussing the sense of family that drew me to the new job and the area. As previously mentioned, this did not help. I needed to come up with something new. I thought maybe something more technically savvy might help, so I created a flyer that included a QR code. However, this flyer continued to have the same format and looked like a form letter, and was relatively uninteresting. It was not until the end of my data collection that someone recommended making my recruitment document look a little more eye-catching. In addition to the parent's recruitment material, the college baseball recruitment materials had the same form letter appearance with the appropriate information.

Some Good

One apparent good was that parents wanted to help and do the study, as seen by the 62 times participants clicked the pre-survey link. I cannot determine how many saw the recruitment materials. However, I think 62 would have provided plenty of data for this study. The college baseball players may not have felt the same, given that I sent the recruitment materials to five different teams; only 16 individuals clicked on the pre-survey link. Therefore, what was the disconnect that kept both groups from completing the rest of the study? One plausible explanation would be that parents did not want to submit their email at the end of the pre-survey. Once this step was removed, and the recruitment letters included all three links, and links were placed at the end of each phase of the study, the number of participants improved. While many of my versions did not work, this last version seemed to work the best. The next area to examine is the educational program. Given that I had two-thirds of the participants watch the video. With such a small number of both groups completing the post-survey, it is logical to assume that the educational video was not the best choice of media.

Analysis

Using Facebook

There is one factor that I could blame all of these issues on from the beginning: the Covid Pandemic. While this certainly did require me to alter my methods and change my plan, I would be lying if I felt my research study would have succeeded as it was initially structured. As previously mentioned, the recruitment process was an area that likely led to limited numbers. I think using Facebook to recruit was the best method for my study, and one study had substantially more responses using Facebook ads than many of their other avenues (Watson et al., 2018).

When participants increased

There was a noticeable increase once parents no longer had to enter their email addresses and had all the links they needed in one document, plus at the end of each study phase. One likely explanation is that parents feared that despite ensuring their information would be safe, they would receive spam emails. Any number of plausible explanations could have contributed to parents not continuing with the study. Namely, I would anticipate that parents are increasingly busy, especially if they have multiple kids. Asking them to take this additional time could have been more than they were willing to take. They also could have forgotten, did not feel the need to continue, did not like the material or did not want to watch the video. As previously mentioned, I think that parents wanted to participate, and if I had my final recruitment methods initially, the outcome might have been different. For the collegiate athletes, I firmly believe they did not complete the project because they did not have the time in one sitting and forgot, and also could have felt that they were not going to get anything out of it immediately, so it was a low priority.

Intervention

Overall, I was happy with the educational video. I wanted it to be a little shorter, but I felt that I had communicated the essential points and needed to be sure I addressed the questions from the survey. Combined with the collegiate baseball portion, I had 41 views on my video. I had 13 completed collegiate baseball pre-surveys, 33 completed parent pre-surveys, and a combined 16 completed the post-survey. It is evident that several watched the educational video or at least started. The video could have been too long. As previously discussed, parents have busy schedules and likely could not contribute this time. This is supported in the literature by (Conaghan et al., 2021), who through a systematic review found that a shorter intervention was better, ideally around five minutes. While this study focused on coaches, I believe this could also

be applied to parents. The video could not have been exciting or engaging enough, or they watched it and intended to return to the post-survey but became sidetracked or forgot. Whatever the case, it is most evident that, as Dr. Brown indicated that this format was an ineffective method for educating parents.

Retention

To increase retention, one research study (Watson et al., 2018) provided multiple follow-up modalities, including online, phone calls, and written. While not many elected to complete follow-ups via phone, it did appear to remind participants to complete the follow-up surveys. This could have certainly helped my retention and was one of the reasons I wanted to initially ask for parent emails to continue to remind them to complete the surveys. I am not sure I would have received phone numbers with my subjects since they were already reluctant to provide their email addresses. Additionally, the Heads Up concussion training program developed by the CDC has successfully educated parents, coaches, and athletes because they offer multiple methods of education (Williamson et al., 2014)). Therefore, if I had another means of education, it might have helped increase my response rates.

Conclusion

Biggest Take Away

One of the central ideas that I have learned from this research project is that I must be adaptable in research. Plan A, B, and C are not likely to work, so be ready to use plan G. I recall going through the development of our project in grant writing. I was going to develop a plan, then put it in motion, collect my data and write my document. It all seemed straightforward. As you can see above, this process was anything but smooth or easy. I had to change multiple

aspects multiple times. The difficulty of gathering participants should not have been surprising because many of my references had meager response rates.

Furthermore, it also creates a significant challenge when those that said they would be willing to help quit communicating. In addition to the poor response rates, I also had to alter my original methodology and switch from an in-person delivery method to a synchronous webinar and then to an asynchronous video. Format of the educational video aside, I also had to figure out a way to shorten a 30-minute presentation and develop a length that parents would be willing to watch. The result was about a 19-minute video, which one participant still regarded as "long-winded."

Material Development

Another component that I felt I learned from was the development of my surveys, educational video, and my recruitment materials. Before this project, I had never developed a formal survey or attempted to recruit participants for a study. The area that I felt least comfortable with was developing the recruitment material. I have taught a few classes, so I felt reasonably comfortable developing the PowerPoint and video. To improve the outcome and have better completion rates, I need to shorten my video or even make it a couple of short videos in a series. An alternative thought would be to create an infographic and an optional video for those that elect to watch it. I also think that it may take a team or league to make this a mandatory event to measure the effectiveness of an educational video. Working with my committee, I learned how to phrase some of the questions better and ensure my survey focused on my topics. As I reflect, I think a combination of a long video and poor recruitment methods were likely the weakest areas of my study.

As I move forward, one of the main areas I need to focus on when developing a research study is considering my target audience. If my audience is more professionally focused then, I could use a more formal letter as I developed for this study. However, if I focus on the general population, I need to make it more engaging and exciting. Additionally, I may need to find a new delivery method for my educational program. I will need to examine some additional studies to see what methods have worked for educating parents in other realms to determine an appropriate media. My research alluded that parents need education on injury prevention and that educational programs have worked in other realms.

Action Plan

With any future research studies, one of the main things I will do is build a strong relationship with anyone who may be a stakeholder in the process. Meaning, if there is a director, supervisor, or anyone in charge, I want to have them 100% on board and have the means to help. I will ensure that they understand their role clearly and that it will not be a one-time deal. More in-person meetings and discussions of what my study focuses on and how it can help them will be needed to address this. When developing my recruitment materials, I need to consider my target audience. Do I need a formal letter, or do I need materials that will grab their attention visually and make it stand out amongst other emails, posts, or flyers?

Streamlining the participant's process and limiting providing personal information could also lead to better involvement. I do not believe offering additional options to complete the post-survey would provide much help. However, I do believe that offering some incentive might. While attending the tryout day, I overheard one parent ask another about a bat and indicated it would make a good Christmas present. Therefore, I think offering an incentive to a sporting goods store might be of benefit. Furthermore, Watson et al, offered incentives at each phase

primarily for completing the follow-up checkpoints. For my study, I would need to obtain a grant to provide incentives after the educational video and post-survey, but I could certainly offer the chance to win a gift card after watching the video and after completing the post-survey.

I would also alter my educational program and determine the best delivery method. Many educational programs, especially for concussions, use videos and therefore I do believe using a video is the best method. However, as indicated in the research, I think I need to shorten it. Additionally, I would also create a pamphlet as another means for parents to educate themselves. I think taking the time to pilot my educational program would be beneficial to address this. Also, with creating the different educational tools, I would add some questions to my survey. Namely, I would want to know which recruitment method brought them there, the email, Facebook post, shared Facebook post, or flyer? I would ask them to evaluate the recruitment material as to whether it had enough, not enough or too much information and whether it lacked esthetics and could have done more to grab their attention. Then I would also ask new questions about which educational media they used and if they used more than one. For example, did they start with the pamphlet then want to learn more, so they watched one of the videos? While this may have been a challenging undertaking for this dissertation, I only think it would have added a few questions to a survey and created a few more educational tools.