Acknowledgements

For pitcher’s arms everywhere...

With thanks to my parents for allowing this project to be possible by supporting my childhood baseball endeavours yet maintaining academic expectations

Abstract

Arm Injuries Suffered by Youth Baseball Pitchers in British Columbia: Solving the Problem in the BC Minor League. Williams, Kyle. 2010: An Action Research Report, University of Phoenix, MAED Program in Administration and Supervision.

This action research project was designed to reduce the number of youth baseball pitchers who suffered arm injuries in the British Columbia Minor Baseball league. Baseball/Pitching/Arm Injuries/BC Minor Baseball/Pitch Count.

The writer implemented a solution strategy to solve the problem in the BC Minor League. Pitching rules, designed by the league to protect pitchers from arm injuries, were changed from being based on the number of innings pitched to the number of pitches thrown. An educational campaign was implemented in the form of weekly educational articles intended to raise awareness among parents, coaches, and players of the risk factors associated with developing an arm injury.

The writer conducted pre and post implementation surveys to determine what percentage of pitchers were suffering arm injuries and to what degree pitchers were being subjected to known risk factors associated with developing an arm injury. Analysis of post implementation survey data indicated that the combination of strategies implemented contributed to reducing the number of youth baseball pitchers who developed arm injuries and who were subjected to risk factors associated with developing arm injuries during the 2009 season.

This project recommends that BC Minor continue to implement the educational initiatives used in this action research project during the 2010 season and that strategies for implementing future educational initiatives and pitching rules be considered by the governing bodies of baseball in Canada.

Permission Statement

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Chapter 1: Introduction

Problem Statement

The problem was that some youth baseball pitchers between the ages of 10-18 were developing arm injuries.

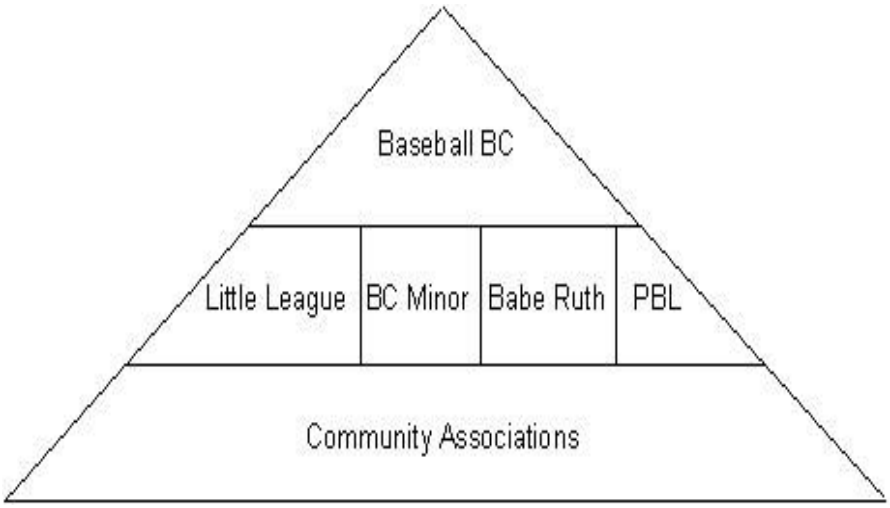
Purpose

The purpose of this study was ultimately to reduce the number of arm injuries suffered by youth baseball pitchers between the ages of 10-18 in British Columbia. Reducing the number of pitchers who suffered arm injuries was accomplished through both policy change and education programs initiated by the writer. Reducing the number of arm injuries suffered by youth baseball pitchers may increase their opportunity to pitch at higher levels including professionally, may improve their performance, and may increase their enjoyment and participation in the sport of baseball.

Description of the Community

This study sought to influence players, coaches, and parents involved in youth baseball in the province of British Columbia. The organization of youth baseball in British Columbia consists of local community associations, leagues, and governing bodies in a pyramid like structure. At the top of the pyramid, as the recognized Provincial Sports Organization, is Baseball BC. Below Baseball BC, from a youth baseball standpoint, are four member leagues. These leagues are: BC Minor, Little League, Babe Ruth, and Premier. Finally, at the base of the pyramid are local community associations who affiliate to one of the leagues.

Organization of Youth Baseball in British Columbia



Graphic by Tyler Williams

The organization of Baseball BC is designed to best support the sport of baseball in British Columbia. Baseball BC is governed by an eight member volunteer executive that is annually elected by its membership (Baseball BC, 2008). Baseball BC also has two paid employees who handle the day-to-day operations of the organization. Baseball BC's membership includes the four youth leagues, two adult leagues, and an umpires association. Baseball BC's mission statement is that, "through its programs and leadership, Baseball B.C. in cooperation with its affiliates, supports the development of baseball and the aspirations of its members, by offering opportunities and setting procedures, standards and policies (Baseball BC, np.)." Compared to the other Provincial Sports Organizations in British Columbia, Baseball BC is unique in that it is not the governing body for baseball in the province. Instead, each league has the autonomous power to govern as they desire making their own rules, policies, and procedures. Baseball BC has a limited ability to influence the decisions of other leagues and until recently two of the four youth leagues operated successfully without being members of Baseball BC. Instead of acting as a governing body, Baseball BC acts as a service provider to its member

leagues, organizing coaching certification and some provincial teams (Baseball BC, 2008). David Laing (personal communication, November 6, 2008), Executive Director for Baseball BC, explained that,

> while that fact of (Baseball BC) being nothing more than a service provider doesn't lend to easy implementation on any initiative or program, it does leave the responsibility on the leagues that are ultimately responsible for the delivery of programs that impact our athletes.

An understanding of the role Baseball BC plays in implementing policy was important for the purpose of this study because it influenced how one may go about enacting policy change. In the case of solving the problem of youth baseball pitchers developing arm injuries, it seemed that solution strategies should be implemented at the league level.

BC Minor Baseball is the largest of the four youth leagues in British Columbia. BC Minor is governed by a board of 18 volunteer directors who are elected annually by its members (BC Minor Baseball, 2008). BC Minor has 43 affiliate member associations whose boundaries cover almost the entire Lower Mainland as well as most of the populated areas of Vancouver Island and the Okanagan. In 2008, community associations affiliated to BC Minor had 15 365 registered players (BC Minor, 2008). BC Minor teams represent the province at Canadian National Championships each year. BC Minor's rules and policies are influenced by Baseball Canada, however, BC Minor has the ability to create local rules for play within the province. BC Minor Baseball does not have a mission statement.

Little League Baseball is the second most prominent youth league in British Columbia with a strong presence in Whalley, Langley, North Vancouver, Vancouver, and White Rock (Little League BC, 2008). An elected volunteer executive of ten members with regional duties

governs Little League. Their teams compete at a separate Little League National Championship and since Little League BC is affiliated with Little League International, their National Champion moves on to play in an International World Series. As an affiliate of Little League International, Little League BC is governed by their international rules of play but like BC Minor has some ability to govern the game at the local level. Little League's mission statement is to "promote, develop, supervise, and voluntarily assist in all lawful ways, the interest of those who will participate in Little League Baseball and Softball" (Little League BC, 2008, np).

Babe Ruth Baseball is a third provincial league that is much less prominent in British Columbia. Babe Ruth has virtually no presence in large population areas that are dominated by the other leagues. Babe Ruth is prominent in eastern British Columbia in communities such as Trail, Grand Forks, and Cranbrook in addition to some smaller affiliates on Vancouver Island (BC Babe Ruth Baseball, 2008). Babe Ruth's provincial winners qualify for Northwest Regional Tournaments and can from there qualify for an International World Series. Babe Ruth's mission statement is, "B.C. Babe Ruth Baseball is a community youth program dedicating itself to the advancement of amateur baseball through progressive leadership by ensuring meaningful opportunities, fair play and enjoyable experiences in a safe sportsmanlike environment" (Babe Ruth BC, 2008, np).

Finally, the Premier Baseball League is a high performance league that only offers two divisions of play; a senior league intended for grade 11 and 12 players and a junior league intended for players in grades 8-10. In 2009, there were twelve PBL franchises. All of these franchises fielded a team in the senior league while ten of the franchises fielded a junior team. There are approximately 400 players registered in the PBL (BC Premier League, 2008). The PBL is not affiliated with any other organizations, other than Baseball BC, giving it the ability to set

its own rules and procedures without interference from other governing bodies. The PBL is primarily interested in producing players who may be drafted to the professional leagues or offered college scholarships (C. Inouye, personal communication, November 12, 2008). In the 2008 Major League amateur player draft, the 16th player selected world-wide, Brett Lawrie, was drafted from the Langley Blaze, a Premier League franchise (Langley Blaze, 2008). The PBL does not have a mission statement.

Local community associations make up the bottom of the youth baseball pyramid in British Columbia and can chose to affiliate with a league of their choice. Generally, the affiliations between associations and leagues are stable and do not change from year to year, however, from time to time associations may change the league to which they affiliate. In some instances, there may be more than one community association within the same community. For example, in Coquitlam, there is one community association affiliated with Little League and another affiliated with BC Minor, in addition to an independent PBL franchise. Some of the responsibilities of community associations include: registering players, selecting coaches, scheduling umpires, and equipping their teams.

Work Setting

This study focused on solving the problem of youth baseball pitchers developing arm injuries within the setting of the BC Minor League. In solving the problem in the BC Minor league, the study sought to influence hundreds of teams in 43 community associations. Specifically, within BC Minor, this study sought to reduce the number of pitchers who suffered arm injuries at the Mosquito, Pee Wee, Bantam, and Midget divisions. In 2008, BC Minor associations registered 2,927 Mosquito players, 2,284 Pee Wee players, 1,676 Bantam players, and 1,148 Midget players (BC Minor Baseball, 2008). Therefore, this study had the potential to

influence the practices of approximately 8,000 players throughout the province of British Columbia.

Writer's Role

The writer of this research has been an active participant in youth baseball for 23 years beginning at age five and has had a variety of roles including player, coach, executive member, and umpire. As a player, the writer played as a child for Coquitlam-Moody Minor Baseball, an affiliate of BC Minor, from the time he entered kindergarten until the end of his grade ten year. In his grade 11 year, the writer began coaching. After coaching grade 4-5 players for two seasons, the writer coached at the grade 10-12 level for nine seasons, all of which were for BC Minor affiliate associations. In 2007, the writer began coaching a Coquitlam team affiliated to the Premier Baseball League. In addition to coaching, the writer served on the executive of a community association, Coquitlam-Moody Minor Baseball, for six seasons, holding the titles of Umpire Supervisor and Midget Division Coordinator. He has also served as a director of the BC Minor Baseball League for the past four years and has held the positions of Second Vice President, Discipline Committee Chair, and Bantam Division Chair. On the executive of BC Minor, the writer has been a leader for change, often arguing for rule and policy changes for the betterment of the game at the Annual General Meeting. The writer has also umpired baseball for 16 years. These various baseball experiences as a player, coach, umpire, and executive member in different leagues and associations provided the writer with the experience and knowledge required to complete the research in this project. His on-field experience as a coach, player, and umpire provided him with an understanding of how and why decisions are made from a variety of perspectives. Additionally, because he is a voting member in the BC Minor League, the writer had an ability to enact policy change and exert influence over that league's direction and the

policies of its member associations. The writer had the requisite background experience and knowledge to complete this action research project.

Chapter II: Study of the Problem

Problem Description

The problem was that some youth baseball pitchers between the ages of 10-18 were developing arm injuries.

Arm injuries have always been a concern for baseball pitchers because of the stress put on a pitcher's arm when throwing a baseball; an activity that is not a natural movement of the human arm. Over the past decade, evidence has suggested that throughout North America an increasing number of youth baseball pitchers may be developing arm injuries. British Columbia did not seem to be an exception to this problem and evidence suggested that the number of youth baseball pitchers suffering arm injuries in British Columbia may have increased (D. Empey, personal communication, November 2, 2008). According to a survey conducted by the writer, the problem may affect hundreds of youth baseball pitchers between the ages of 10-18. Recently many baseball leagues, throughout North America, have become aware that a problem exists and have taken steps in an attempt to solve the problem (Little League Baseball, 2007; Baseball Alberta, 2008; Baseball Canada, 2008). Within British Columbia's youth leagues, Little League attempted to solve the problem with rule changes, while BC Minor, Babe Ruth, and the PBL had not yet formalized a solution strategy at the end of the 2008 season.

Arm injuries to pitchers are a problem because they can reduce a pitcher's level of performance. An injured pitcher, just like an injured runner, will not be able to achieve to their full athletic potential had they been healthy (D. Empey, personal communication, November 3, 2008; R. Forbes, personal communication November 5, 2008; D. Otterman, personal communication, November 5, 2008). Richard Forbes (personal communication, November 6, 2008), currently a pitching instructor at the Bullpen Baseball Academy, suggested that when

pitchers have an arm injury they suffer from decreased velocity and endurance. Dave Empey (personal communication, November 3, 2008), an experienced long-time pitching coach in the Premier Baseball league, furthered Forbes' assertions, and explained the impact of arm injuries on performance when he stated that:

> No one pitches well with an arm injury. Professional pitchers deal with minor injuries because they're getting paid a whole lot of money but anything major puts them on the DL (disabled list). A young kid cannot throw with an injury. He isn't strong enough or experienced to overcome it and he should never have to.

Secondly, arm injuries are a problem because they cause short-term pain for the affected pitcher (D. Otterman, personal communication November 5, 2008; R. Forbes, personal communication November 5, 2008). David Otterman, a PBL graduate of the Coquitlam Reds who currently pitches for the University of British Columbia, added that when he pitches with an arm injury that, "a sharp pain shoots up the outter (sic) portion of my elbow and proceeds up my tricep (sic)." Forbes describes the pain injured pitchers experience as, "a deep pain within their shoulder" that they feel when they release the ball. In addition to the short-term pain, there may be long-term consequences for developing an arm injury at a young age. Dr. Howard Moore (as cited in Galewitz, 2008), an orthopaedic surgeon and sports medicine specialist at Baylor University, cautioned that, "it's not just baseball careers that are threatened, injuries to growth plates in the elbow or rotator cuffs in the shoulder can leave permanent damage that can reduce arm function or lead to arthritis" (p.2).

There are a number of reasons why the problem of youth baseball pitchers suffering arm injuries had not been solved throughout British Columbia. Firstly, the problem appears to have developed slowly over time and it is possible that many leagues, coaches, and parents have not

recognized that the number of pitchers suffering arm injuries may be increasing. Throughout North America, medical studies are only beginning to provide more conclusive evidence that a problem exists. When youth leagues became aware that a problem existed, they may have had difficulty identifying what was causing the problem. Additionally, in attempting to solve the problem, Little League BC benefited from research completed by Little League International, as rule changes aimed at solving the problem were instituted at the International level and passed down to local leagues.

There are a number of reasons why BC Minor had not formally addressed the problem of youth baseball pitchers developing arm injuries as of the end of the 2008 season. Unlike Little League, BC Minor did not initially have the benefit of taking direction from Baseball Canada, the National organization to which they affiliate. At the end of the 2008 season, Baseball Canada was still exploring and testing new rules in pilot projects that may help solve the problem and had not yet recommended any solutions strategies for play within the provinces. This left BC Minor to solve the problem on their own, a daunting task for a volunteer organization that does not have experience in interpreting medical research and instituting action plans to solve problems. Additionally, until recently at BC Minor, there had been a resistance to adopt new pitch count rules aimed at solving the problem. BC Minor director Bob Wadsworth had campaigned his fellow directors for years to consider pitch count rules and until recently Wadsworth's ideas were seen as too radical to be seriously considered by many directors.

Problem Documentation

In order to document the problem of youth baseball pitchers developing arm injuries in British Columba the writer conducted a survey of youth baseball pitchers in the summer of 2008. The survey was completed by players in both the BC Minor and Premier Leagues, therefore,

comparisons are made between players in both leagues throughout this discussion. These comparisons are important because each league has their own rules and strategies for protecting the arms of their pitchers and pitchers in different leagues may be subjected to different levels of risk for developing arm injuries. Through this comparison, specific areas of concern for each league are identified.

The survey results indicated that youth baseball pitchers in British Columbia were suffering arm injuries. Pitchers were asked how many times during their pitching career they had suffered an arm injury that prevented them from pitching for more than two weeks. The two week duration was chosen because it identified a period of time that indicated the pitcher had likely suffered a more serious arm injury than one that prevented him from pitching for a few days. The results indicated that 62% (33/53) of the pitchers surveyed reported that they had suffered an injury that prevented them from pitching for at least two weeks at least once during their career. Additionally, 20% (11/53) of these pitchers reported to have suffered a two week injury multiple times in their career. The percentage of pitchers reporting to have suffered a two week injury was higher in the 15-19 age bracket, with 71% (30/42) of pitchers reporting to have suffered a two week injury while only 27% (3/11) of pitchers aged 14 and younger reported to have suffered a two week injury. These results, indicating that older pitchers had suffered more two week injuries than younger pitchers, were expected because older pitchers had been pitching longer and therefore, had a greater opportunity to suffer an injury. The data also indicated that pitchers in the 15-19 year old age bracket in the Premier League were more likely to have suffered a two week injury then those of the same age playing in the BC Minor league. In the 15-19 year old age bracket, 81% (18/22) of Premier League pitchers, compared to 60% (12/20) of BC Minor pitchers reported such an injury. Finally, pitchers were asked whether they had ever

suffered an injury from which they had never fully recovered. Only one pitcher reported such an injury. This data confirmed that some youth baseball pitchers in British Columbia were suffering arm injuries.

Overuse is considered one of the leading causes of arm injuries among youth baseball pitchers (Hyman, 2004; Andrews as cited in Pennington, 2005; Lord, 2002; Micheli as cited in Pennington; Bach & Shilling, 2008). In an attempt to prove that youth baseball pitchers in British Columbia are suffering arm injuries, this survey sought to identify the degree to which these pitchers may be subjected to overuse. The writer identified four potential types of overuse and pitchers were asked to report the degree to which they may be subjected to each type of overuse. Research supporting these four types of overuse and their connection to the development of arm injuries among youth baseball pitchers is documented in the Literature Review.

Potential Cause of Overuse #1 – Pitching Too Long in a Game. To determine whether youth baseball pitchers are pitching too long in a game, pitchers were asked the following question: How often do you pitch longer then (sic) you feel you should have in an outing (too many pitches, tired, sore, etc.)? Pitchers were asked to answer by selecting from one of four response categories offered. Responses are recorded in Table 1.

Table 1

How Often Pitchers Report They Have Pitched too Long in a Outing

	Rarely (0-15%)	Sometimes (15-50%)	Often (50-85%)	Very Often (85-100%)
14 or younger	5	5	1	0
15-19	18	20	3	1
Total:	23	25	4	1

This data indicated that 57% (30/53) of pitchers surveyed reported that they believe they pitched too long in at least 15% of their outings. Additionally, 9% (5 of 53) of pitchers indicated that they believe they pitched too long in an outing at least half the time they pitched. The results also indicated that Premier League pitchers were more likely to report to have pitched too long in an outing than BC Minor pitchers, as 73% (17/23) of Premier League pitchers reported to pitch too long in an outing at least 15% of the time they pitched in comparison to 43% (13/30) of BC Minor pitchers.

Potential Cause of Overuse #2 – Pitching Again Without Adequate Rest and Recovery Time. To determine whether youth baseball pitchers were pitching with adequate rest and recovery time between their outings, pitchers were asked the following question: Every pitcher needs an adequate amount of rest between outings so their arm can recover to the point that they can pitch again without feeling the effects of their last outing. In what percentage of your outings do you pitch without, what you feel, is adequate rest for your arm (ie. It's still sore/stiff, etc.)? This question included a descriptive sentence prior to the actual question to ensure that pitchers understood the writer's definition of adequate rest. Pitchers were asked to answer by selecting from one of four response categories offered. Responses are recorded in Table 2.

Table 2

How Often Pitchers Report They Pitch Without Adequate Rest and Recovery Time

	Rarely (0-15%)	Sometimes (15-50%)	Often (50-85%)	Very Often (85-100%)
14 or younger	3	6	1	2
15-19	16	13	12	1
Total:	19	19	13	2

This data indicated that 28% (15/53) of pitchers surveyed believed they pitch without adequate rest and recovery time at least half the time they pitched and that 64% (34/53) of pitchers believe this occurred at least 15% of the time they pitched. A comparison between pitchers in the BC Minor and Premier League showed little variation in the results. This data suggested that many pitchers report to not having adequate rest and recovery time between outings.

Potential Cause of Overuse #3 – Playing Other Positions. To determine how often pitchers played other defensive positions, such as infield, outfield, or catcher, instead of resting on the bench when they were not pitching, pitchers were asked questions pertaining to this type of overuse. To determine how often pitchers played other defensive positions when they were not pitching the survey asked the following question: How often do you play a defensive position when you are not pitching? Pitchers were asked to answer by selecting from one of four response categories offered. Responses are recorded in Table 3.

Table 3

How Often Pitchers Report to Play Other Defensive Position When They Are Not Pitching

	Rarely (0-15%)	Sometimes (15-50%)	Often (50-85%)	Very Often (85-100%)
14 or younger	1	1	2	7
15-19	14	6	5	17
Total:	15	7	7	24

This data indicated that 58% (31/53) of pitchers reported that they play a defensive position at least half the time they were not pitching with a further 45% (24/53) of pitchers reporting that this occurred at least 85% of the time. A comparison between BC Minor and Premier League pitchers indicated that 60% (18/30) of BC Minor pitchers reported they played a defensive position at least 85% of the time they were not pitching, in comparison to only 26% (6/23) of Premier pitchers. While the sample size is small, age appeared to be a factor in whether a pitcher played another defensive position when not pitching as 82% (9/11) of pitchers under the age of 14 reported to play a defensive position at least half the time they were not pitching compared to 38% (16/42) of pitchers in the 15-19 age bracket.

To determine how often pitchers played other defensive positions on the same day they pitched, pitchers were asked the following question: How often do you play a defensive position and pitch on the same day (either before or after you pitch)? Pitchers were asked to answer by selecting from one of four response categories offered. Responses are recorded in Table 4.

Table 4

How Often Pitchers Play a Defensive Position on the Same Day They Pitch

	Rarely (0-15%)	Sometimes (15-50%)	Often (50-85%)	Very Often (85-100%)
14 or younger	3	1	4	3
15-19	18	8	5	11
Total:	21	9	9	14

The results indicated that 43% (23/53) of pitchers reported to pitching and playing a defensive position on the same day at least half the time they pitched and that 26% (14/53) of pitchers reported this occurred over 85% of the time they pitched. A comparison between pitchers in the BC Minor League and Premier league indicated that more BC Minor pitchers played defensive positions on the same day they pitched than pitchers in the Premier League with 56% (17/30) of BC Minor pitchers indicating they play a defensive position on the same day they pitched at least half the time, compared to only 26% (6/23) of Premier League pitchers.

Potential Cause of Overuse #4 – Inadequate Off-season Rest. To determine how much rest pitchers were giving their arms during the off-season, pitchers were asked the following question: In a calendar year, what is the longest you would go without throwing during the off-season? Pitchers were asked to answer by selecting from one of four response categories offered. Responses are recorded in Table 5.

Table 5

Amount of Rest Time Without Throwing During the Offseason

	1 week or less	1-4 weeks	1-2 months	2 or more months
14 or younger	3	5	1	2
15-19	14	16	8	4
Total:	17	21	9	6

This data indicated that 71% (38/53) of pitchers reported to take less than a month off without throwing during the off-season and that 32% (17/53) of pitchers reported to take less than a week off. Only 11% (6/53) of pitchers reported to taking two or more months off during the off-season without throwing.

Literature Review

The general problem of injuries in youth sports is becoming well documented and research has raised awareness that more youth athletes are suffering sport related injuries every year (Hyman, 2004; Andrews as cited in Pennington, 2005; Lord, 2002; Micheli as cited in Pennington; Bach & Shilling, 2008). Data collected by the National Center for Sports Safety (2005) indicated that 3.5 million youth athletes in North America are treated for sporting injuries each year. Sport is considered to be the leading cause of injuries in adolescents in North America and represents a significant strain on the health care system (Lord; Micheli, Glassman, Klein, 2007). Many attribute the strikingly high number of injuries to the growing trend of sport specialization where athletes spend more and more time training for one specific sport instead of playing a variety of seasonal sports (Hyman; Lord). Dr. Lyle Micheli (as cited in Pennington, 2005), a professor of orthopaedic surgery at Harvard's School of Medicine, added that overuse injuries are increasing in youth athletes, "because of specialization in one sport at an early age

and the year-round manic of training for it" (p.1). Mark Hyman argued that this trend of sport specialization and increased practice time has led to an increase in overuse injuries among youth athletes. He supported this claim with data from a Boston Sports Medicine Clinic that has seen the percentage of youth sporting injuries relating to overuse jump from 20% to 70% over the past decade. Data collected from New York's Mount Sinai School of Medicine also supported these findings and suggested that 60% to 75% of the adolescent sports injuries they treat are related to overuse (Lord). Dr James Andrews also believed younger athletes are suffering overuse injuries and stated, "you get a kid on the operating table and you say to yourself, it's impossible for a 13-year-old to have this kind of wear and tear" (p.1). Dr. Cathy Cantor (as cited in Spino, 2008), Associate Director of Sports Care at a West Toledo clinic, explained that:

> Children are especially vulnerable to overuse injuries because they're growing and have tender growth plates. Bones, which are still a tad soft, can't withstand the daily micro trauma created from constant running, jumping, or throwing. They eventually break down. Joints, where muscles meet bone, are especially at risk (p.1).

Youth baseball pitchers may be no exception to this trend of increasing overuse injuries in youth athletes.

Evidence That Youth Baseball Pitchers Are Suffering Arm Injuries. Documenting the problem of youth baseball pitchers developing arm injuries with research is a challenging proposition. Despite expert theories suggesting arm injuries are a current problem for youth baseball pitchers, very few academic studies indicate what percentage of pitchers are suffering arm injuries and the rate at which these injuries may have increased in recent years (Pennington, 2005). There is an absence of research support because there are no records kept by youth baseball organizations documenting injuries that would allow one to review the history of arm injuries like one could

review league standings on a year by year basis. Therefore, most often when attempting to prove the problem of youth baseball pitchers developing arm injuries; researchers are forced to rely on anecdotal evidence submitted by baseball coaches and administrators.

Despite the lack of quantitative data that researchers could use, there is evidence available to confirm that arm injuries are a current problem for youth baseball and that the number of pitchers suffering arm injuries has increased in recent years. A number of respected doctors and researchers who treat arm injuries in baseball pitchers have recently sounded alarm bells to draw attention to what they feel is an unacceptable number of youth baseball pitchers suffering arm injuries (Andrews as cited in Galewitz, 2008; Dodd, 2003; Bechtel, Cannella, 2005; Thurston, 2008; Jaeger, 2008). As early as 2003, researchers such as Mike Dodd identified doctors who were treating arm injuries previously only experienced by adults in pitchers as young as 14 years old. One of the leading experts in the field, Dr. James Andrews, pointed to the increase in reconstructive elbow surgeries that he has performed on youth pitchers since 1995 at his Birmingham, Alabama clinic, as evidence of an increasing problem. In the four year period between 1995-1998, Andrews completed only nine surgeries on youth baseball pitchers. The number of surgeries Andrews completed increased to 61 between 1999-2002 before ballooning to 148 surgeries between 2003-2006. While some of the increase in the number of surgeries completed may be attributed to the fact that over the documented 12 year period Andrews became a well known, if not the best known doctor in the United States for his ability to reconstruct pitching arms, the data still demonstrates that a high number of pitchers are having reconstructive elbow surgery (Burke, 2003). Other doctors have also reported high numbers of reconstructive surgeries on youth pitchers, including Dr. Tim Kremchek (2004) of the Cinncinati Reds, who in 2004 alone reported completing 38 elbow surgeries on pitchers under the age of 16.

These statistics seem to support the argument that arm injuries are a current and increasing problem for youth baseball pitchers.

The American Sports Medicine Institute in consultation with the American Baseball Foundation (2002) conducted the only comprehensive study on what percentage of active pitchers were actually suffering arm injuries and how often these injuries occurred. The researchers completed a full year study of 476 baseball pitchers between the ages of 9-14 in an attempt to determine how often pitchers reported elbow or shoulder pain after pitching. The researchers found that pitchers in the study reported elbow or shoulder pain 16% of the time they pitched (Lyman, Fleisig, Andres (sic), Osinski, 2002). The study also found that over the course of the season more than half of the pitchers studied reported elbow or shoulder pain at least once. While failing to document the extent of the pain, how long it lasted, and how often it resulted in a reduced level of performance or led to long-term injury, the study nonetheless supported the argument that a significant percentage of youth baseball pitchers suffer arm injuries on a regular basis.

Researchers found that there are many causes of youth baseball pitchers developing arm injuries. In general, arm injuries occur over time and unlike impact injuries that occur in a moment when an ankle is twisted or a bone is broken, arm injuries generally cannot be traced to one specific moment. The concept of pitching arm injuries occurring over time was best described in an American Sports Medicine Institute (2008) article that stated that when a serious arm injury occurs, “quite frequently the one bad pitch was really just the straw that broke the camel’s back and was the final micro tear that led a series of micro tears to become a large tear” (p.2). Therefore, to determine the cause of arm injuries, researchers must consider a variety of factors that, combined over time, caused the injury to occur.

Researchers found that a leading cause of arm injuries in youth baseball pitchers is overuse (Thurston, 2008; Andrews as cited in Pennington, 2005; Andrews as cited in Galewitz, 2008; Maloney as cited in Galewitz, 2008). Glenn Fleisig (as cited in Khan Jr, 2008), researcher at the American Sports Medicine Institute, claimed, "without a doubt the number one statistic cause of UCL injuries is overuse" (p.1). This position is supported by the previously detailed American Sports Medicine Institute's study of 476 youth pitchers, which found that pitchers who threw between 75-99 pitches in an outing were up to 52% more likely to report feeling shoulder pain after pitching then those who had thrown under 75 pitches (Lyman, et al., 2002). A 2006 study by Olsen, et al. supported this research and found a correlation between pitchers who threw more than 80 pitches on a regular basis and pitchers who have had arm surgery, suggesting that the more pitches a pitcher threw the greater the likelihood that the pitcher had suffered an arm injury. In an open letter to Little League Baseball, Dr. James Andrews (no date) stated that, "the scientific results confirmed that the number of pitches thrown was the most significant contributor to arm problems" (p.1).

Pitching without adequate rest and recovery time between outings can also lead to overuse (Pennington, 2005; Relins, 2007; Olson, Fleisig, Dun, Loftice, & Andrews, 2006; USA Baseball, 2004). Andrews (as cited in Pennington, 2005) suggested that this is a particular problem for young talented pitchers as coaches are more likely to ask them to pitch before they have had adequate rest and recovery time because they want their best pitchers on the mound to give them the best opportunity to win games. Examples of 15-year-old pitchers starting as many as 64 games in a season have been presented to support this claim (Relins). Olson et al. indentified the risk of pitching without adequate rest and recovery time in a baseball specific research study that found that when a pitcher regularly threw with arm fatigue, that they were 36

times more likely to have had surgery than a pitcher who had not regularly thrown while fatigued.

Pitchers who consistently play other positions when they are not pitching may also be subjected to overuse. Playing other positions may contribute to arm injuries because it means that pitchers will make an increased number of throws, which may lead to overuse. When explaining the need for pitchers to have adequate rest and recovery time between outings Jack Kuzniczci (2004), a former professional player and varsity baseball coach added that, “rest does not mean playing high stress positions such as catcher and shortstop (p.1).” Dave Empey (2002) identified pitchers who play other positions as a problem that coaches must be aware of and cautioned coaches to limit how much throwing their pitchers do when playing other positions in practice. The position of catcher would require the greatest number of throws because the catcher throws the ball back to the pitcher on most pitchers that are not hit by the batter. Ben Ronald (personal communication, November 8, 2008), a former pitcher, and catcher with the Tri City Indians explained that when he played at the Bantam level (age 14-15) he often pitched the first game of doubleheaders and then played as the catcher in the second game and regularly felt shoulder pain as a result.

Researchers also found that pitchers who do not give their arm adequate rest during the off-season may be at an increased the risk of developing arm injuries (Relins, 2007; Andrews, 2006; Andrews, as cited in Galewitz, 2008; Thurston 2008; Dodd, 2003). With the trend towards sport specialization, baseball season continues inside gyms and training centers for many pitchers even when the winter weather arrives. The development of indoor training facilities has allowed pitchers to practice 12 months a year, if desired, causing once more the opportunity for overuse injuries to occur. Research indicated that pitchers who take at least two months off in a

calendar year are less likely to develop an overuse injury than a pitcher who takes less than two months off (Dodd; Andrews; Thurston). Dr. James Andrews takes the need for off-season rest a step further and recommends that pitchers have at least four months away from throwing during the off-season. Having four months away from throwing was supported by his 2006 study that compared pitchers who had previously had arm surgery to those who had not. The results indicated that pitchers who had thrown for more than eight months in a year were more likely to have had arm surgery during their career then those who threw for less than eight months (Andrews as cited in Galewitz, 2008). In a position paper on the subject of off-season rest, USA Baseball's Medical & Safety Advisory Committee (2004) stated that:

> Pitchers should compete in baseball no more than nine months in any given year as periodization is needed to give the body time to rest and recover. For at least three months a year, a baseball pitcher should not play any baseball, participate in throwing drills, or participate in any other stress related overhead activities (p.2).

Researchers have also suggested that a communication problem between pitchers and their coaches may be causing some pitchers to pitch while fatigued or injured which may lead to overuse. Communication between coaches and pitchers is cited as a problem when a pitcher chooses to be dishonest about the condition of their arm. Bechtel & Cannella (2005) suggested that many youth pitchers may be unwilling or are unable to communicate to their coaches that their arm is tired, sore, or in need of rest. Andrews, as cited in Galewitz (2008), cited pressure to help their team win and pressure from coaches to perform, as reasons pitchers may be dishonest about the condition of their arm. Michael Maloney (as cited in Galewitz, 2008), Director of Sports Medicine at the University of Rochester, added that, "coaches can't expect teens to tell

them whether their arms are tired...kids are ashamed if they don't throw through pain or have to take time off due to injury" (p.8).

Showcase tournaments have also been identified as contributing to the overuse of some youth baseball pitchers (Andrews, 2005; USA Baseball, 2004). Showcase tournaments are held for the best high school aged players and provide them with an opportunity to display their talent to a variety of professional and college scouts (Andrews). At showcase tournaments, high school pitchers may feel parental pressure to earn college scholarships and knowingly take risks with their arm because they know their window to show their ability is small (Bechtel & Cannella, 2005). Sometimes, because of their commitment to their regular teams, pitchers do not have adequate rest and recovery time before showcase tournaments or fail to have rest before returning to their commitments with their regular teams (B. Green, personal communication, July 15, 2008). Also, while at showcase tournaments pitchers may make attempts to impress scouts often throwing to the radar gun and attempting to reach high speeds that their arm may not be safely able to attain (Dodd, 2003; Bechtel & Cannella).

In addition to overuse, researchers found that improper throwing mechanics can put a pitcher who may not be subjected to overuse, at risk of developing an arm injury (Thurston, 2008). In part, proper mechanics, which include: having your pelvis and shoulder square to the plate, landing on the ball of your foot, keeping your elbow at shoulder height, and following through, help protect pitchers from developing arm injuries by reducing the load on the elbow (Wilson, 2007; Little League Baseball, 2007; Ellis, 2008). In a laboratory study Fleisig, Barrentine, Zheng, Excamilla, and Andrews (1999) found that youth baseball pitchers were more likely than adult pitchers to have a greater load placed on their elbow when throwing and concluded that this was a result of youth pitchers not having been taught correct throwing

mechanics. Carl Wilson (2007) recently demonstrated how improper mechanics could lead to arm injuries in his own laboratory study and found that an increased measurable rate of elbow load was exhibited by youth pitchers with improper mechanics. He concluded that this increase in load contributed to elbow injuries.

Anecdotal evidence suggested that throwing curveballs or sliders instead of fastballs, particularly for younger pitchers, may put them at a greater risk for developing an arm injury, however, there is little consensus on this issue among experts. Many experts have argued that throwing curve balls and sliders puts younger pitchers at greater risk of developing an arm injury (American Sports Medicine Institute, 2008; Petty, Andrews, Fleisig, & Cain, 2004; Cassas & Casettari, 2006). A study completed by the American Sports Medicine Institute (2008) found that pitchers in the 9-14 age bracket who threw sliders were 86% more likely to report elbow pain than those who did not throw sliders. Other studies have found similar correlations and drawn the same conclusion (Petty, et al.). However, laboratory research failed to support these conclusions. A recent study compared the kinetics of youth baseball pitchers throwing a fastball, curveball, and change up in a controlled setting (Shouchen, Loftice, Fleisig, Kingsley, & Andrews, 2008). The results went against even the researchers predictions and indicated that elbow and shoulder loads measured highest when fastballs were thrown and lowest when curveballs were thrown. A similar study completed with college players found the same results (Fleisig, Kingeley, Loftice, Dinnen, Ranganathan, Dun, Escamilla, 2006). Little League Baseball (2007), which conducted a recent in-depth review of the literature in regards to pitching arm injuries, concluded that, “there is no medical evidence to support a ban on breaking pitches (curveballs and sliders).” Little League continued that, “it is widely suspected by medical professionals that it is ill-advised for players under the age of 14 years old to throw breaking pitches” (p.1), but stopped short of

recommending a ban. Little League has begun a five year study on the effects of breaking pitches, conducted by the University of North Carolina. Until this or other research is complete, it appears there is no clear medical evidence to support the belief that curve balls and sliders lead to an increased risk of developing an injury in youth baseball pitchers.

Causative Analysis

Some youth baseball pitchers in British Columbia were being overused and as a result were subjected to an increased risk of developing an arm injury. There appeared to be four primary ways in which youth baseball pitchers in British Columbia were being overused including: throwing too many pitches in a game, pitching again without adequate rest and recovery time, playing other positions, and not having enough off-season rest without throwing. The results of the writer's survey of youth baseball pitchers indicated that youth baseball pitchers in British Columbia are subjected to these types of overuse and research supported that these types of overuse can lead to the development of arm injuries. There are a number of factors causing youth baseball pitchers in British Columbia to be subjected to these various types of overuse.

The Decisions of Coaches and Their Understanding of Arm Injuries. The decisions of coaches contribute to causing pitchers in British Columbia to be overused (R. Downes, personal communication, November 3, 2008; D. Laing, personal communication, November 6, 2008; D. Empey, personal communication, November 3, 2008). Coaches are a cause of the problem because they determine when pitchers pitch and are therefore responsible for protecting pitchers from overuse injuries. One of the problems in British Columbia is that some coaches do not have an understanding of what may cause a pitcher to be overused and at risk of developing an arm injury. In this way, a well intended coach might unknowingly overuse a pitcher. A lack of

education of arm injuries amongst inexperienced coaches was identified by Dave Empey who stated that, “too many coaches think they know all about that (risk factors associated with arm injuries) and are oblivious to reality.” Doug Matheison (personal communication, November 3, 2008), the founder of the Langley Blaze franchise in the PBL, argued that coaches need to be better educated in regards to the ways in which they can prevent arm injuries. Matheison listed icing, Jobe’s exercises, and understanding the differences between pitch counts and innings pitched as potential areas for further education. Empey also suggested that arm injuries occur because coaches are unaware of the importance of proper warm-ups, correct pitching mechanics, baseball specific weight training programs, and how much pitchers should pitch. David Laing, confirmed that currently the National Coaching Certification Program’s coaching clinics provide limited training in regards to the prevention of arm injuries.

The Decisions of Coaches Influenced by Their Desire to Win. In some cases, coaches who understand the risk factors associated with pitchers developing arm injuries may choose to ignore the risks and push their pitchers in pursuit of wins and championships (S. Sangara, personal communication, November 14, 2008). In some cases, coaches may pressure pitchers to pitch when they are tired, fatigued, or injured. Many feel that coaches get caught up in a “culture of winning” that is prevalent within youth baseball and that this culture causes coaches to overuse pitchers because they want their best pitchers on the mound because their best pitchers give them the best chance to win. Dave Empey (personal communication, November 5, 2008) described coaches wanting to win as, “a major problem” for youth baseball in British Columbia. From his position at Baseball BC, David Laing (personal communication, November 6, 2008) claimed that coaches’ desire to win is, “the biggest issue facing the sport.” He furthered his position by citing, “numerous examples of coaches who overuse an arm to win a game or tournament.” Serj

Sangara, a Midget Division Director for BC Minor Baseball, stated that, “at the higher levels the majority of coaches understand the risk factors (associated with arm injuries) but lack the fortitude to pull the trigger (make a pitching change) when needed”. The writer’s survey of youth baseball pitchers in British Columbia indicated that 16% (9/53) of pitchers reported to have sometimes felt pressure from coaches to pitch when their arm was sore. Jaret Adair (as cited in Pennington, 2005), a 16-year-old pitcher in Atlanta who has undergone arm surgery summarized the inevitability of good pitchers being overused by coaches who want to win when he stated that, “if you’re a good pitcher on a team of 14 or 15 year olds you’re going to be throwing too much. Everybody wants their ace out there (p.1).”

Communication Between Coaches and Pitchers. There is also a communication problem between coaches and pitchers in British Columbia that is causing pitchers to be overused because they are not being truthful with their coaches about the condition of their arm. In the writer’s survey of youth baseball pitchers, only 43% (23/53) of pitchers reported that they are always truthful with their coaches about the condition of their arm. Furthermore, 11% (6/53) of pitchers indicated that they are rarely truthful about the condition of their arm to their coaches. Pitchers from the BC Minor leagues seem to be more truthful than their Premier League counterparts, as 50% (15/30) of BC Minor pitchers reported to be always honest in comparison to 36% (8/22) of pitchers from the Premier League. When pitchers are not honest with their coaches about the condition of their arm it may lead coaches to incorrectly believe that they doing due diligence in terms of ensuring their pitchers are healthy when in fact their pitcher is injured.

Length of the Baseball Season and Off-season Training. In British Columbia, there is evidence to suggest that the length of the baseball season has changed over the past decade, which is also causing pitchers to be overused. Historically, baseball in British Columbia was played from late

March to early August, which is a relatively short playing season. Players generally put their baseball equipment away when school started in September, played a winter sport, and did not pick up a baseball again until the early spring (B. Green, personal communication, June 14, 2008). However, over the past decade, fall leagues were created and the outdoor playing season was extended to late October. Additionally, in the mid 90's a variety of private indoor baseball facilities were built creating the potential for players to play baseball year round, outside from March to October and then inside for the four winter months. Bill Green, a Major League Baseball scout, who has completed his 25th season at the helm of the Coquitlam Reds of the PBL, identified pitchers throwing well into the winter months, something he argued they never used to do, as potentially contributing to overuse injuries. Green added in recent years pitchers on his staff have been, "breaking down" at the end of the season more so than they have in the past, something he attributes to the expanded length of the season. Randy Downes (personal communication, November 8, 2008), a Pee Wee coach for decades and current director in BC Minor, furthered Green's argument saying that, "kids play more games than they did 20 years ago what with fall ball and all. This without a doubt would add to the stress on a young arm."

In addition to the start of fall leagues and year round training facilities, teams currently play more games during their spring and summer seasons than they have in previous years. A study of the history books of the Coquitlam Reds (2007), a Premier Baseball League team, found a significant increase in the number of games played over the past twenty years. From 1985-1989 Coquitlam played an average of 60 games per season. This increased to an average of 68.6 games played per season from 1990-1994 and sky rocketed to an average of 79.4, which has been consistent since 1995. A combination of an increased in season schedule, the development of fall leagues, and the opportunity for pitchers to practice in year round facilities has meant that

pitchers are playing more baseball in a calendar year than they ever have before in British Columbia. When pitchers play and practice more they are increasing the number of throwing repetitions they complete, which may lead to overuse.

Chapter III: Outcomes and Analysis

Goals and Expectations

The goal of this study was to reduce the number of arm injuries suffered by youth baseball pitchers in British Columbia. In order to achieve this goal this study implemented new rules and procedures within the BC Minor league. Under these rules, pitchers should, more often than in previous baseball seasons, throw a safe number of pitches in each outing and should only pitch again after having adequate rest and recovery time. Additionally, it was the goal of this study to encourage open and honest communication between coaches and players so that pitchers would feel safe to communicate injuries to their coaches. Finally, this study implemented educational initiatives, aimed at players, coaches, and parents, with the intent on improving their overall understanding about how youth baseball pitchers may develop arm injuries.

Expected Outcomes

The following are specific outcomes that this study sought to achieve at the end of the implementation phase. It was expected that:

1) No more than 10% of pitchers would report to have suffered an arm injury that prevented them from pitching for two or more weeks during the 2009 season.
2) Zero percentage of pitchers would report to have pitched too long in a game often or very often during the 2009 season.
3) At least 75% of pitchers would report to have pitched too long in a game rarely during the 2009 season.
4) No more than 10% of pitchers would report to have pitched without adequate rest and recovery time often or very often during the 2009 season.

5) At least 75% of pitchers would report to have pitched without adequate rest and recovery rarely during the 2009 season.
6) At least 80% of pitchers would report to be always honest with their coaches about the condition of their arm during the 2009 season.
7) At least 95% of coaches would report to have increased their understanding of the risk factors associated with pitchers developing an arm injury during the 2009 season.

Measurement of Outcomes

In order to measure whether the expected outcomes of this project were met two surveys were conducted by the writer at the end of the 2009 season. One survey was completed by pitchers and collected answers to questions related to the first six expected outcomes. The second survey collected answers from coaches related to the seventh expected outcome. The writer provided surveys to a random sampling of teams in each division that could be returned to the writer by email or collected at provincial championships. The writer also sent emails to association presidents, coaches, and parents seeking participants to complete an electronic version of the survey. The writer collected completed surveys from 28 players and 13 coaches.

Analysis of Results

Using pre-implementation survey results, the writer set a target percentage for each of the seven expected outcomes. This target represented a level of improvement that the writer felt could be reasonably achieved through the implementation of specific solution strategies. The data obtained through the post-implementation surveys was analyzed to determine whether each outcome was met. Comparisons were made between pre and post survey results and the level of improvement of each expected outcome was discussed in terms of a percentage.

Chapter IV: Solution Strategy

Statement of the Problem

The problem was that some youth baseball pitchers between the ages of 10-18 were developing arm injuries.

Discussion

Youth baseball leagues have long addressed the concern of youth baseball pitchers developing arm injuries with rules intended to protect the arms of pitchers. These rules often involved limiting the number of innings a pitcher could pitch and mandating how much rest and recovery time a pitcher required before he could pitch again. These rules often used the number of innings pitched to determine how long a pitcher could pitch and how much rest and recovery time a pitcher required. For example, under Little League's previous rules based on innings pitched, a 10 year old pitcher in the Major's Division could pitch a maximum of three innings in a day, six innings in a week, and required two nights rest after pitching three innings in a day (Little League, 2007). Recently many youth leagues have realized that an increasing number of youth baseball pitchers are developing arm injuries. The understanding that arm injuries are becoming an increasing problem caused some youth leagues to review their rules and procedures related to the protection of pitchers and to develop rules and strategies to solve the problem. A review of the history of pitching rules and recent changes to them provides direction to this project and support for the solution strategies implemented to solve the problem in the BC Minor League in this project.

After studying the problem of youth baseball pitchers increasingly developing arm injuries, some youth baseball leagues created new rules aimed at better protecting the arms of their pitchers. One common rule change involved changing the measurement standard used to

determine how long pitchers were allowed to pitch in a game. Instead of rules based on the number of innings pitched, new rules were created that are based on the number of pitches thrown (Little League, 2007; Baseball Alberta, 2008). These new rules are commonly referred to as pitch counts. For example, under pitch count rules, a ten year old pitcher in Little League's Majors Division cannot throw more than 75 pitches in a day and must have one day of rest after throwing 21-40 pitches, two days of rest after throwing 41-60 pitches, and three days of rest after throwing 61 or more pitches. Researchers (Andrews & Fleisig, nd; USA Baseball Position Paper, 2004) recommended the change from innings pitched to pitch counts and argued that because it is possible for pitchers to throw a high number of pitches in relatively few innings it makes sense to enforce pitch counts instead of innings pitched. Dr. James Andrews supported pitch counts and stated they are, "one of the most important injury prevention steps ever initiated by youth baseball (Little League Baseball, 2007, p2). By creating pitching rules that use the number of pitches thrown as a measure, leagues can better ensure that their pitchers are not subjected to overuse.

Little League International was the first youth baseball league to implement a formal solution strategy to address the problem of youth baseball pitchers developing arm injuries when they introduced a pitch count rule as part of a pilot project in 2005 and 2006 (Little League, 2007). Stephen Keener, President of Little League Baseball, explained the success of Little League's implementation when he stated that, "surveys of the leagues that implemented pitch count as a part of the pilot project showed that the overwhelming majority were able to implement a pitch count rule without any problems" (p2). After a successful implementation of pitch counts in their pilot project, Little League Baseball implemented the rule in all of their more than 7 000 local league programs worldwide in 2007 (Little League). Little League's

pitching rules prior to 2007 can be found in Table 6 while their pitching rules introduced in 2007 are found in Table 7.

Table 6

Little League Pitching Rules – Prior to 2007

Division/Age	Maximum innings/day	Maximum innings/week	Required Rest and Recovery Time
Minors (age 7-8)	6	6	One day of rest after 1-3 innings pitched Three days of rest after 4+ innings pitched
Majors (age 8-10)	6	6	One day of rest after 1-3 innings pitched Three days of rest after 4+ innings pitched
Junior (age 11-12)	9	9	One day rest after 1-4 innings pitched Three days of rest after 5+ innings pitched
Senior (age 13-16)	9	9	One day rest after 1-4 innings pitched Three days of rest after 5+ innings pitched
Big League (age 17-18)	9	12	One day of rest after 4 innings pitched Three days of rest after 5+ innings pitched

Little League Baseball, 2006

Table 7

Little League Pitching Rules - Current

Division/Age	Maximum pitches/day	Required Rest and Recovery Time
Minors (age 7-8)	50	1 days rest after throwing 21-40 pitches 2 days rest after throwing 41-60 pitches 3 days rest after throwing 61 or more pitches
Majors (age 8-10)	75	1 days rest after throwing 21-40 pitches 2 days rest after throwing 41-60 pitches 3 days rest after throwing 61 or more pitches
Junior (age 11-12)	85	1 days rest after throwing 21-40 pitches 2 days rest after throwing 41-60 pitches 3 days rest after throwing 61 or more pitches
Senior (age 13-16)	95	1 days rest after throwing 21-40 pitches 2 days rest after throwing 41-60 pitches 3 days rest after throwing 61 or more pitches
Big League (age 17-18)	105	1 days rest after throwing 26-50 pitches 2 days rest after throwing 51-75 pitches 3 days rest after throwing 76 or more pitches

Note: These rules become slightly less restrictive for tournament play.
Little League Baseball, 2008

Baseball Alberta (2008) was the first provincial baseball association in Canada to introduce new rules to protect pitchers when in 2007 they implemented pitch count rules modelled after those adopted by Little League. Dan Curtis (personal communication, November

8, 2008), Program and Operations Coordinator for Baseball Alberta, explained that Alberta has had a, “great experience” with pitch counts through two seasons and that pitch counts were, “received relatively well by the membership.” Curtis identified one drawback with pitch counts which was that Baseball Alberta first experienced a “watering down of the leagues” due to the number of pitchers available, however, Curtis stated that Alberta expects to see an “increase in quality in 3-4 years when Midget teams have more pitchers.” Alberta’s rules go further than those set out by Little League and include some creative attempts to help protect pitchers’ arms and reduce overuse injuries. For example, pitchers are prevented from throwing on three consecutive days and are not permitted to play as a pitcher and a catcher in the same game. Alberta also outlawed the use of curve balls in their Mosquito and Pee Wee divisions. Table 8 is a summary of Baseball Alberta’s pitch count rule.

Table 8

Alberta Pitch Count Rules – 2007

Division/Age	Maximum pitches/day	Required Rest
Mosquito (age 9-10)	70	One days rest after 21-30 pitches Two days rest after 31-44 pitches Three days rest after 45-54 pitches Four days rest after 55-70 pitches
Pee Wee (age 11-12)	80	One days rest after 26-35 pitches Two days rest after 36-54 pitches Three days rest after 55-64 pitches Four days rest after 65-80 pitches
Bantam (age 13-14)	90	One days rest after 31-40 pitches Two days rest after 41-59 pitches Three days rest after 60-74 pitches Four days rest after 75-90 pitches
Midget (age 15-17)	100	One days rest after 31-44 pitches Two days rest after 45-64 pitches Three days rest after 65-79 pitches Four days rest after 80-100 pitches

Baseball Alberta

BC Minor's National governing body, Baseball Canada has recently followed the lead of Little League and Baseball Alberta in their implementation of pitch counts. Baseball Canada's first pitch count pilot project occurred at the 2008 Pee Wee National Championships, which used pitch counts for that single tournament (BC Minor Baseball, 2008). Baseball Canada has recently published a pitch count proposal that they plan to implement as a rule change for the 2009 season that mirrors the pitch count rules of Baseball Alberta found in Table 8 (Baseball Canada, 2009). In a recent publication, the executive of Baseball Canada's (2008) recommended that, "each Provincial Baseball Association adopts the same rules, without changes to the rule format, at its next annual meeting or meeting when rule changes may be considered" (p.1). Based on the recommendations of the executive of Baseball Canada it seems likely that pitch count rules will soon be implemented in most youth baseball leagues in Canada.

With Little League having adopted pitch count rules to protect the arms of their pitchers, BC Minor, Babe Ruth, and the Premier League remained having not implemented any formal solution strategy to address the problem of youth baseball pitchers developing arm injuries. The Premier Baseball League is the only youth baseball league in British Columbia not to have any pitching rules aimed at protecting the arms of youth baseball pitchers. The Premier League believes that because their coaches are experienced and have a good understanding of arm injuries that the majority of their teams do not have a problem with pitchers developing arm injuries (C. Inouye, personal communication November 12, 2008). Clyde Inouye (personal communication), Executive Director of the Premier League, stated he believed, "most coaches do understand the risk factors associated with arm injuries. At this level, most teams have a pitching coach that should be knowledgeable about these risks. These coaches have been pitchers

and have personal experience that is beneficial" (November 12, 2008). For these reasons, the PBL has not discussed or considered implementing a pitch count rule.

As of the 2008 season Babe Ruth BC continued to use pitching rules based on the number of innings pitched. However, Keith Small (personal communication, November 14, 2008), Provincial Commissioner for Babe Ruth BC, explained that Babe Ruth BC is waiting for approval to use pitch counts for the 2009 season. Babe Ruth's current pitching rules are found in Table 9.

Table 9

Babe Ruth Baseball Pitching Rules - Current

Division/Age	Maximum innings/day	Maximum innings/week	Required Rest
Cal Ripken (age 4-12)	6	6	Three nights rest after 3 or more innings pitched
Babe Ruth (age 13-15)	7	7	Three nights rest after 4 or more innings pitched
SR Babe Ruth (age 16-18)	Unlimited	Unlimited	None required

Babe Ruth Baseball, 2008

Until November 2008, BC Minor also used pitching rules based on the number of innings pitched. These rules are shown in Table 10.

Table 10

BC Minor Baseball Pitching Rules - Current

Division/Age	Maximum innings/day	Maximum innings/week	Required Rest
Mosquito (age 9-10)	3	6	Two nights rest after 3 innings pitched.
Pee Wee (age 11-12)	7	12	Two nights rest after 4 or 5 innings pitched. Three nights rest after 6 or 7 innings pitched.
Bantam (age 13-14)	7	14	Two nights rest after 5 innings pitched. Three nights rest after 6 or 7 innings pitched.
Midget (age 15-17)	8	14	Two nights rest after 5 or more innings pitched.

BC Minor Baseball, 2008

The solution strategies implemented by other leagues are relevant and useful in this study to the degree that they provide examples of potential solution strategies that could be implemented to solve the problem in the BC Minor league. However, the solution strategies used in other leagues are not yet supported by evidence to indicate whether they have successfully protected pitchers from developing arm injuries in the league in which they were implemented. The absence of evidence exists because the solution strategies have only recently been implemented in other leagues and those leagues have not yet conducted extensive statistical research to determine the degree to which their solution strategies have affected the problem.

Based on a survey of their members Little League believes their pitch count rules were successfully implemented in 2007, however, they have not yet been able to determine whether fewer pitchers are actually developing arm injuries (Little League, 2007). When asked whether there was a noticeable reduction of arm injuries after using pitch counts for two seasons in Alberta, Dan Curtis (personal communication, November 8, 2008) stated, "it is very hard to see the overall impact pitch count has had on the young arms across the province." Additionally, there is also no evidence to show that pitchers in leagues that have not implemented pitch counts are at a greater risk of developing arm injuries than pitchers in leagues that have pitch count rules. Therefore, because leagues that have implemented pitch counts have not been able to provide sound research results to determine whether their rules are helping to solve the problem, this study was unable to support its choice of solution strategies with evidence of how these strategies have been previously successfully used to solve similar problems in other leagues.

Discussion of Selected Solutions/Calendar Plan

This project implemented two categories of solution strategies intended to solve the problem of youth baseball pitchers developing arm injuries within the BC Minor League. The first category of solution strategies implemented rule changes for the 2009 season. These rule changes were closely modelled after rules implemented by other youth baseball leagues and included changing BC Minor's pitching rules from being based on the number of innings pitched to the number of pitches thrown. One difference between the rules changes implemented by BC Minor and those implemented by other leagues is that the BC Minor rules are less restrictive in that they allow pitchers to throw more pitches and have less rest and recovery time before pitching again. This is the case because the proposed pitching rules had to be passed by the membership of BC Minor Baseball at their 2008 AGM. As such, the writer had to consider the

level of support for pitch count rules from within the membership of BC Minor and write motions that he was confident would be supported and carried. The 2009 BC Minor pitching rules are found in Table 11.

Table 11

BC Minor Pitch Count Rules - 2009

Division	**Spring Season**	Single or Summer Season
Mosquito	1-20 pitches = no rest	1-30 pitches = no rest
	21-30 pitches = 2 nights rest	31-40 pitches = 2 nights rest
	31-45 pitches = 3 nights rest	41-55 pitches = 3 nights rest
	46-55 pitches = 4 nights rest	56-65 pitches = 4 nights rest
	56-70 pitches = 5 nights rest	66-80 pitches = 5 nights rest
	70 pitches max in a week	80 pitches max in a week
Pee Wee A	1-45 pitches = no rest	1-55 pitches = no rest
	46-65 pitches = 2 nights rest	56-80 pitches = 2 nights rest
	66-85 pitches = 3 nights rest	81-95 pitches = 3 nights rest
Pee Wee AA & AAA	1-35 pitches = no rest	1-45 pitches = no rest
	36-55 pitches = 2 nights rest	46-70 pitches = 2 nights rest
	56-75 pitches = 3 nights rest	71-85 pitches = 3 nights rest
Bantam	1-35 pitches = no rest	1-45 pitches = no rest
	36-65 pitches = 2 nights rest	46-75 pitches = 2 nights rest
	66-85 pitches = 3 nights rest	76-95 pitches = 3 nights rest
Midget	1-45 pitches = no rest	1-50 pitches = no rest
	46-65 pitches = 2 nights rest	51-75 pitches = 2 nights rest
	66-100 pitches = 3 nights rest	76-115 pitches = 3 nights rest

Establishing pitch count rules as a solution strategy in BC Minor was supported by the use of similar rules in other leagues, intuitive common sense, and an understanding of how overuse injuries can occur. Any strategy that successfully reduces the number of throwing repetitions completed by a pitcher should reduce the likelihood of that pitcher suffering an overuse injury. Reducing the number of throwing repetitions made by pitchers as a strategy to prevent overuse is supported by an understanding that overuse injuries are caused by the repetitive motion of the same body part (Current Health, 2006; Larker, 2008). Dr. Scott Larker defined overuse injuries as, "tissue damage that results from repetitive demand over the course of time" (p1). While research supported that reducing the number of throwing repetitions pitchers make would reduce the likelihood of a pitcher suffering an overuse injury, the degree to which throwing repetitions have to be limited should be carefully considered. The degree to which throwing repetitions are limited is important because it is possible, for example, for a league to make a rule that pitchers could only throw ten pitches in a day. This rule would likely immediately eliminate all arm injures but in doing so would destroy youth baseball because games would only last two innings due to the availability of pitchers. Rules that excessively limit the use of pitchers will also not be supported by baseball coaches, players, or parents and will not successfully solve the problem (S. Sangara, personal communication, November 12, 2008). Serj Sangara argued unreasonable limits on pitchers may, "stunt the growth of those that are willing to put in the time and effort to strengthen their arms through a proper understanding of mechanics". Solution strategies must therefore find a balance between what is safe for pitchers and what does not unnecessarily reduce their ability to participate in the game and improve their skills, which improve with constant practice and repetition (Hyman, 2004). This study, therefore, proposed solution strategies involving reducing the number of throwing repetitions pitchers

made and aimed to achieved a balance between protecting pitchers' arms, while still allowing pitchers to pitch and play the game as much as safely possible.

In addition to pitch counts, other pitching rules were implemented that sought to reduce the likelihood of pitchers being overused by attempting to reduce the number of throwing repetitions they complete. One of these rule changes prevented pitchers from pitching on three consecutive days, although an exception was made for tournament play that was not supported by the writer. This rule helped to ensure that pitchers have adequate rest and recovery time between outings. Another rule limited a pitcher's ability to pitch and catch in the same day in an attempt to reduce overuse. This rule identified the position of catcher as being a position where a player makes high number of throws and as a result a pitcher who plays that position may be subjected to a greater risk of overuse than if he was playing another position. Both of these rules are modelled after those implemented by Baseball Alberta and proposed by Baseball Canada.

The second category of solution strategies implemented in this study involved educating players, coaches, and parents about the risk factors associated with developing an arm injury. There are a number of individuals involved in baseball in British Columbia who believed that education coaches about the risk factors associated with developing arm injuries was of an upmost importance. Dave Empey (personal communication, November 5, 2008) suggested, "pitch counts are a good starting point but it's only the beginning. The education part is critical." Randy Vranckaert, (personal communication, November 9, 2008) First Vice President of BC Minor Baseball, added his support for education and stated, "all coaches should have mandatory education on pitching injuries from Mosquito on up." This was furthered by Richard Forbes (personal communication, November 8, 2008) who suggested that the young pitchers he instructs have little understanding of the risk factors associated with developing arm injuries and "do not

know the difference between pain and being tired...and do not practice and perform certain exercises that can prevent arm injuries." Forbes also identified a challenge of educating young pitchers about what they need to do to prevent arm injuries and explained that, "young pitchers are often not willing to change bad habits because they do not feel the consequences of their bad habits in terms of deep pain that will not be associated with their bad habits until they are much older." Education initiatives aim to raise draw attention to the problems of youth pitchers developing arm injuries by educating players, coaches, and parents about the risk factors associated with developing arm injuries.

The education initiatives implemented in this project took the form of weekly articles that were posted on the website of BC Minor Baseball every Monday during the baseball season. The articles were as short as possible and were written in a language that could be easily understood by a wider audience that includes young pitchers. Each article was consistently released every Monday so that players, coaches, and parents could become accustomed to looking for a new article at a specific time each week. Additionally, by spreading the release of the articles out over the course of the season, players, coaches, and parents had time to process and use their new knowledge over the course of a week as opposed to being inundated with new information all at once. Articles from previous weeks were archived on the website so they could be easily referenced by participants.

Calendar Plan

The following is a summary of the topics that were covered for each the 14 weeks that educational articles were released on the BC Minor website.

Week 1 (Posted April 6/09)

Topic: The transition to pitch counts: Why pitch counts may reduce pitching arm injuries.

Week #2 (posted on April 13, 2009)

Topic: Establishing open and honest communication between coaches and pitchers.

Week #3 (posted on April 20, 2009)

Topic: Pitchers playing other positions: risks and cautions.

Week #4 (posted on April 27, 2009)

Topic: The importance of correct pitching mechanics: how improper pitching mechanics may lead to injury.

Week #5 (posted on May 4, 2009)

Topic: Importance of pre-game routines.

Week #6 (posted on May 11, 2009)

Topic: The use of ice for pitchers.

Week #7 (posted on May 18, 2009)

Topic: The importance of developing arm strength and endurance

Week #8 (posted on May 25, 2009)

Topic: Jobe's exercises and surgical tubing

Week #9 (posted on June 1, 2009)

Topic: The curve ball debate

Week #10 (posted on June 8, 2009

Topic: The importance of proper clothing for pitchers

Week #11 (posted on June 15, 2009)

Topic: *Old and sore: the importance of learning good habits at a young age.*

Week #12 (posted on June 22, 2009)

Topic: Showcase tournaments

Week #13 (posted on June 29, 2009)

Topic: Off-season overuse

Week #14 (posted July 6, 2009)

Topic: Series summary

See Appendix D for a full version of each article.

Chapter V: Results

Results

The problem was that some youth baseball pitchers between the ages of 10-18 were developing arm injuries. The goal of this project was to reduce the number of pitchers who developed arm injuries in the BC Minor league during the 2009 season. The writer identified seven expected outcomes that would measure whether this study achieved its goal.

1) The writer expected that no more than 10% of pitchers would report to have suffered an arm injury that prevented them from pitching for two or more weeks during the 2009 season. This outcome was met. A survey of youth baseball pitchers indicated that 4% (1/28) of youth baseball pitchers reported that they had suffered a two week arm injury during the 2009 season.

2) The writer expected that 0% of pitchers would report to have pitched too long in a game often or very often during the 2009 season. This outcome was not met. A survey of youth baseball pitchers indicated that 4% (1/28) of pitchers reported that they had pitched too long in a game often or very often during the 2009 season.

3) The writer expected that at least 75% of pitchers would report to have pitched too long in a game rarely during the 2009 season. This outcome was met. A survey of youth baseball pitchers indicated that 86% (24/28) of pitchers reported they rarely pitched too long in a game during the 2009 season.

4) The writer expected that no more than 10% of pitchers would report to have pitched without adequate rest and recovery time often or very often during the 2009 season. This outcome was met. A survey of youth baseball pitchers indicated that 0% (0/28) of

pitchers reported they often or very often pitched without adequate rest and recovery time during the 2009 season.

5) The writer expected that at least 75% of pitchers would report to have pitched without adequate rest and recovery rarely during the 2009 season. This outcome was met. A survey of youth baseball pitchers indicated that 89% (25/28) of pitchers reported that they rarely pitched without adequate rest and recovery time during the 2009 season.

6) The writer expected that at least 80% of pitchers would report to be always honest with their coaches about the condition of their arm during the 2009 season. This outcome was not met. A survey of youth baseball pitchers indicated that 79% (22/28) of pitchers reported to have been always honest with their coaches about the condition of their arm during the 2009 season.

7) The writer expected that at least 95% of coaches would report to have increased their understanding of the risk factors associated with pitchers developing an arm injury during the 2009 season. This outcome was not met. A survey of youth baseball coaches indicated that 72% (13/18) reported to have increased their understanding of the risk factors associated with pitchers developing an arm injury during the 2009 season.

Discussion

The results indicated that four of the seven expected outcomes were met. While the results of all seven outcomes were important in determining whether this project met its overall goal, expected outcome number one was of particular importance because it was the only outcome that measured how many pitchers suffered an arm injury during the 2009 season. The results indicated that 4% (1/28) of pitchers surveyed reported that they had suffered an arm injury that prevented them from pitching for more than two weeks during the 2009 season. A

pre-implementation survey conducted by the writer at the end of the 2008 season found that 52% (15/29) of BC Minor pitchers surveyed reported that they had suffered a two week injury at least once during their career. The data indicating that only 4% of pitchers surveyed at the end of the 2009 season reported to have suffered a two week arm injury during that season provided evidence to suggest that the number of pitchers who suffered arm injuries was reduced from previous seasons, which was the ultimate goal of the project.

In contrast to expected outcome number one, that measured the actual number of pitchers who suffered arm injuries, outcomes number 2-6 measured the degree to which pitchers were subjected to risk factors known to cause arm injuries. Reducing the number of pitchers who were subjected to certain risk factors, such as pitching too long in a game, was considered an important step towards reducing the actual number of injuries suffered by pitchers during the 2009 season and throughout their careers. Of the five expected outcomes related to risk factors, three were met and two were not met.

Outcome number two, that expected 0% of pitchers would report to have pitched too long in a game often or very often during the 2009 season, was not met. Of the 28 pitchers surveyed, only one pitcher reported to have often pitched too long in a game during the 2009 season. This single survey result caused the goal to not be met and therefore seemed to be suggestive of an anomaly within one team, rather than being reflective of the entire BC Minor league. Considering one survey result caused the objective to not be met, it seems that important progress was made towards reducing the number of pitchers who reported to have often pitched too long in a game during the 2009 season. The target set by the writer of not allowing for even one pitcher to report to have often pitched too long in a game, seemed upon reflection, to be an unreasonable expectation by which to measure whether this outcome was met.

Outcome number six, that expected 80% of pitchers would report that they were always honest with their coaches about the condition of their arm during the 2009 season, was not met in this project. Survey results indicated that 79% of pitchers surveyed reported that they were always honest about the condition on their arm. The 79% result demonstrated improvement from a 2008 survey that indicated that 50% (15/30) of BC Minor pitchers were always honest about the condition of their arm but despite the improvement, the results did not meet the expected outcome target of 80%. The writer had previously indentified the importance of open and honest communication between coaches and pitchers to be important in preventing arm injuries because coaches may unknowingly pitch an injured or tired pitcher based on misinformation communicated by the pitcher, which may contribute to causing an arm injury. Based on survey data, it seems that progress was made towards improving the honesty between pitchers and their coaches; however, the problem of pitchers being honest with their coaches about the condition of their arm may still be a cause of arm injuries for a number of pitchers in the BC Minor league.

Outcome number seven, that expected 95% of coaches surveyed would report to have increased their understanding of the risk factors associated with pitchers developing an arm injury during the 2009 season, was not met. Survey results indicated that 72% of coaches reported to have increased their understanding of arm injuries during the 2009 season. This 72% result suggested that a high number of coaches increased their understanding of arm injuries during the 2009; however, the result did not meet the expected outcome target of 95%. The writer set a high target of 95% because he felt that the educational initiatives in this project could be made available to almost every coach in the BC Minor League and that the content would provide a learning opportunity for even experienced coaches. Of the coaches who reported to have not increased their understanding during the 2009 season, 80% also reported to have not

read the educational articles implemented as part of this project. Not reading the articles suggests a problem in the dissemination of the articles or in the motivation of coaches. Some coaches reported that they read the articles but had extensive background knowledge and did not learn anything new. Of the coaches who reported to have read the articles, 86% rated the articles as informative or very informative.

To determine whether this study met its expected outcomes the writer relied primarily on the results of surveys completed by BC Minor players. The writer faced a number challenges in obtaining valid survey results that are common to researchers who use self-reporting surveys or questionnaires. In his book Curriculum Action Research: A Handbook of Method and Resources for the Reflective Practitioner, James McKernan (p. 125), identified low response rates and respondents not answering questions honestly as challenges for researchers who use surveys. Both response rate and honestly were challenges for the writer of this action research project.

In this project, the writer overcame the challenge of low response rates by sending surveys to hundreds of players in anticipation of a low response. Although the percentage of players who responded was low, the sample size of 28 completed surveys by players was large enough to ensure the validity of the results. The surveys also consisted of players ranging in ages, who played at different calibers (A, AA, AAA), and who played for a variety of community associations. Of the 28 surveys completed by players 9 were completed by Pee Wee players; 10 were completed by Bantam players, and 9 were completed by Midget players.

The challenge of players not answering survey questions honestly was a difficult challenge for the writer to overcome in this action research project because parents and coaches were both involved in the process of collecting survey results which may have had an impact on whether the youth athletes felt comfortable enough answer the questions honestly. Parents were

involved because the youth athletes required a parent signature in order to complete the survey. Often parents sent the results directly to the writer. Coaches, in some cases, were involved in collecting the completed surveys and submitting them to the writer or designate. In this survey questions such as whether a player was honest with their coach about the condition of their arm, may have been difficult for pitchers to answer honestly when they may have had to return the completed survey to their coach.

A further challenge in using 2009 survey results to determine whether this project met its goal of reducing the number of pitchers who suffered arm injuries was that, for the purpose of this research, the results had to be collected at the conclusion of the 2009 season. As documented in the literature review, arm injuries are known to occur over time, potentially after years of a pitcher being subjected to known risk factors that may increase the likelihood of an arm injury occurring. Therefore, ideally, the most accurate measure of whether this project met its goal may be whether pitchers develop arm injuries over the course of their youth baseball career, something that the scope of this study could not measure.

This project sought to meet its expected outcomes, with the ultimate goal of reducing the number of youth baseball pitchers who suffered arm injuries, by combining new pitch count rules with an educational campaign. While survey results provided evidence as to whether the expected outcomes were met, further discussion is warranted to determine the degree to which the rules component and educational component were successfully implemented.

After being passed at the BC Minor AGM in November the pitch count rules immediately became binding on all member associations with consequences including forfeits and suspensions for non-compliance (BC Minor Rule Book; 2009). Local associations effectively communicated the new rules to their coaches and pitch count rules could be found prominently

displayed on a number of local association websites. While there were some examples of the new rules being misinterpreted by coaches the rules seem to have been followed throughout the season as BC Minor received very few complaints related to non-compliance. Pitch count rules were successfully implemented by BC Minor during the 2009 season and seemed to be followed by all associations.

The implementation of the educational initiatives, which took the form of weekly educational articles, was much more challenging in comparison to the implementation of pitch count rules. In order to implement the educational component of the project successfully the writer had to promote the articles so as many coaches, parents, and players would read them. This implementation proved to be challenging because whereas the rule changes were mandated with consequences for non-compliance, coaches had the freedom to choose whether they participated in the educational initiatives. In an attempt at promoting the articles, the writer posted the weekly articles on the BC Minor website and made them available to local associations through a direct email option. Each local association also had permission to post the articles on their own website and were encouraged to promote the articles to their members. Of the 46 member associations, only seven requested that the weekly article be emailed directly to them. While many member association websites prominently displayed the new pitch count rules, only South Burnaby Minor Baseball posted any information regarding the educational articles on their website. Overall, the writer was disappointed in what appeared to be a lack of promotion of the educational articles by local associations. The lack of promotion may have occurred due to a lack of awareness by the associations of the articles, challenges faced by associations in disseminating information to their members, the absence of a coaching education

coordinator within some associations, and constraints on the time of already overworked association volunteers.

Despite the apparent lack of promotion, most articles received 100-150 unique views in their first week of posting and by the end of July, 2009 had been viewed between 800-1200 times. The writer received positive responses from a number of individuals about the usefulness of the articles. Rick Reining (personal communication; July 6, 2009), a SR Head Coach for Ridge Meadows Minor Baseball wrote,

> Great work on your series of articles regarding reducing arm injuries for pitchers. I have put much of what you have written into practice with many of the kids that I coach, and am even using a lot of the exercises for myself, as I still pitch in over 30 and over 45 baseball leagues.

Tracy Mabone (personal communication, April 1, 2009), President of South Burnaby Minor Baseball added,

> I think this (the educational articles) is an excellent step for BC Minor to be taking and will go a long way to help reinforce the new rules that have just been implemented as well as help parents know what they can and should be doing to help their kids and not just trust that a coach has your kids' best interests at heart.

Stuart Fraser (personal communication, August 8, 2009), Coaches Coordinator for Westside Minor Baseball reported that his association mandated that their coaches read the weekly articles and suggested that posting the articles weekly ensured that coaches had time to reflect upon their learning instead of being inundated with information all at once. It seemed that the implementation of the educational component of this project was met with mixed results due to

the challenges associated with disseminating the articles to as many coaches, parents, and players as possible.

The writer achieved some of the expected outcomes in this action research project and appeared to make progress towards reducing the number of youth baseball pitchers who suffer arm injuries. Certainly, in terms of the implementation of pitch count rules, progress was made towards reducing the degree to which youth baseball pitchers are subjected to some of the known risk factors associated with developing arm injuries in the BC Minor league. While the educational initiative may not have had the impact envisioned by the writer, it was nonetheless a positive first step towards educating parents, coaches, and players in British Columbia about arm injuries. When evaluating the impact of the educational initiative it should be considered that the project sought to implement a groundbreaking educational campaign on a scale that had not been attempted in any other league in Canada. At the very least, through this action research project, the writer helped begin and support a conversation about arm injuries suffered by youth baseball pitchers and what can be done to reduce them in the future.

Recommendations

1. That the educational initiatives implemented as part of this project be continued in 2010 to increase the understanding of how youth baseball pitchers can develop arm injuries among parents, coaches, and players. In 2009, local associations focused on communicating the new pitch count rules to their coaches and less on educational initiatives. With most coaches now familiar with the new rules, associations, with the support of BC Minor, should begin by using the articles written for this action research project and implement a plan for disseminating them to their coaches.

a. Additionally, in terms of education, Baseball Canada, through the National Coaching Certification Program should incorporate a pitching arm injury component into all levels of its coaching clinics so that new coaches are educated on the risk factors associated with pitchers developing arm injuries. Baseball Canada, in cooperation with Baseball BC, and BC Minor should also seek to ensure that education is ongoing for current coaches, players, and parents. As further research on this topic is completed, it will be important that a strategy be developed for disseminating information from Baseball Canada, through Provincial Sports Organizations, all the way to grassroots coaches in local associations. Taking a leadership role will be important for Baseball Canada as is the need for each province to support Baseball Canada's initiatives and promote the flow of information.

2. That further research is completed to determine whether the current pitch count rules, including the number of pitches a pitcher can throw in a game, how much rest a recovery time a pitcher needs before pitching again, and rules that limit a pitcher's ability to play the position of catcher, are effective in preventing arm injuries. Some coaches, parents, and players have argued that the current rules are too restrictive while others have argued that the rules should be more restrictive. Continued research into the effectiveness of these rules is required so that decisions regarding pitching rules can be based on research findings rather than anecdotal evidence. The researcher strongly believes that pitching rules must achieve a balance between protecting pitchers from injury while not unnecessarily restricting their ability to play the game.

3. That longitudinal research is completed to study the development of arm injuries over the course of a pitcher's career. This research should seek to determine if the pitch count rules that have been adopted by BC Minor and other youth baseball leagues are effective in preventing pitchers from developing arm injuries later in their careers not just in the short term.

Plans for Dissemination

The writer plans to present the results of this action research project at the 2009 BC Minor Baseball AGM in November. This audience would include the Board of Directors of BC Minor as well as the presidents of most community associations. This presentation should further the awareness of local associations to the problem of pitchers developing arm injuries with a specific focus on the role each association could play in supporting future educational initiatives.

The writer also plans to send the completed action research project to Baseball Canada and the Provincial Sport Organizations of each province affiliated to Baseball Canada. Additionally, a copy of this research will be sent to other leagues in British Columbia, including Little League, Babe Ruth, and the Premier Baseball League.

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Appendix A

Pitching Arm Injuries

Pitching Arm Injuries

Baseline Data Survey – Summer 2008

- How old are you?

  11-12 13-14 15-19 20-25 25+

- What league do you play in? (circle one; indicate AAA, AA, or A):
  Senior – PBL – JRPBL – Midget AAA or AA - Bantam AAA or AA or A – Pee Wee AAA or AA or A

- On average how many game innings will you throw between March and October (circle one):
  20-40 41-60 61-80 81-100 100+

- On average how many times do you throw during the week from November to February?
  0 1 2 3 4+

- In a calendar year, what is the longest you would go without throwing during the off season?
  1 week or less 1-4 weeks 1-2 months 2+ months

- During the season how often do you throw a bullpen between outings?

  Rarely Sometimes Most of the time Always

- Do you ice your arm after you pitch?

  Rarely Sometimes Most of the time Always

- How many times per season do you pitch and play as a catcher on the same day?

  0-2 2-5 5-10 10+

- How often do you play a defensive position and pitch on the same day (either before or after you pitch)?

(0-15%)	(15-50%)	(50-85%)	(85-100%)
Rarely	Sometimes	Often	Very often

- How often do you play a defensive position when you are not pitching?

  (0-15%) (15-50%) (50-85%) (85-100%)
  Rarely Sometimes Often Always

- Circle any of the activities below that are a part of your pregame warm-up routine:

  Long distance running Stretching Sprints Long toss
  Tubing Use of all pitches

- How often do you pitch longer then you feel you should have in an outing? (too many pitches, tired, sore, etc)?

  (0-15%) (15-50%) (50-85%) (85-100%)
  Rarely Sometimes Often Very often

- Every pitcher needs an adequate amount of rest between outings so their arm can recover to the point that they can pitch again without feeling the effects of their last outing. In what percentage of your outings do you pitch without, what you feel, is adequate rest for your arm (ie. It's still sore/stiff, etc.)?

  (0-15%) (15-50%) (50-85%) (85-100%)
  Rarely Sometimes Often Very often

- How often does your coach ask you how your arm feels during an outing?

  Rarely Sometimes Often Very often

- Pitchers may not always be truthful with their coach when their arm is sore because they want to start or finish a game. How truthful are you about the condition of your arm?

  Rarely truthful Sometimes truthful Always truthful

- How often are you pressured by a coach to pitch when you arm is sore?

  Rarely Sometimes Often Very often

- How often during a season does a minor arm injury prevent you from pitching? (ex. You're still sore days later when you'd normally be ready to pitch again)

  0-1 times 2-3 times 4-5 times 5-10 times 10+ times

- How many times during your pitching career have you suffered an arm injury that prevented you from pitching for more than two weeks?

  0 1 2-3 4-5 6-10 10+

  At what age did these injuries occur?_____

- Have you ever suffered an arm injury from which you have never fully recovered?

  Yes No

  If yes, at what age did the injury occur?_____

The information collected in this survey will be used as part of an action research project (thesis) by Kyle Williams as part of his Master's Degree program at the University of Phoenix. Participation is optional.

Appendix B

Survey of Youth Baseball Coaches

Survey of Youth Baseball Coaches - Summer 2009

1) Have you learned anything new about the risk factors associated with pitchers developing an arm injury over the past six months?

Yes No

2) Have you read the online articles regarding pitching arm injuries posted on the BC Minor website?

Yes No

2B) If yes, please rate the overall usefulness of the articles:

Very informative

Informative

Somewhat informative

Not informative

Appendix C

Survey of Youth Baseball Pitchers

Survey of Youth Baseball Pitchers - Summer 2009

Note: Answers to questions on this survey can be typed in or highlighted. The document can then be saved and emailed to kwilliams@sd43.bc.ca.

Pitcher's age: _____

What league/level do you play in (ex. JPBL or Bantam AA)?_____

1) Did you suffer an arm injury that prevented you from pitching for two or more weeks during the 2009 season?

   Yes No

2) How often do you believe you pitched longer that you safely (too many pitches, arm tired or sore, etc) should have in a game during the 2009 season?

(0-15%)	(16-50%)	(51-85%)	(86-100%)
Rarely	Sometimes	Often	Always

3) How often do you believe you pitched without adequate rest and recovery time during the 2009 season?

(0-15%)	(16-50%)	(51-85%)	(86-100%)
Rarely	Sometimes	Often	Always

4) How truthful were you with your coaches about the condition of your arm during the 2009 season?

   Rarely truthful Sometimes truthful Always truthful.

Note: These questions are should be answered by the youth player as opposed to an adult.

Appendix D

Educational Articles – Used in Implementation of Solution Strategy

Educational Articles – Used in Implementation of Solution Strategy

(Emailed to Presidents April 1/09)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers: A BC Minor Educational Initiative

Introduction Letter to Presidents

Dear BC Minor Presidents:

Reducing the number of pitchers who suffer arm injuries is a goal for BC Minor during the 2009 season. The adoption of pitch counts and other pitching related rules at the 2008 AGM was an important first step in reaching this goal, however, it only part of the process for BC Minor. Starting on **Monday April 6th**, BC Minor will launch a season long education initiative aimed at raising an awareness within the baseball community of how arm injuries can occur and how they can be prevented. Each Monday through to the end of June, a new article will be posted on the BC Minor website at www.bcminorbaseball.org. It is our desire that after 14 weeks of articles that pitchers, parents, and coaches will have a better understanding of how arm injuries can occur and what steps they can take to prevent them.

In order for this initiative to be successful, BC Minor needs the help of local association presidents to promote this initiative to their members. It is our goal to have a high percentage of pitchers, parents, and coaches at the Mosquito level and higher (house league and high performance) reading the articles each week. It would be much appreciated if you could forward this email through your communication channels to your pitchers, their parents, and your coaches so they know about these articles and are looking for them every Monday morning. Additionally, for associations who are interested, BC Minor will email the weekly article directly to your association. BC Minor will also grant any baseball association permission to forward these articles directly to their members and/or post them on their own association's website.

If you would like the weekly article emailed to your association please let Kyle Williams know at kwilliams@sd43.bc.ca.

Please let me know if you have any questions regarding this initiative.

Kyle Williams
BC Minor Baseball
778-285-8010
kwilliams@sd43.bc.ca

(Posted April 1/09)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative

Introduction Letter to Pitchers, Parents, and Coaches

To BC Minor pitchers, parents, and coaches:

Reducing the number of pitchers who suffer arm injuries is a goal for BC Minor during the 2009 season. The adoption of pitch counts and other pitching related rules at the 2008 AGM was an important first step in reaching this goal, however, it is only part of the process for BC Minor. Starting on **Monday April 6th**, BC Minor will launch a season long education initiative aimed at raising an awareness within the baseball community of how arm injuries can occur and how they can be prevented. Each Monday through to the end of June, a new article will be posted on the BC Minor website at www.bcminorbaseball.org. It is our desire that after 14 weeks of articles that pitchers, parents, and coaches will have a better understanding of how arm injuries can occur and what steps they can take to prevent them.

Check the BC Minor website on Monday April 6th for the week one article that discusses how following pitch counts may help youth baseball pitchers avoid arm injuries.

(Posted April 6, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week One Article

The Transition to Pitch Counts: Why Pitch Counts May Reduce Pitching Arm Injuries

For many years youth baseball leagues have used the number of innings pitched as a measure to determine how long a pitcher can safely pitch in a game and how much rest a pitcher needs before he can pitch again. For 2009, BC Minor has changed its pitching rules to be based on the number of pitches thrown (pitch counts) instead of the number of innings pitched. This article will explain the rationale behind the change to pitch counts and will detail some of the research that suggests pitch counts may help reduce the likelihood of youth baseball pitchers developing arm injuries.

Evidence that pitchers are suffering arm injuries

Before adopting pitch counts, BC Minor examined research that indicated that both within British Columbia and throughout North America an unacceptable number of youth baseball pitchers are being overused and some are developing arm injuries. The following is a brief review of some this research.

A) In 2008 BC Minor conducted a survey of 53 youth baseball pitchers between the ages of 12-18 and found that:

- 62% of the pitchers reported that they had suffered an arm injury that had sidelined them for at least 2 weeks sometime in their career

- 57% of the pitchers reported that they felt that had pitched too long in at least 15% of their outings last season

- 64% of the pitchers reported that they felt they didn't get enough rest between outings at least 15% of the time they pitched last season; additionally 28% of pitchers reported that they didn't get enough rest between outings at least 50% of the time last season

B) Outside of BC there is evidence to suggest that more pitchers are suffering severe arm injuries that require surgery than ever before. One of the leading experts in the field of arm injuries, Dr. James Andrews, reported that in the four year period from 1995-1998, he completed only nine surgeries on youth baseball pitchers. The number of surgeries he completed increased to 61 from 1999-2002 before ballooning to 148 surgeries from 2003-2006. (M. Burke. Collateral Damage.)

Why pitching rules based on pitch count are better than those based on innings pitched

It is widely accepted that throwing too many pitches and not having enough rest before pitching again can lead to overuse and arm injuries. The important understanding for pitchers, coaches, and parents is that the statistic that matters is the number of pitches thrown, not the number of innings pitched. For example, a pitcher who threw 110 pitches in 5 innings has likely been subjected to a higher rate of overuse when compared to a pitcher who threw 90 pitches in 7 innings. Under innings pitched rules, a pitcher could throw 250 pitches or more before reaching their 7 inning limit for the day. Therefore, pitching rules based on the number of actual pitches thrown should be more effective in preventing overuse then those rules based on innings pitched.

Despite evidence to suggest that pitch counts will be more effective at preventing overuse they are not a perfect solution either. One of the challenges is determining what the exact pitch count numbers should be for each division. This is an area for future research and something that BC Minor and its member associations will review at the conclusion of the 2009 season.

Summary

Pitchers, coaches, and parents need to be aware that the number of pitches thrown is a better indicator of how long a pitcher should pitch in a day and how much rest time that pitchers needs after pitching.

Further reading

A short academic article linking overuse to arm injuries.
http://www.asmi.org/asmiweb/research/adolescentepi.htm

A newspaper article on Little League elbow injuries
http://www.active.com/baseball/Articles/Dealing_with_Little_League_elbow.htm

A link to Little League's pitch count resource page
http://www.littleleague.org/Learn_More/rules/pitch_count_resource_page.htm

An online article comparing pitch count rules to innings pitched rules
http://www.qcbaseball.com/philosophy/pitch_count1.aspx

Check back on Monday April 13th for the week two article on the importance of open and honest communication between pitchers and their coaches.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted April 13/09)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Two Article

Establishing Open and Honest Communication between Coaches and Pitchers

Open and honest communication between coaches and their pitchers is important for preventing arm injuries. Many coaches will ask their pitchers questions like, “Can you pitch today?” or “Can you go one more inning?” and will make pitching decisions based on their pitchers' answer. However, are pitchers always truthful to their coaches about the condition of their arm? The answer appears to be no and the result may be that many coaches unknowingly overuse their pitchers when they are given inaccurate information by their pitchers. This article will raise an awareness to importance of open and honest communication between coaches and their pitchers for the purpose of preventing arm injuries.

Are pitchers truthful with their coaches about the condition of their arm?

A 2008 survey of youth baseball pitchers in BC sought to identify how truthful pitchers are with their coaches about the condition of their arm. The results indicated that only 43% of pitchers surveyed reported that they are always truthful with their coaches about their arm condition. Additionally, 11% of pitchers reported that they are rarely truthful about the condition of their arm. It therefore appears that many coaches may not be getting truthful answers when they ask their pitchers about their arm condition.

Reasons some pitchers may not be truthful about the condition of their arm?

- Desire to win
- Desire or pressure to help their team
- Desire to appear tough or “be a man”
- Perceived or actual pressure from parents or coaches to pitch
- A lack of understanding of how arm injuries occur
- At a tryout, knowing that they have limited opportunities to make a team (beginning of the season, all-star, etc.)
- Future coaches or scouts in attendance

What can coaches do to promote open and honest communication with pitchers?

Coaches should establish an environment where pitchers feel safe reporting injuries, soreness, or simply the need for rest. Adopting a “no questions asked” policy so pitchers know that all they have to do is say they can’t pitch and the coach will respect and respond to their request instead of getting mad or trying to squeeze another inning out of them may be a good idea. The initial reaction of the coach, including body language, may determine how comfortable young pitchers feel reporting that they cannot pitch. Pitchers must know it is okay to say “no”. Coaches should

also work to ensure that pitchers understand and buy into the fact that by protecting their arms they are doing what is best for themselves and the team in the long-term. That may mean losing a game in April to win three in July.

Summary

Coaches need establish open and honest communication with their pitchers so they make pitching decisions that are based on accurate and truthful information provided by their pitchers.

Check back on Monday April 20 for the week three article identifying the increased risk for developing arm injuries for pitchers who play other defensive positions when they are not pitching.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted April 20, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Three Article

Pitchers Playing Other Positions: Risks & Cautions

Professional pitchers do just that; they pitch. Starting professional pitchers often only pitch once in every five games. Unlike youth baseball pitchers, when professional pitchers are not pitching they are watching the game from dugout and do not play other positions. Youth baseball is much different as most pitchers play other defensive positions when they are not pitching, particularly at younger ages. This article will examine the risks associated with pitching and playing other defensive positions and will make recommendations for coaches on how to reduce the risk of these pitchers developing an overuse arm injury.

Stats that demonstrate how often pitchers are playing defensive positions when they are not pitching

A 2008 survey of youth baseball pitchers in BC confirmed that pitchers are often playing defensive positions when they are not pitching.

- 65% of BC Minor pitchers surveyed reported that they play a defensive position at least 85% of the time they are not pitching. In comparison, only 26% of PBL (the PBL is high performance league for players aged 15-19) pitchers reported that they play a defensive position at least 85% of the time they are not pitching

- Age was a factor in determining whether a pitcher played a defensive position as the results confirmed that the younger the pitcher, the more likely he was to play a defensive position when he was not pitching. 82% of pitchers 14 years old or younger reported to playing a defensive position at least half the time they weren't pitching.

Link between playing defensive positions and the development of arm injuries

Playing other positions increases the number of throws pitchers make over the course of the season both in game situations, warm-up, and practice. Increasing the number of throws a player makes, even if these throws occur at other positions, may increase the likelihood of that pitcher suffering an overuse injury. While individually these throws do not equal the repetitive stress of throwing a baseball in succession as a pitcher, they do add to the wear and tear on a pitcher's arm and may contribute to overuse.

Strategies for reducing the risk of injury for pitchers who play a defensive position

- Look to play your pitchers in positions that have a reduced amount of throwing or lower intensity throws. First base is generally considered a position that is easy on the arm, while shortstop, third base, and catcher are generally considered higher intensity positions. Outfielders make very few throws but the throws they do make can be very long and may be of high intensity.

- Know your pitcher and the condition of his arm. Has he pitched a lot lately and is in need of a rest? Is he pitching today or tomorrow? There are many factors to consider and these are the type of questions coaches should think about when deciding whether to play a pitcher defensively.

- Use BC Minor rules to keep your pitcher's bat in the line-up while giving him a defensive rest. In all bat leagues a pitcher can bat all game long while playing a limited number of defensive innings. In 9 man ball, BC Minor has adopted an EH (extra hitter) rule that would allow a pitcher to bat but not play a defensive position. Consider these as options when trying to get your pitchers extra rest.

- Look for ways to reduce throwing in practices. If you have a group of players in a line fielding ground balls or fly balls consider whether they need to throw the ball after making the play. Is it throwing practice or fly ball/ground ball practice? A great way to reduce throwing in these situations is to have your pitchers drop the ball in a bucket instead of throwing it back to the coach. When all the balls have been hit the players return the bucket to the coach who is hitting. That way your pitchers can get hundreds of reps without even throwing a baseball. This is a strategy coaches can use to protect the arms of all players not just pitchers.

Summary

Parents, pitchers, and coaches should be aware that pitchers can suffer overuse injuries when playing other positions and they should look to use the strategies identified in this article to reduce throwing whenever possible.

Check back on Monday April 27th for the week four article that will discuss the importance of pitchers using correct throwing mechanics to avoid arm injuries.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted April 27, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Four Article

The Importance of Correct Pitching Mechanics: How Improper Pitching Mechanics May Lead to Injury

The term "pitching mechanics" can be defined as the interconnected movement of a pitcher's various body parts when throwing a baseball. There is a correct and an incorrect way for a pitcher to throw a baseball. When a pitcher throws a baseball correctly he has demonstrated proper pitching mechanics. The use of correct pitching mechanics gives a pitcher an opportunity to reach their maximum potential in terms of accuracy (throwing the ball where they want to) and velocity (speed). Incorrect mechanics often result in reduced performance for a pitcher. In addition to reduced performance, the use of incorrect pitching mechanics can also lead to injury. This article will examine the relationship between incorrect pitching mechanics and arm injuries and will provide a brief summary of correct pitching mechanics.

The relationship between incorrect pitching mechanics and arm injuries

Improper pitching mechanics can put additional strain on a pitchers elbow and/or shoulder. Dr. Carl Nissen recently scientifically demonstrated this connection in a laboratory study that found that pitchers who had improper pitching mechanics had higher loads placed on their elbow then pitchers with correct pitching mechanics. Nissen concluded that the increase in elbow load may lead to arm injuries. (as cited an American Association of Orthopaedic Surgeons article titled "Poor Form Causes Little League Elbow in Kids")

Also see the following links:

http://www.asmi.org/asmiweb/pitching%20biomechanics%20evaluation.htm

http://www.asmi.org/asmiweb/research/usedarticles/improper_pitching.htm

Correct pitching mechanics

The following are links to websites or articles that discuss correct pitching mechanics:

http://www.setpro.com/NEWWEB/sptfpbt00.htm

http://www.webball.com/cms/page1156.cfm

http://www.baseball.ca/eng_doc.cfm?DocID=119

http://www.youthpitching.com/

http://www.thecompletepitcher.com/pitching_faults.htm

Learning correct mechanics

Learning and maintaining correct pitching mechanics is not an easy process for pitchers. While pitchers can read about correct mechanics, they really need to receive feedback and direct instruction from knowledgeable coaches. While all coaches can read about correct pitching mechanics, many coaches find it difficult to teach proper mechanics to pitchers, particularly when it comes to eliminating a pitcher's bad habits, and few coaches would consider themselves proficient in this area. All coaches can really do is their best, which is to learn some of the basics of correct pitching mechanics detailed above and to try to teach them to their pitchers. Often pitchers seek out expert instruction from private instructors, while sometimes guest pitching coaches can help support an inexperienced coach correct or teach pitching mechanics.

Summary

Pitchers, parents, and coaches should understand that incorrect pitching mechanics can cause arm injuries. Teams and associations should therefore look to provide all pitchers with the opportunity to receive instruction from knowledgeable pitching coaches.

Check back on Monday May 4 for the week five article that will discuss the importance of effective pre-game routines for pitchers in preventing arm injuries.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted May 4, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Five Article

Importance of Pre-Game Routines

Having pitchers use an effective pre-game warm-up can reduce the likelihood of a pitcher developing an arm injury. Each team should develop a pre-game pitching routine for their pitchers. This article will examine components of an effective pre-game warm-up for both starting and relief pitchers.

General Ideas:

- Pitchers should have a consistent routine that they follow every time they pitch. Pitchers should have input into the details of their routine based on personal preference, therefore a standard team routine may be slightly adapted to each pitchers' needs.

- A starting pitcher's routine may be different from that of regular position players from the moment the pitcher arrives at the ball park. Here are some considerations for varying the starting pitcher's routine from that of position players:

  A) Many pitchers like to know a day or more in advance of a starting appearance so they can begin their mental preparation. Consider this an option in helping pitchers prepare.

  B) For teams that arrive more than an hour before the start of a game you may choose to allow your starting pitcher to have a later arrival time so they are not sitting around, particularly on sunny days, during activities they would not be participating in.

  C) Many higher level teams do not allow their pitchers to take batting practice when they are starting. At the younger levels, where the pitchers hit during a game (instead of being DH'ed), coaches often still want their pitchers to hit in warm-up. Consider allowing your pitcher to hit and sit down on the bench instead of shagging in the outfield to conserve energy.

  D) Many starting pitchers will not run, stretch, or throw with their teammates upon arrival as they will just cool down and have to start over again before their formal pitching warm-up. Consider allowing your pitcher to run, stretch, and throw on his own before the game.

General components of a pre-game warm-up routine

About 30 minutes before game time a starting pitcher should begin his more organized pre-game warm-up routine.

A) Running & Stretching (apx. 10 min)

B) Tubing and/or Jobe's exercises (optional)

C) Easy throwing from a short distance

D) Long Toss (optional)

E) Fastballs from the rubber

F) Other pitchers from the rubber

The warm-up should be finished about five minutes before the pitcher will be needed on the field.

Warm-up routines for relief pitchers

Ensuring that a relief pitcher has a proper warm-up is challenging because coaches do not have the luxury of being able to plan the pitchers' warm-up around a known starting time.

Tips for warming up relief pitchers:

- Coaches should know who the potential relief pitchers are before the game. This should be communicated to the pitcher so they can stay loose throughout the game.

- Avoid having relief pitchers warm-up and sit down multiple times before they go into the game.

- If the relief pitcher is on the bench it is easier to have a correct warm-up. In this case the pitcher should be staying loose throughout the game (running, maybe some light throwing) because they may not have time to run and stretch before they are told to warm-up.

- Have an organized bullpen. When a pitcher gets in trouble and a coach tells a pitcher to warm-up, time may be very limited before that pitcher gets into the game. A pitcher who is told to warm-up should be throwing in the bullpen within 30 seconds. Know who the bullpen catcher is going to be and ensure they have their mask, glove, and couple good baseballs ready all game. This will ensure the relief pitcher gets as much warm-up time as possible.

- If the relief pitcher is playing in the game then an effective warm-up is even more challenging because the pitcher may be going into the game directly from a defensive position or may have to bat in the inning before he pitches and may not have time to warm-up properly. Consider using league rules to take your pitcher out of the game before he has to pitch. BC Minor all bat rules allow for this option, as does the BC Minor extra hitter (EH) rule.

Warm-up routines for starters of game 2 of a DH

Starting pitchers for the second game of a DH often have a difficult time warming up correctly. Here are some tips for game two starters:

- If possible, don't play your game two starter in the first game or substitute him late in the game so he can eat and relax before warming up for game two.

- Often game two starters start their warm-up too late. An assistant coach (the manager will be busy with line-ups) should be assigned the responsibility of supervising the game two starter. A catcher for the game two starter must also be identified.

- Ensure the game two starting time is agreed upon. Often teams and umpires do not talk about what time game two is going to start. Pitchers need to know the exact starting time so they can be ready and not be rushed or have to sit around for an extra 15 minutes after they warm-up.

Summary

Each team should establish a pre-game warm-up routine for their pitchers. Having a correct pre-game warm-up should help youth baseball pitchers avoid unnecessary arm injuries.

Further Reading

http://www.stevenellis.com/steven_ellis_the_complete/2008/02/whats-a-good-pr.html

http://www.thediamondprospects.com/index.php?option=content&task=view&id=649

http://www.baseball.ca/eng_doc.cfm?DocID=120

Check back on Monday May 11th for the week six article that will discuss the use of ice by youth baseball pitchers as a strategy for reducing the likelihood of developing an arm injury.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted May 11, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Six Article

The Use of Ice for Pitchers

Many pitchers use ice as a strategy for preventing arm injuries and decreasing recovery time after pitching. However, more recently, some coaches have argued that the use of ice has little benefit for pitchers and may actually increase recovery time. This article will discuss the use of ice as a strategy for preventing arm injuries.

Number of youth baseball pitches who use ice

Many youth baseball pitchers in British Columbia report to using ice after pitching, though not necessarily on a consistent basis. The following are results of a 2008 survey of youth baseball pitchers who were asked how often they used ice after pitching.

Rarely – 8
Sometimes – 13
Often – 15
Always – 17

Arguments for the use of ice

Many experienced pitching coaches and professional pitchers highly recommend the use of ice by pitchers to prevent arm injuries. These coaches argue that ice, as it is well known for its use on impact injuries, is an effective method of reducing swelling and increasing healing time. Most coaches recommend that pitchers:

A) Ice immediately after they finish pitching (have ice at the park as opposed to waiting until you get home)

B) Not throw again for the rest of the day after they have iced

C) Not place ice directly on the skin

See the following articles that support the use of ice.

http://www.thecompletepitcher.com/pitching_icing.htm

http://www.baseball.ca/eng_doc.cfm?DocID=122

http://www.painreliever.com/proice_PITCHERSKIT.html

Arguments against the use of ice

Some pitching coaches are beginning to argue that the benefits of using ice are mythical and in some cases ice may actually increase recovery time for a pitcher. They suggest that many major league pitchers use ice out of habit and there is a lack of research documenting its benefits. One argument against the use of ice is that it may delay the flow of blood to the arm thereby delaying the body's natural healing process from beginning. Others argue that pitchers should only ice their arms if they are in pain after pitching.

See the following articles that do not support the use of ice.

http://www.pitching.com/articles/view/the-myth-of-baseball-pitchers-icing-why-ice-is-not-nice/

http://www.pitching.com/articles/view/should-pitchers-ice-after-they-pitch-not-according-to-the-research/

Summary

Many pitching coaches support the use of ice and argue that ice allows a pitchers' arm to heal faster, while other pitching coaches argue the benefits of ice are mythical. Pitchers should make a personal and informed decision about their use of ice.

Check back on Monday May 18th for the week seven article that will outline strategies for building arm strength and endurance for the purpose of not only increasing performance but avoiding arm injuries.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted May 18/09)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Seven Article

The Importance of Developing Arm Strength & Endurance

The development of arm strength is important for baseball pitchers in their attempt to reduce their risk of developing an arm injury. Good arm strength should allow a pitcher to throw a greater number of pitches before becoming fatigued and should also give a pitcher faster recovery time after pitching. This article will identify ways in which youth baseball pitchers can build arm strength and endurance.

Long Toss

- Long toss is a throwing activity where pitchers attempt to throw over an increasing distance.
- The actual distance pitchers throw would vary depending on age but would typically be between 100-200 feet.
- Correct mechanics for long toss including using a crow hop, bending your back, and using your entire body

See the following links for information on long toss.

http://www.webball.com/cms/page2010.cfm

http://www.stevenellis.com/steven_ellis_the_complete/2008/09/long-tossing-a.html

Weight Training

- Weight training programs may help many youth baseball pitchers build arm strength.

- Baseball pitchers should ensure that they participate in a weight training program that is pitcher specific. There are many types of weight training activities designed for other sports and even baseball hitters that may increase the likelihood of a pitcher suffering an injury. It is highly recommended that pitchers consult a professional to assist in designing a program that meets their needs as a pitcher.

- Pitchers should use caution when participating in school based weight training programs as part of their physically education class and may need to request exemptions from these activities.

See the following links for information on baseball specific weight training:

http://www.sport-fitness-advisor.com/baseball-training.html

http://weighttraining.about.com/od/weighttrainingforsport/a/baseball.htm

Conditioning

- Conditioning programs are also recommended to pitchers to build overall endurance.
- Many pitchers participate in programs that include both long distance running and short sprints.
- By building endurance pitchers may be able to maintain correct mechanics for longer during games thereby avoiding arm injuries.

See the following links for further information on pitcher conditioning programs:

http://www.baseball.ca/eng_doc.cfm?DocID=121&Related=21

http://ezinearticles.com/?The-Pitchers-Workout-Program-Helps-Build-Strength-And-Endurance&id=1118298

Check back on Monday May 25th for the week four article that will discuss the use of Jobe and tubing exercises as a method for strengthening a pitchers shoulder muscles and rotator cuff.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted May 25, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Eight Article

Jobe's Exercises & Surgical Tubing

Many youth baseball pitchers are unaware that there are simple activities that they can do at home to strengthen their shoulder and rotator cuff that may reduce the likelihood of developing an arm injury. Two of these activities are Jobe's exercises and the use of surgical tubing. This article will discuss how Jobe's exercises and surgical tubing can be used to strengthen the shoulder and prevent arm injuries.

Jobe's Exercises

- Jobe's exercises were designed by Dr. Frank Jobe of the Los Angeles Dodgers as an exercise pitchers could use when rehabbing an injury. These exercises are now commonly used by pitchers to maintain healthy shoulder muscles.
- The exercises involve performing a variety of arm motions with small dumbbells
- Check out any of the websites below for details

  http://www.webball.com/cms/page1322.cfm

  http://www.maxxtraining.com/jobes.htm

  http://www.beabetterhitter.com/text/batspeed/condition/condition.htm

Surgical Tubing

- There are a variety of exercises involving surgical tubing that also work to maintain healthy shoulder muscles
- Many Jobe's exercises can also be completed with tubing
- Check out the website below for details

  http://www.asmi.org/SportsMed/throwing/thrower10.html

Check back on Monday June 1st for the week nine article that will discuss whether youth baseball pitchers should avoid throwing curveballs in an attempt to reduce the likelihood of developing an arm injury.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted June 1, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Nine Article

The Curveball Debate

Many youth baseball parents and coaches have long argued that young pitchers, particularly those in Pee Wee baseball, should not throw curve balls because of the risk of developing arm injuries. Naturally, most young pitchers want to and do throw curve balls because they help pitchers be more successful by getting hitters out easier. In recent years, during the comprehensive review of solutions for the problem of youth baseball pitchers developing arm injuries, the use of curveballs has received great scrutiny. This article will examine the issue of whether young pitchers should stop throwing curveballs to reduce the likelihood of suffering an arm injury.

Arguments for eliminating the curveball

- Many experts have argued that throwing curve balls and sliders puts younger pitchers at a greater risk of developing an arm injury. Most of these experts use anecdotal evidence to support their position.

- A study completed by the American Sports Medicine Institute (2008) found that pitchers in the 9-14 age bracket who threw sliders were 86% more likely to report elbow pain than those who did not throw sliders. Other studies have found similar correlations and drawn the same conclusion.

- See the following links for further articles that do not support the use of curve balls:

http://query.nytimes.com/gst/fullpage.html?res=9905E4D8153EF937A2575BC0A9639C8B63

http://hwmaint.ajs.sagepub.com/cgi/content/abstract/30/4/463

Arguments for allowing curveballs

- Many experts and researchers have conducted studies in an attempt to scientifically prove that throwing curve balls results in pitchers subjecting their elbows and shoulders to higher loads. However, experts have been unable to prove their theories and currently have no scientific evidence to explain how throwing curveballs increases the likelihood of a pitcher suffering an arm injury.

- A recent study compared the kinetics of youth baseball pitchers throwing a fastball, curveball, and change up in a controlled setting. The results went against even the researchers predictions and indicated that elbow and shoulder loads measured highest

when fastballs were thrown and lowest when curveballs were thrown. A similar study completed with college players found the same results.

- See the following articles for further details.

  http://www.ncbi.nlm.nih.gov/pubmed/16260466

  http://www.baseballdrills.info/baseball/35/is_it_safe_to_throw_a_curveball.php

  http://ajs.sagepub.com/content/36/4/686.abstract

Little League Conclusions

- After reviewing the literature and research Little League Baseball concluded that, "there is no medical evidence to support a ban on breaking pitches (curveballs and sliders) but that it is widely suspected by medical professionals that it is ill-advised for players under the age of 14 to throw breaking pitches" (p.1).

- Despite these conclusions Little League chose not to ban the curveball because of the lack of scientific evidence but instead chose to conduct further research in partnership with the University of North Carolina.

Summary

This issue of whether young pitchers should throw curveballs is much like the debate over whether pitchers should use ice after games that was presented in article six of this series. The decision should be an informed one made by pitchers, parents, and coaches after having a complete understanding of the research and evidence. The key, once again, is to make an informed decision.

Further Reading

For a middle ground position on the curve ball see the following article:

http://www.thecompletepitcher.com/teaching_curveballs.htm

Check back on Monday June 8 for the week ten article that will discuss proper clothing for pitchers and its role in helping to prevent arm injuries.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted June 8, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Ten Article

The Importance of Proper Clothing for Pitchers

It's a cold, windy day for baseball; a typical April evening during the beginning of baseball season in British Columbia. Many youth baseball pitchers take the mound in practices and game situations and risk injury due to the cool temperature; however, there are steps pitchers can take to reduce the effects of the cool weather. This article will discuss proper clothing for pitchers and its role in helping to prevent arm injuries.

Importance of pitchers keeping their arm warm during a game

All players, including pitchers, warm-up their muscles before every game so they can perform skills at full speed in a game situation without suffering an injury. During the course of a game, it is important for pitchers to "stay loose" to avoid suffering injuries. Staying loose is particularly challenging for pitchers in cold weather because they cool down quicker than they would on a warm day. Therefore, pitchers must dress appropriately when pitching in cool weather in order to retain body heat and keep their arm loose.

Must have clothing for pitchers:

- On any cool day baseball pitchers should wear long sleeves. Long sleeves help keep the arm warm and loose thereby helping to prevent injuries. Under armour now offers a variety of lightweight undershirts designed to keep pitchers warm in cool temperatures.

- Pitchers should wear a jacket between innings. A jacket offers additional insulation and helps to keep the arm warm. Many pitchers choose to wear a jacket on the bases if they are hitting and get on base. Some pitchers also like to wrap their arm in a cloth between innings.

Further reading

http://www.stevenellis.com/steven_ellis_the_complete/2008/02/how-to-pitch-in.html

Check back on Monday June 15th for the week eleven article that will discuss the importance of developing good pitching habits from an early age.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted June 15, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Eleven Article

Old and Sore: The Importance of Learning Good Habits at a Young Age

A Pee Wee pitcher throws on a cold day with no sleeves, uses incorrect mechanics, has an inadequate warm-up, is overused, and does not participate in a conditioning program. That same pitcher leads the league in strikeouts, is one of the best pitchers in the province, and never complains about a sore arm. Why then should this seemingly invincible young pitcher care about all the correct habits and strategies he is told to learn in order to prevent arm injuries? This article will discuss why many young pitchers fail to develop correct habits and why learning correct pitching habits that prevent arm injuries is essential at a young age.

Most young pitchers do not suffer consequences of their bad habits

Former college pitcher Richard Forbes, who is currently an instructor at the Bullpen Baseball Academy, explained this concept the best when he stated that, "kids are untouchable...they never feel pain, so they get into a habit of doing anything and everything with their arm without the pain that will be associated with the same movements as they get older. Until they feel deep pain, they do not believe it exists." Because many young pitchers do not feel a high level of pain after pitching, it is challenging to get them to buy into learning correct habits and routines at a young age when they can achieve success without good habits and often not suffer serious injuries. It can also be challenging to convince coaches to buy into teaching and pressing their pitchers to develop correct habits at a young age when they do not see the immediate benefits of their time and effort.

Arm injuries occur over time and bad habits are hard to correct with age

While pitchers may not suffer the consequences for their bad habits at a young age, they most likely will over time. Most arm injuries occur over time, and unlike impact injuries that occur in a moment when an ankle is twisted or a bone is broken, arm injuries often cannot be traced to one specific moment. The concept of pitching arm injuries occurring over time was best described in an American Sports Medicine Institute (2008) article that stated that when a serious arm injury occurs, "quite frequently the one bad pitch was really just the straw that broke the camel's back and was the final micro tear that led a series of micro tears to become a large tear". In these cases, it is years of bad habits, starting at a young age, that has led to the injury. By time the injury has occurred it is likely too late for the pitcher to develop correct habits. Pitching mechanics, in particular become much harder to change with age, as the pitcher's mechanics have been entrenched after so many repetitions. Correct habits need to be taught to pitchers at a young age and maintained throughout their careers in order to prevent injury.

Conclusions & Recommendations

In order for pitchers to have lengthy and injury free seasons through their teen years it is of the upmost importance for them to learn correct pitching habits and routines at a young age. It is an investment that will pay dividends in the long-term for most pitchers.

Check back on Monday June 22th for the week twelve article that will discuss how showcase tournaments (or other tryout opportunities) can lead to pitchers developing arm injuries.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted June 22, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Twelve Article

Showcase Tournaments

Regional showcase tournaments are held yearly to give highly skilled players with college or professional ambitions, the opportunity to play in front of a large contingent of scouts. Most often, these opportunities only exist by invitation for grade 10-12 players who are nearing draft age. These players leave their regular teams for a weekend and head south, often to Arizona or Florida for the tournament. For younger players within BC Minor, the risk of developing an arm injury through showcase tournaments may be similar to the risk younger players face at all-star tryouts, select camps, PNC tryouts, or any other mid-season tryout opportunity where a player showcases their talent to coaches **during events that are not connected to their regular teams**. This article will discuss the risks of pitchers suffering arm injuries as a result of participating in showcase tournaments.

Problems with showcase tournaments or other tryout opportunities

- At showcase tournaments pitchers are not under the supervision of their regular pitching coaches who normally regulate the number of innings they pitch to ensure they are not overused.

- Pitchers often arrive at showcase tournaments without adequate rest. For example, if a pitcher is going to be away at a showcase tournament his regular coach will often pitch him the day or two before he leaves. Often, when pitchers return from showcase tournaments they are expected to pitch right away for their regular teams. Bill Green, a long-time coach with the BC Select team confirms that over the years at their yearly four day selection camp, it is not unusual for a pitcher to show up having pitched a complete game the previous day. The same problem exists at all-star tryouts for younger players where a pitcher may have pitched for his team the day before having to showcase his talent at a tryout.

- Often at showcase tournaments pitchers feel pressure to earn college scholarships or make a team and knowingly take risks with their arm because they know their window to show their ability is small. Pitchers may also make attempts to impress scouts often throwing to the radar gun and attempting to reach high speeds that their arm may not be safely able to attain.

Reducing the risk of pitchers developing arm injuries at showcase tournaments

A) The pitcher's regular season coach must buy into the showcase opportunity for the player instead of viewing showcase tournaments as an annoyance that interfere with the pitcher's commitment to his regular team. If coaches buy in to these opportunities they will ensure their pitchers have adequate rest time both before and after attending the tournament.

B) Pitchers must be their own pitching coaches while at showcase tournaments and make sure they take personal responsibility for protecting their arm. This may mean telling a new coach that they can only pitch one inning instead of two or that they're going to throw a 40 pitch bullpen instead of 60 pitch bullpen. Pitchers must know their limits and be willing to stop instead of pitching themselves to the point where they dramatically increase their risk of developing an arm injury. Pitchers must ensure that they follow their regular pitching routines, such as warm-up, even though they may not have a pitching coach reminding them of these routines.

Summary

Pitchers, coaches, and parents should be aware of the increased risk of developing an arm injury at showcase and tryout opportunities and should consider the recommendations detailed above as strategies for reducing the risk of injury.

Check back on June 29nd for the week thirteen article that will discuss the importance of pitchers having an off-season to rest their arms.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted June 29/2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Thirteen Article

Off-Season Overuse

It's early September and the provincial championships of August are a distant memory as many young baseball players return to the classroom for another school year. Soon the leaves will fall off the trees, the monsoon rains will come, and soon after snow will cover the diamonds where the previous summer's memories were made. One would think that a pitcher's baseball glove would be tucked away, their hockey stick would be out, and the risk of suffering an arm injury would be greatest with a slash to the elbow. However, this is no longer the case in British Columbia as many youth baseball pitchers spend the winter months indoors practicing and refining their craft. This article will examine how off-season pitching routines have changed over the past decade and the risks of developing an arm injury through off-season overuse.

History of the baseball season in British Columbia.

Historically, baseball in British Columbia was played from late March to early August, which is a relatively short playing season. However, over the past decade, fall leagues were created and the outdoor playing season was extended to late October. Additionally, in the mid 90's a variety of private indoor baseball facilities were built creating the potential for players to play baseball year round, outside from March to October and then inside for the four winter months. In addition to the start of fall leagues and year round training facilities, teams currently play more games during their spring and summer seasons than they have in previous years. A combination of an increased in season schedule, the development of fall leagues, and the opportunity for pitchers to practice in year round facilities has meant that pitchers are playing more baseball in a calendar year than they ever have before in British Columbia. When pitchers play and practice more they are increasing the number of throwing repetitions they complete, which over time may lead to overuse.

Stats that identify the amount of off-season rest BC pitchers are taking

A 2008 survey of 53 youth baseball pitchers in BC found that that 71% of pitchers reported to take less than a month off without throwing during the off-season. Additionally, 32% of pitchers reported to take less than a week off. Only 11% of pitchers reported to taking two or more months off during the off-season without throwing.

How much rest does the research suggest pitchers should have during the off-season?

- Research indicated that pitchers who do not give their arm adequate rest during the off-season may be at an increased the risk of developing arm injuries. Most research indicated that pitchers who take at least two months off in a calendar year are less likely

to develop an overuse injury than a pitcher who takes less than two months off from throwing.

- Dr. James Andrews takes the need for off-season rest a step further and recommends that pitchers have at least four months away from throwing during the off-season. Having four months away from throwing was supported by his 2006 study that compared pitchers who had previously had arm surgery to those who had not. The results indicated that pitchers who had thrown for more than eight months in a year were more likely to have had arm surgery during their career then those who threw for less than eight months.

- In a position paper on the subject of off-season rest, USA Baseball's Medical & Safety Advisory Committee (2004) stated that "pitchers should compete in baseball no more than nine months in any given year as periodization is needed to give the body time to rest and recover. For at least three months a year, a baseball pitcher should not play any baseball, participate in throwing drills, or participate in any other stress related overhead activities (p.2)."

Summary

Parents, coaches, and pitchers should be aware that the research indicates that pitchers should take between two and four months off without throwing during the off-season.

Check back on Monday July 6th for the final article in this series that will summarize the ways in which youth pitchers can reduce the risk of developing arm injuries. Next week's final article will also discuss BC Minor's research into pitching arm injuries and its potential course in the future. Opportunities to participate in a season ending survey will also be identified.

This article was written by Kyle Williams for BC Minor Baseball.

(Posted July 6, 2009)

Reducing Arm Injuries Suffered by Youth Baseball Pitchers:
A BC Minor Educational Initiative
Week Fourteen Article

Summary

For the past thirteen weeks BC Minor Baseball has published a weekly educational article with the goal of educating parents, pitchers, and coaches about the risk factors associated with pitchers developing an arm injury.

In summary, the articles which are now archived on the BC Minor website, discussed the following:

- Pitch Counts
- Communication between pitchers and coaches
- The risk of playing other positions
- Mechanics
- Pre-game warm-up
- Ice
- The development of arm strength and endurance
- Jobe and tubing exercise
- The use of curve balls
- Clothing
- The development of good habits at an early age
- Showcase tournaments
- Off-season training

The institution of pitch counts was one of the biggest changes to the game BC Minor has made since its inception in 1968. At the end of the summer BC Minor and its member associations will review this year's initiatives and may propose changes for 2010. Here are some important questions for the baseball community to discuss and debate over the next few months:

- Do we still support the concept of pitch count rules instead of innings pitched rules?
- Did the pitch count numbers for 2009 work? Did they protect arms? Did they ruin the game due to a lack of pitching? Should there be differences between "A", "AA", and "AAA"?
- Did the rules that limited a pitchers ability to play as a catcher after pitching work? Should this rule be expanded or curtailed?
- How did the rules allowing pitchers to pitch on three consecutive days during tournaments work? Should the tournament exception be removed?
- Baseball Canada would like to see all provinces adopt their pitching rules so there is one standard across Canada (these rules are more restrictive than our current rules). Should

BC Minor adopt Baseball Canada's rules and conform to the National standard or should we continue to make decisions on our own for play within British Columbia?

- Were the educational articles in this initiative effective in communicating accurate information to players, coaches, and parents? How can we reach more people in future years? How can this information be worked into coaching training programs?
- Are there other needs and goals for 2010?

The entire series of articles is available in a single word document that can be emailed to any individual or association. Permission is granted to use and reproduce any of these articles so long as credit is given to the author. Please email me at kwilliams@sd43.bc.ca for a copy.

On a personal note, this article completes the solution strategy implementation phase of my Masters in Education action research project (thesis) with the University of Phoenix titled, Arm Injuries Suffered by Youth Baseball Pitchers in British Columbia: Solving the Problem in the BC Minor League.

As part of my research I am looking for pitches of all ages to, with parent permission, complete a survey about pitching arm injuries. Any pitcher interested should contact me at kwilliams@sd43.bc.ca for a survey and permission form.

These articles have been written by Kyle Williams for BC Minor Baseball.