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Professor Name [Last, First, MI] *	Graetzer, Daniel, G.		
Program Name *	Sports and Health Sciences		
Capstone Type *	Capstone-Creative Project		
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Social Pressure Causes Overuse Injuries in Youth Baseball Pitchers

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Jonathan K. Orr M.Sc.

Social Pressure Causes Overuse Injuries in Youth Baseball Pitchers

Sports and Health Sciences Capstone Manuscript

SPHS-697

October 29th, 2023

Daniel G. Graetzer, PHD

American Public University

Alphabetical List of Keywords

- **Acute Injuries**
- **Deliberate Practice**
- **Extrinsic Social Pressure**
- **The Gladwell Method**
- **Intrinsic Social Pressure**
- **Linear Periodization**
- **Multi-Sport Athlete**
- **Overuse injury**
- **Periodization**
- **Physically Healthy**
- **Social Pressure**
- **Specialization**
- **Undulating Periodization**
- **Youth Athlete**
- **Youth Sports**

Alphabetical List of Acronyms

- **ACL- Anterior Cruciate Ligament**
- **LTAD- Long Term Athletic Development**
- **NATA- National Association of Athletic Trainers**
- **NSCA-National Strength and Conditioning Association**
- **ROI- Return On Investment**
- **UCL- Ulnar Collateral Ligament**

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This research paper is dedicated to every child who has been driven away from sports by the poor behavior of adults, and to my amazing wife Susan who has said “go for it” on every crazy endeavor I have gone on, with love, support and guidance. Without her I am still just “the punk kid from the suburbs of Tampa.”, and to my Children Jamie, Jonathan, and Siera who make me strive to be better each day.

Abstract

The World of Youth Sports is a 37 billion Dollar a year business. However, unlike most businesses the customer and consumer are not the same person. With Parents purchasing expensive equipment, booking time with "sports specialists" and personal trainers, along with paying for their children to play on expensive travel ball teams. These expensive fees and costs are often presented and seen as "investments" in the future of their athlete. With the Return on Investment (ROI) coming in the form of the coveted college scholarship or professional contract when the athlete (sometimes as young as six years old) reaches the age in which those can be achieved.

While the idea is noble oftentimes the social pressure both extrinsic and extrinsic on the athlete, can lead to overwork, and in turn an overuse injury. Specifically in this case to the pitching arm of youth baseball players. The following study takes an in depth look into the role social pressure, and sports specialization plays in the rising number of overuse throwing injuries in Youth Baseball Players.

"Surround yourself with good people. People who are going to be honest with you and look out for your best interests."

-Derek Jeter

Literature Review

Introduction

According to Yahoo Finance, Youth Sports has become a multi-billion-dollar industry. It was determined that in 2022 the youth sport market had a value of 37.5 billion dollars with estimates of reaching 60 billion dollars by 2030. (Yahoo Finance,2023) With Recreational, City, Intramural, and Church Leagues springing up around cities on seemingly a daily basis, and the recently developing phenomenon that is known as travel sports there is no shortage of playing time for the willing youth athlete to find the time.

Theoretically and in many cases realistically a youth athlete could participate in upwards of five games, over a two-day weekend across multiple leagues or a travel team tournament. Beyond that, there are a growing number of private coaches serving as hitting, fielding, throwing, running, baserunning, dribbling, passing, and shooting specialists available to offer their services for a nominal fee. With these supplemental services added to the various leagues mentioned above it would not be a difficult task for a young athlete to be immersed or "specialize" in one sport all year round.

While Youth (defined an athlete under 18 years of age) Sports Specialization is a rapidly growing trend. It is not without question nor criticism about whether or not the process of specialization is healthy for the athlete. Not just physically healthy, but socially, mentally and psychosocially healthy for the youth athlete involved.

In order to provide a comprehensive analysis and review of the physical and mental risks of Youth Sports Specialization, versus the potential short and long term rewards of

Specialization, while reaching a scientifically backed conclusion as to whether it is better for an athlete to specialize (focus on one sport year round), or be a multi-sport athlete (play various sports year round), with "better" being defined as physically, mentally, and socially healthier. For the purposes of the Capstone, *physically* is defined as no long term or short term injuries formed or caused by overuse, and not acute injuries due to trauma. Regarding overuse injuries, David Wang at John Hopkins University defines an overuse injury as *"when tissue is damaged due to repetitive demand over a period of time".* Further describing it by stating; "They (the athlete) are micro-fracturing their bones, and micro-tearing their muscles and tendons. When the body is given time to rest, it heals these micro-injuries and adapts to become stronger. When done properly with load management and appropriate rest the skill improves at an acceptable rate, and the athlete in question stays healthy. However, if the body is not allowed enough time to recover and heal, the micro-injuries can continue to progress and eventually become an overuse injury." (Wang,2023) Wang further describes *acute* injuries as injuries that happen suddenly such as sprains and dislocations.

For the purposes of study and analysis the sport of baseball will be the primary focus of the capstone, chosen due to the multiple repetitive movements down the various planes (Sagittal, Frontal, and Transverse,) of the human body.

Specialization Defined

In order to scientifically determine if specialization can lead to overuse injuries as defined above, a clear definition of what specialization must be provided. According to a study led by Meyer, it is defined as *"participating in a single sport for more than 8 months or 66% of the calendar year, and quitting all other sports."*(Meyer,2023). To simplify it this means an

athlete would forgo playing other sports (i.e., basketball, and football) in order to put their focus on baseball. When an athlete chooses to specialize it can bring various health concerns from professionals, in the Sports, Health, and Medical Science Fields due to the rigorous demands on the body and mind Specialization can often require. In order to further clarify, Specialization is not to be used as a synonym for obsession or love of the game in which the athlete partakes in games of catch, or hitting off a tee in the backyard, nor is it playing a game of pickup or sandlot baseball at recess or with neighborhood friends. Specialization falls more under the term *Deliberate Practice Framework* (DPF)*

in which the athlete is training deliberately in sport specific methods year-round with various coaches to improve, as well as playing a dense schedule of games for more than 8 months or 66% of the calendar year. (Mosher,2021) To further support the specialization approach and justify the reasoning behind specialization it is believed that *"the positive correlation between time spent in training and eventual level of attainment, and the importance of domain specificity".* Meaning in theory that Specialization is the belief that following the deliberate practice framework will warrant more success leading to the eventual college scholarship or pro contract, However, statistics show that along with Specialization comes a higher level of Social Pressure, as well as higher risk of overuse injuries.

When discussing the term *Deliberate Practice Framework* one can define it as practice in which everything is structured and rigorous with a specific goal in mind to improve a set of skills or abilities to further improve on the chosen specialization. (Mosher,2021) When discussing *Domain Specificity,* it is the idea that within the chosen domain of the sport (ie a baseball players pitching ability), the deliberate practice framework should allow for total focus on that specific skill with the long term goal being superior performance compared to peers, superior

performance in comparison to competitors, elite status among a broader scale (nation, world), College Scholarship, and or Professional Contract. (Uzynski,2019)

The Gladwell Method

While this may seem as a logical approach to greatness in the chosen sport, and is indirectly supported by Author Malcolm Gladwell, who is of the approach that it takes 10,000 hours of deliberate practice to master a craft (Gladwell,2008). The Human anatomy and psyche is not considered when discussing the *10,000 hours theory.* Meaning if not managed carefully and efficiently the body can fail the athlete long before the 10,000-hour threshold is achieved due to overuse, mental exhaustion, social pressures, burnout, or a combination of the lot.

Following Gladwell's 10,000-hour approach regarding specialization in sport and based on the assumption that the Specialized Athlete is a full-time student with 40 hours (out of 168) devoted to All things academic including commute and homework. The athlete is reaching the recommended amount of sleep (8-10 Hours) for Children aged 8-17. (Cleveland Clinic,2022). As well as spending 12 hours deliberately and correctly practicing the chosen sport and playing in 3 competitive games a week each lasting 2 hours (total of six hours). Not including commute time to and from the games which are often out of the city, county or state. It would take a Specialized athlete 833 weeks or 16 years of deliberate practice to achieve mastery.

Time Frame Required to Achieve Mastery Utilizing Gladwell's 10,000 Hours Theory

10000 hours\12 hours a week=833.3333 Weeks

833 weeks\52 weeks a year = 16.01923 Years

These numbers are put in place under the assumption the Specialized athlete remains consistent and disciplined in practice with no gaps, injuries, or breaks in training. Meaning that in order for a young athlete to follow Gladwell's approach of 10,000 hours to mastery in time to achieve that college scholarship at the age of 18 a perfect schedule of training must be implemented just prior to the athlete's second birthday and maintained consistently in order to achieve mastery. Making Gladwell and the 10,000 rule seem to be an unrealistic concept or practice in the time frame in which a young athlete would specialize.

When considering a developing human body with pre and post pubescent changes and acclimations it is not scientifically possible to consider this method to be safe and effective in developing a young athlete in a specialized environment.

The Risks of Specialization

While the payoff may be lucrative, the physical, mental, social, and psychosocial health risks MUST be considered before determining whether a youth athlete should specialize in one specific sport. Failure to do so could cause long term irreversible damage to the athlete.

Social Pressure

The Marinovich Project

Specialization and social pressure cannot be discussed thoroughly without mentioning one of the first specialized athletes that was put on the forefront of media scrutiny. That was the story of Todd Marinovich. Dubbed "Robo QB" in 1988 by Sports Illustrated. Marinovich set the

National High School passing record as a quarterback at Mission Viejo High School in 1988 and was seemingly set to be the next great pro quarterback. (The Marinovich Project,2011)

However, the ugly secret was that Todd was the victim of both mental and physical abuse from his overbearing father Marv. Never allowed to eat candy, McDonalds or sugary snacks as a kid, and being trained from birth by his father, Marinovich faced intense social pressure to deliver. Poor play was disciplined with corporal punishment, and verbal abuse. With Marv known to strike Todd in the face with the back of his hand during the ride home and going as far as making 8-year-old Todd run the 4 miles home after a bad practice.

***Social Pressure can and does occur within unspecialized athletes but is often exacerbated within athletes specializing in a sport.**

Marinovich attended the University of Southern California, and by then already had a well-known drug problem. Known among his peers as "Marijuanavich" he began using Cocaine and Heroin in college, and was an NFL bust with his nearby Oakland Raiders. He has since spent time in and out of prison and drug rehabilitation facilities. With many Sports Psychologists pinning his substance abuse problems directly on the social pressure inflicted on him from birth by his father, and the constant pressure to perform at an elite level with no respite. The Social Pressure inflicted on Todd to perform was so intense and unrelenting that it caused his mother Trudi to divorce Marv while Todd was in High School.

The Specialization of Marinovich can be seen as a textbook example of how poorly handled Specialization can increase Social Pressure to a level so intense that an athlete may resort to drugs, or other vices to cope. Unable to find a healthy social balance and coping

mechanisms to deal with the stress and pressure placed upon him. With most of it being extrinsic pressure placed on him by his overbearing father Marinovich buckled socially and turned to drugs and alcohol to deal with the crippling social pressures. (Chiari,2011)

Parental Pressure

While the Tragic story of Todd Marinovich may be what Malcolm Gladwell would see as an Outlier, there is evidence to believe the contrary with many "specialized" athletes being driven by their parents in a similar but not as mentally and physically abusive as Marv Marinovich methods. Many parents inadvertently and with good intentions apply pressure to their athletes, and this pressure if not controlled and managed properly is leading to an increase in overuse injuries in young athletes. As this study progresses, the data presented will prove that parents and social pressure increase the risk of overuse injuries.

According to a 2017 survey of 201 sports parents conducted by the Orthopedic Journal of Sports Medicine, 106 parents (53.4%) reported their children were involved in multiple sports. Furthermore 115 parents (57%) expressed a desire for their kid to achieve a scholarship or play professionally. (Padaki,2017) The study further reveals that 100 parents (49.7 %) encourage their kids to specialize in one sport. "When the survey was analyzed and reported, it was found that the majority of parents who completed the survey were female (71.4%), while 58.2% of youth athletes were male. The mean age ± SD of the surveyed parents' children was 13.8 ± 3.0 years. Regarding medical history, 72.1% of parents stated that their children had experienced a sports-related injury. Injury severity ranged from nonoperative conditions, including medial epicondylitis and patellar tendinitis, to operative conditions such as anterior cruciate ligament

rupture and ulnar collateral ligament rupture. Approximately 25.1% of parents had hired personal trainers, and 22.9% had hired sports-specific instructors for their children." (Padaki,2017)

The issue with the survey is the lack of input from the athlete in question. Which leaves the open-ended details of how much say they have in their choice of sport, or amount of time spent on it. More concerning is that out of the 201 parents survey an astonishing 144 parents (72%) have reported a sports related injury. Regarding Specialization, 50 parents (25%) have employed private personal trainers, and 43 parents (23%) of parents surveyed have employed private sports specific coaches.

The previous issues mentioned further show the existing and often immense social pressure on the young athlete. The Extrinsic Social Pressure can be manifested in the car rides to and from the game where a parent uses the captive audience to criticize and over analyze the performance through unsolicited advice and criticism. Even worse and more mentally breaking is the "Silent Treatment" where the parent is so "disappointed" in the performance they choose to ignore the athlete and not say anything. (Uzynski,2019) While the stereotype of the parent living through their child and forcing the kid to live their dream is factual, oftentimes this social pressure the young athlete feels is applied using a well-meaning approach in which the parent only wants the athlete to do their best.

While Social Pressure is something every athlete encounters, it is often more intense with the Specialized athlete. (Uzynski,2019) Social Pressure can be of both the intrinsic (from within) and extrinsic (from outside sources) nature, and oftentimes the Social Pressure comes directly from the parents of the athlete. Within the 37 billion dollars annually spent on youth sports mentioned above a majority of that comes from parents paying for expensive equipment, private coaches, travel teams, and travel expenses. Parents in turn occasionally see all this as an

“investment” in the future and consciously or subconsciously relay that financial pressure for an ROI onto their athlete.

The Problem with applying these levels of social pressure to a youth athlete is the professionalization of fun. Meaning what eventually was a fun activity begins to feel like employment, and increased amounts of pressure on the fragile youth psyche. (Gould,2023)

Social Isolation (Intrinsic/Extrinsic)

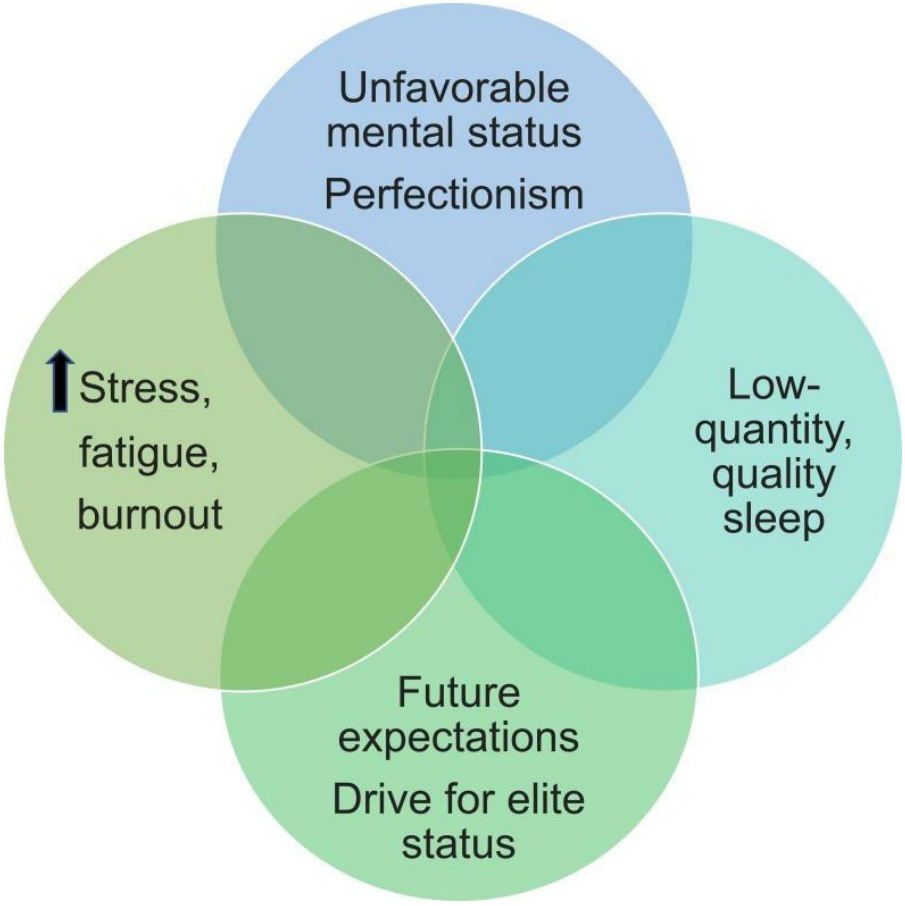
Peer acceptance based on performance can increase social pressure as a player long to be accepted and ties their self-worth among their peers' acceptance of them. In a specialized environment in which the athlete only has the social circle of fellow specialized athletes the increased pressure to play well or feel ostracized from their friend group. This pressure can lead to social burnout, increased pressure to perform, loss of enjoyment. (Gould,2023)

The social pressure due to specialization under the influence of travel ball can also lead to social isolation for the athlete due to missed opportunities to socialize with peers due to the intense travel schedule, practices, games, and commitments. Those missed opportunities to socialize with non-teammates can lead to social isolation, loneliness and anxiety in the specialized youth athlete.

As one further research and analyzes both the intrinsic and extrinsic social pressure attached to highly competitive youth sports. According to Dr. Ashwin Rao the team physician of the University of Washington, “There is a big debate about youth sports specialization and professionalization, where adolescent and younger athletes are asked to practice and play in a manner like professionals, this can lead to injury and burnout, and many young athletes can be turned off to this level of stress, and hence sport, at a young age. “Stated Rao “These effects and

impacts are still being studied," added Rao. (Weinstock,2022) While the effects relating to burnout are still being studied, youth sports programs need to refocus the objectives regarding their overall mission. With a transition from "win at all costs" to a three headed approach of retention, development, and growth.

Furthermore, intense social pressure on an athlete, especially one who is specializing in a sport can compound pre-existing issues whether known or unknown in the young athlete. (Weinstock,2022) For example, an athlete specializing in baseball and unknowingly clinically depressed, or suffering from anxiety, and involved in a peer group of baseball players, and driven parents, could be sent into a spiraling depression, or worsened state of anxiety by a hitting slump.



The Effects of Social Pressure on Overuse Injuries

The Venn Diagram (pictured above) is a portrayal of the Social Pressures a regular youth athlete can face within a season, with the assumption that the standard recreational baseball league lasts 3 months. An athlete reaching for “specialization" (greater than 8 months) will theoretically experience double the stressors and pressures to perform. The intensified social pressures can lead to a physical desire for an athlete to prove themselves, and in turn ignore what is perceived as “soreness” leading to Overuse Injuries.

Another concern within the specialized athlete is the desire to “tough it out” and play through the pain. This desire can stem from the intrinsic social pressure. Pressure to perform out of fear of social isolation for their peer group on their respective team. Fear of disappointing their team, and coaches by self-reporting the injury, and fear of disappointing their parents by not playing. These intrinsic pressures, while also prevalent in the non-specialized athlete, can manifest more often in the specialized athlete aware of the pressure and high stakes environment often surrounding competitive sports. (Weinstock,2022)

The Extrinsic Social Pressure for the specialized athlete to play through pain and discomfort can occur when parents, coaches, and teammates “encourage” a player reporting an injury to “tough it out for the team”, and often includes a motivational story about a player playing through pain. (i.e. Curt Schilling and the Bloody Sock). The Extrinsic Social Pressure, while often well intentioned can and will inherently create more problems for the athlete if ignoring the pain is their choice. Unfortunately, with the specialized youth athlete the choice is not always theirs. Parents and coaches can often force a hurt athlete into competition for the sake of their own agenda or ego. These extrinsic social pressures can lead to an overuse injury in an athlete reporting soreness.

Overuse Injuries

In a study led by Post regarding overuse injuries. Post and his team of experts recruited 716 youth athletes from basketball, soccer and volleyball teams to complete a survey regarding their participation patterns. When allowed to self-report, it was determined by the athlete's perspective what was and is considered an overuse injury. The study goes on to show that oftentimes when allowed to make the decision on their own, athletes will view injuries differently. Meaning without social and parental pressure being applied an athlete will often determine something to be worse off.

The study further shows the correlation in injury reporting in specific athletes (ones considered specialized) to be higher than overuse injuries reported by athletes who do not consider themselves. specialized. This study runs counterintuitive to previously defined terms such a specialization in regarding athletes with overuse injuries.(Post,2019) Post's ideas are further supported in ***Sport Specialization and Overuse Injuries in Adolescent Throwing Athletes: A Narrative Review*** a study led by Dr Jason Zaremski discussing the overall problems with injuries and the annual increase (average 2.3% per year increase) over the past 20 years in baseball athletes requiring "Tommy John Surgery", a invasive surgery once considered career ending in professional pitchers that involves repairing a torn Ulnar Collateral Ligament (UCL). The UCL tear has been specifically tied to overuse and repeated stress on the elbow of the throwing arm. The fact that it has been increasing in athletes under the age of 18 at a steady and almost alarming pace provides further evidence that maybe specialized training is not best practices.

Muscle Imbalances

Loosely defined as one muscle overcompensating for another muscle due to injury, soreness, tightness, or weakness. Muscle imbalances can be created through overuse of another muscle. For example, a right-handed hitter repeatedly swinging a baseball bat through the horizontal plane will rotate their core from back to front repeatedly creating an imbalance in which the transverse abdominis muscles become stronger than the lower back muscles. (UT Southwestern Medical,2014) This can cause compensations that lead to a hitter having lower back problems. While in a normal youth sports season of 3 months this allows for times of recovery. However, when a specialized schedule is employed, it makes recovery times significantly less and imbalances more common.

Scientific Conclusion

Upon review of the data provided, and search for contradictory evidence among medical professionals. It has been concluded that Youth Sports Specialization as defined by the previously set parameters of *Youth* being any athlete under the age of 18, and *Specialization* being any athlete who participates in a sport for more than 60% of the year, as being detrimental to the overall health and wellbeing of the athletes involved. While on the surface Specialization seems as an ideal way to become the best at a chosen discipline. The underlying health and safety risks with the small percentage of reward turn the risk vs reward continuum vertical in the favor of risk outweighing the reward, therefore making it a potentially dangerous endeavor for the specialized athlete. Upon a more in-depth study and review it was concluded that Overuse Injuries are most prevalent in the throwing arms of youth baseball pitchers, which is where the focus of this study will be placed.

Social Pressure Can Causes Overuse Injuries in Youth Baseball Pitchers

Introduction

According to Yahoo Finance, Youth Sports has become a multi-billion-dollar industry. It was determined that in 2022 the youth sport market had a value of 37.5 billion dollars with estimates of reaching 60 billion dollars by 2030. (Yahoo Finance,2023) With Recreational, City, Intramural, and Church Leagues springing up around cities on a seemingly daily basis, and the recently developing phenomenon that is known as travel sports, there is no shortage of playing time for the willing youth athlete to find the time and dedication required to participate.

Theoretically and in many cases realistically a youth athlete could participate in upwards of five games over a two-day weekend across multiple leagues, or a travel team tournament. Beyond that, there are a growing number of private coaches serving as hitting, fielding, throwing, running, and baserunning specialists available to offer their services for a substantial fee. With these supplemental services added to the various leagues mentioned above it would not be a difficult task for a young athlete to be immersed or "specialize" in one sport all year round. While this phenomenon has been evolving and growing over the past 25 years to where it is no longer uncommon to have an athlete playing one sport year-round. The question of "when does it become too much?" often goes unasked.

While Youth (defined as an athlete under 18 years of age), Sports Specialization is a rapidly growing trend. It is not without fair question or criticism about whether or not the process of specialization is healthy for the athlete. Not just physically healthy, but socially, mentally and psychosocially healthy for the youth athlete involved.

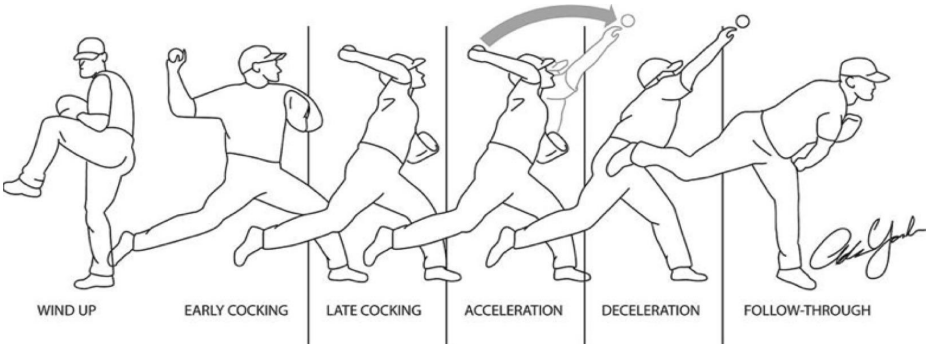
The purpose of this Capstone is to analyze and review how Social Pressure and Youth Sports Specialization is directly related to the steady increase in overuse injuries in young athletes, specifically youth baseball pitchers. While reaching a scientifically backed conclusion as to whether it is better for an athlete to specialize (focus on one sport year-round) or be a multi-sport athlete (play varying sports year-round), with "better" being defined as physically, mentally, and socially healthier. For the purposes of the Capstone, *Physically Healthy* is defined as no long term or short-term injuries formed or caused by overuse, and not acute injuries due to trauma.

In order to further differentiate between the two types of injuries discussed (Overuse, and Acute), standard definitions must be provided. Regarding overuse injuries, David Wang at John Hopkins University defines an overuse injury as *"when tissue is damaged due to repetitive demand over a period of time"* Further describing it by stating "They (the athlete) are micro-fracturing their bones, and micro-tearing their muscles and tendons. When the body is given time to rest, it heals these micro-injuries and adapts to become stronger. But if the body is not allowed enough time to heal, the micro-injuries can continue to progress and eventually become an overuse injury." (Wang,2023) Wang further describes acute injuries as injuries that happen suddenly such as sprains and dislocations.

Utilizing baseball as a reference point of the Capstone, common overuse injuries are shoulder inflammation, elbow inflammation, (commonly known as Little Leaguer's Shoulder or Elbow) from repetitively throwing or pitching a baseball, or lower body injuries from rotating through the horizontal plan while swinging. (Zaremski,2019) The overuse injuries stated above are mentioned in comparison to acute injuries suffered in baseball such as Bone Breaks from

being hit by a pitch, or knee injuries inflicted on the base paths when the cleats hit the base or clay awkwardly.

With the standard definitions stated, further analysis of peer reviewed and scientific data will provide the information required to support the belief that *"Sports Specialization and the Social pressure to do so is in fact detrimental to the physical social and mental wellbeing of the youth athlete, and when combined is a direct cause of overuse injuries in young athletes."*



[Figure 1] (Ace Therapy,2015)

Figure 1 demonstrates a textbook pitching technique demonstrated from wind-up to follow-through. Even with a perfectly executed technique from start to finish there remains a risk of injury due to the amount of torque, strain and pressure the throwing shoulder and elbow are placed under with the Early Cocking through Deceleration phases of movement. With the throwing arm being placed under repeated tension without proper rest the chances for injury increase EVEN with perfect technique.

Specialization Defined

In order to scientifically determine Specialization can lead to overuse injuries as defined above, a clear definition of what Specialization must be provided. According to a study led by Myer, it is defined as Defining it as *"participating in a single sport for more than 8 months or 66% of the calendar year, and quitting all other sports."*(Meyer,2023). To simplify it this means an athlete would forgo playing other sports (i.e., basketball, and football) in order to put his focus on baseball. While baseball is not the only sport in which one can specialize for the purposes of the study baseball will be the primary sport referenced when regarding specialization.

In order to further clarify, Specialization is not to be used as a synonym for obsession or love of the game in which the athlete partakes in games of catch, or hitting off a tee in the backyard, nor is it playing a game of pickup or sandlot baseball at recess or with neighborhood friends. Specialization falls more under the term *Deliberate Practice Framework (DPF)* in which the athlete is training deliberately in sport specific methods year-round with various coaches to improve, as well as playing a dense schedule of games for more than the 8 months or 66% of the calendar year. (Mosher,2021) To further support the specialization approach and justify the reasoning behind specialization it is believed that *"the positive correlation between time spent in training and eventual level of attainment, and the importance of domain specificity".* Meaning in theory that Specialization is the belief that D.P.F. will warrant more success and exposure leading to the eventual college scholarship and/ or pro contract. The problem with this mentality lies within the fact that the prepubescent body is not equipped nor prepared for the rigors of the heavy workload required to "Specialize" and will often break down (as shown in Figure1) in the process when proper care and rest are not applied.

[Figure 2] An MRI of a Distal UCL Tear

Deliberate Practice Framework

Deliberate Practice is a term that was originally used in 1899 to define the relationship between time spent in practice and skill development. (Ericsson,2021) However, more recently the term has transitioned into the sports, utilized where an athlete's entire athletic pursuits are focused on the mastery of one specific segment of the sports (i.e., Pitching in baseball), and divided into sub-segments of the sport (i.e., mechanics, pitch selection, speed and velocity training etc.).

Within the concept of deliberate practice, the idea of a game of catch, or sandlot baseball are non-existent with every scheduled hour of sports being scripted and dedicated to mastery of the art of pitching, pitching mechanics, pitch selection, and performance under the watchful eye of a parent, coach, or pitching specialist with the intentions of creating an elite pitching phenom oftentimes before the athlete and their arm reach peak physical maturation. Deliberate Practice Framework can complement, be applied, or compared to the 10,000 hours theory mentioned in the book Outliers by Malcolm Gladwell which is discussed below.

Gladwell's 10,000

While this may seem as a logical approach to greatness in the chosen sport, and is indirectly supported by Author Malcolm Gladwell who is of the approach that it takes 10,000 hours of deliberate practice to master a craft (Gladwell,2008) The Human anatomy and psyche is not considered when discussing the *10,000 hours theory.* Meaning if not managed carefully and efficiently the body can fail the athlete long before the 10,000-hour threshold is achieved due to overuse, mental exhaustion, social pressures, burnout, or a combination of the lot.

Following Gladwell's 10,000-hour approach regarding specialization in sport and based on the assumption that the Specialized Athlete is a full-time student with 40 hours (out of 168) devoted to all things academic including commute and homework. The athlete is reaching the recommended amount of sleep (8-10 Hours) for Children aged 8-17. (Cleveland Clinic,2022). As well as spending 12 hours deliberately and correctly practicing the chosen sport and playing in 3 competitive games a week each lasting 2 hours (total of six hours). Not including commute time to and from the games which are often out of the city, county or state. It would take a Specialized athlete 833 weeks or 16 years of deliberate practice to achieve mastery.

Time Frame Required to Achieve Mastery Utilizing Gladwell's 10,000 Hours Theory**

10000 hours\12 hours a week=833.3333 Weeks

833 weeks\52 weeks a year = 16.01923 Years

**** This is assuming an athlete utilizes a 7 day a week cycle of training**

[Figure 3]

These numbers in Figure 2 are put in place under the assumption the specialized athlete remains consistent and disciplined in practice with no gaps, injuries, rest days or breaks in training. Meaning that in order for a young athlete to follow Gladwell's approach of 10,000 hours to mastery in time to achieve that college scholarship at the age of 18 a perfect schedule of training with the deliberate practice framework must be implemented just prior to the athlete's second birthday and maintained consistently with no breaks planned or unplanned in order to achieve mastery. Making Gladwell and the 10,000 rule seem to be an unrealistic concept or practice in the time frame in which a young athlete would specialize.

Social Pressure Defined*

Social Pressure is defined as "*the influence that is exerted on a person or group by another person or group. It includes rational argument, persuasion, conformity and demands."* Regarding athletes Social Pressure can come from outside sources in the form of parents demanding extra practice, or conditioning work out of the athletes, coaches publicly comparing teammates to one another, or teammates holding each other accountable to performance standards on the field of play. While some of the above-mentioned tactics are not harmful when used responsibly and in moderation. Studies have shown they can be detrimental, when overused. Especially when the athlete is in a Specialized environment where his or her athletic and social lives are interwoven.

Athletes can also apply social pressure internally through the identification of self-worth based on their on-field performance, the fear of losing social status or peer acceptance, or fear of failure and disappointing their parents.

***Social Pressure can and does occur within unspecialized athletes but is often exacerbated within athletes specializing in a sport.**

Types of Social Pressures

Within the research below there will be two specific types of Social Pressure discussed and presented in relation to Overuse Injuries, Intrinsic and Extrinsic. Intrinsic is defined as internally or from within. Regarding social pressure intrinsic social pressure is a pressure that an athlete places upon themselves to succeed. Extrinsic is defined as outside sources of social pressure applied on the athlete to succeed. While both types of pressure are inevitable, too much of either type of social is detrimental, and can lead to overuse injuries

"The Marinovich Project" When Social Pressure Fails

Specialization and social pressure cannot be discussed thoroughly without mentioning one of the first specialized athletes that was put on the forefront of media scrutiny. That was the story of Todd Marinovich. Dubbed "Robo QB" in 1988 by Sports Illustrated. Marinovich set the National High School passing record as a quarterback at Mission Viejo High School in 1988 and was seemingly set to be the next great pro quarterback. (The Marinovich Project,2011)

However, the ugly secret was that Todd was the victim of both mental and physical abuse from his overbearing father Marv. Never allowed to eat candy, McDonalds or sugary snacks as a kid, and being trained from birth by his father, Marinovich faced intense social pressure to deliver. Poor play was disciplined with corporal punishment, and verbal abuse. With Marv known to strike Todd in the face with the back of his hand during the ride home and going as far

as making the 8-year-old Todd run the 4 miles home after a bad practice. The Social Pressure inflicted on Todd to perform was so intense and unrelenting that it caused his mother Trudi to divorce Marv while Todd was in High School, leaving Todd unprotected while he continued to live with his father.

Initially the methods worked, as Todd set national High School passing records, was highly recruited out of high school, and earned the prestigious Division I football scholarship to the University of Southern California, he and his dad worked for. However, the Social Pressures were breaking Marinovich.

Marinovich Pictured with Father Marv in 1988

Marinovich, who by then already had a well-known drug problem and was frequently known among his peers as “Marijuanavich”, began using Cocaine and Heroin in college earning a suspension from USC. Marinovich entered the 1991 NFL Draft and after being selected in the first round was an NFL bust with his nearby Los Angeles Raiders due to his drug use taking over his life. He has since spent time in and out of prison and drug rehabilitation facilities. With many Sports Psychologists pinning his substance abuse problems directly on the intense social pressure

inflicted on him from birth by his father, and the constant pressure to perform at an elite level with no respite.

The Specialization of Marinovich can be seen as a textbook example of how poorly handled Specialization and increased Social Pressure may drive an athlete to drugs, or other vices to cope. Unable to find a healthy social balance and coping mechanisms to deal with the stress and pressure placed upon them. With most of it being extrinsic pressure placed on him by his overbearing father Marinovich buckled socially, and turned to drugs and alcohol to deal with the crippling social pressures (Chiari,2011), but what about Overuse Injuries?

Parental Pressure

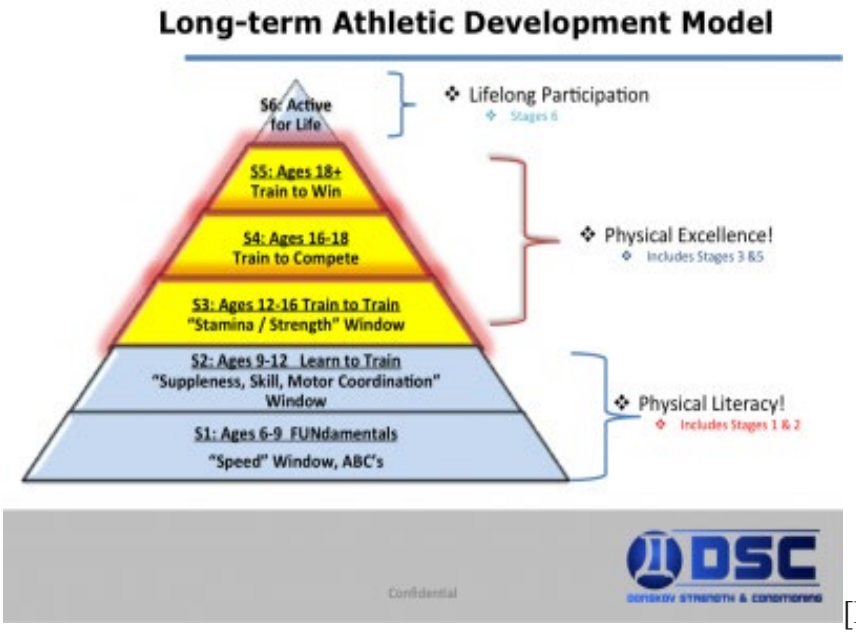
While the Tragic story of Todd Marinovich may be what Malcolm Gladwell would see as an "Outlier". (Gladwell,2008) There is evidence to believe the contrary with many "specialized" athletes being driven by their parents in a similar but not as mentally and physically abusive way as Marv Marinovich methods. In his 2019 Ted Talk Chicago White Sox Orthopedic Surgeon Dr. Nikhil Verma challenges the parental role played in young pitchers developing overuse injuries Specifically Ulnar Collateral Ligament Tears caused by Overuse injuries. Stating that the overuse injury risk in Youth Baseball Pitchers is in fact significantly higher. (Verna,2019) a ten-year trend from 2004 to 2014 shows that the average age for UCL Tears in athletes has gone from 27 to 17. To further emphasize the decline in age, the average age in UCL Tears in athletes has gone from the mid professional career age of 27, to the average age of a high school junior of 17, Verna relates this decline to athletes now specializing in baseball. According to the research conducted by Verna's team at the Rush Institute in Chicago Illinois. 1/3 of athletes playing

year-round baseball report pain in their throwing shoulder. Furthermore, Verma's team's study said single sport or specialized athletes are 81 percent more likely than multiple sport athletes to obtain an injury, with 50 percent being overuse injuries. When asked directly by Verna's team 50% of the parents of single sport or specialized athletes expected their kids to earn a scholarship and or play professionally.

That 50% when paired with the high cost of Specialization, intrinsic social pressures regarding fear of disappointing their parents as well as the extrinsic social pressures from parents wanting their children to "tough it out "because the parent has "invested" in said athlete financially, the risk of an overuse can increase significantly. Now with the costs of colleges skyrocketing, and admissions becoming more competitive, the parental pressure on the athlete to obtain the college scholarship and potential pro contract can lead to the athlete working or being worked to a state of overuse and developing an overuse injury. It could be argued that Specialization is the wrong approach by Youth Sports Athletes, Parents, and Coaches. With the suggestion that Long Term Athletic Development be the goal of anyone involved in a youth sport.

Long Term Athletic Development

Long Term Athletic Development is a youth centered sports approach, focused on developing a young athlete at their own pace with a commitment to a lifelong healthy lifestyle. (NSCA,2023). Long Term Athletic Development utilizes a more patient approach in which athletes are individualized based on their needs, and skills, opposed to a standard expectation of skill based on age, size or birth month. The Long-Term Athletic Development Approach functions on an age focused commitment to lifelong activity



[Figure 34] (Donskov,2015)

When the approach shown in figure 3 is applied successfully the 70 percent burnout rate of youth athletes by age 13 will reduce significantly, and the annual retention for recreational youth sports should increase. More importantly the overuse injuries that are becoming prevalent in young athletes will decrease.

Specialized Study 1

According to a 2017 survey of 201 sports parents conducted by the Orthopedic Journal of Sports Medicine, 106 parents (53.4%) reported their children were involved in multiple sports. Furthermore 115 parents (57%) expressed a desire for their kid to achieve a scholarship or play professionally. (Padaki,2017) The study further reveals that 100 parents (49.7 %) encourage their kids to specialize in one sport. When the survey was analyzed and reported, it was found that most parents who completed the survey were female (71.4%), while 58.2% of youth athletes were male. The mean age ± SD of the surveyed parents' children was 13.8 ± 3.0 years. Regarding medical history, 72.1% of parents stated that their children had experienced a sports-related injury. Injury severity ranged from nonoperative conditions, including medial

epicondylitis and patellar tendinitis, to operative conditions such as anterior cruciate ligament (ACL) rupture and ulnar collateral ligament rupture (UCL). Approximately 25.1% of parents had reported hiring personal trainers, and 22.9% had hired sports-specific instructors for their children."(Padaki,2017)

Specialized Study 1 Analysis

The issue with the survey is the lack of input from the athlete in question. Which leaves out the details of how much say they have in their choice of sport, or amount of time spent on it. Leaving the open-ended question as to if the athlete was allowed to choose their sport, or were they forced into it at a young age by a parent who had chosen it and decided that would be their path in life? More concerning is that out of the 201 parents surveyed, an astonishing 144 parents (72%) have reported their child suffering a sports related injury. Regarding Specialization, 50 parents (25%) have employed private personal trainers, and 43 parents (23%) surveyed have employed private sports and or skill specific coaches to theoretically improve their child's chances of a college and/or professional career.

The previous issues mentioned further show the existing and often immense social pressure on the young athlete. The Extrinsic Social Pressure can be applied in the car rides to and from the game where a parent uses the captive audience to criticize and over analyze the performance through unsolicited advice and criticism. Even worse and more mentally breaking is the "Silent Treatment" where the parent is so "disappointed" in the performance they choose to ignore the athlete and not say anything. (Uzynski,2019) While the stereotype of the parent living through their child and forcing the kid to live their dream is factual, oftentimes the social

pressure the young athlete feels is applied using a well-meaning approach in which the parent only wants the athlete to do their best and reach their potential whether it is realistic or perceived.

While social pressure is something felt by every athlete. It is often more intense with the specialized athlete. (Uzynski,2019) Social pressure can be of both the intrinsic (from within) and extrinsic (from outside sources) nature, and oftentimes the social pressure comes directly from the parents of the athlete, turning what in fact should be a socioemotional “safe space” into an environment in which the pressure is so immense the young athlete feels they have nowhere to turn and competes out of necessity.

Financial Pressure (Extrinsic)

Within the 37 billion dollars annually spent on youth sports mentioned above a majority of that comes from parents paying for expensive equipment, private coaches, travel teams, and travel expenses. Parents in turn occasionally see all this as an “investment” in the future and consciously, or subconsciously relay that financial pressure for a “return on their investment” onto their athlete. That pressure can manifest itself through the parents with constant criticism of their athlete's performance. Never being satisfied, and constantly finding something to correct is one-way parents apply unnecessary social pressure on their athlete. While this again is a universal problem within youth sports the added pressure of increased monetary commitments by the parents exacerbate it. The Financial pressure then can potentially manifest itself onto the athlete who in turn overworks themself to a state of injury or exhaustion.

The Sideline Coach (Extrinsic)

Social pressure can further be applied to the athlete when a parent in a non-coaching role decides to spend the entire game coaching from the stands. This creates both extrinsic and intrinsic social pressure on the athlete as oftentimes the player does not know whether or not to follow the coaches' instructions or the parents, as well as feeling "singled out" or "spotlighted" in the event leading to increased social pressure. Furthermore, it can create a conflict between player and coach, player and parent, or coach and parent. Where the lines of authority are skewed leaving the athlete conflicted and increasing both intrinsic and extrinsic social pressure. Baseball can be especially intense regarding this application of social pressure due to the *"dugout effect".* (Uzynski,2019) In sports such as basketball and football the benches are often separated from the spectators allowing the athlete to have their own space to process, recover, analyze and adjust. However, in most youth sports environments the dugout is often right next to the bleachers and parents often take advantage of that time between innings or at bats to continue to "coach" and correct their athlete. This time in front of their teammates and peers which only intensifies the rapidly growing social pressure.

The Sideline Coach can often hinder the young athlete from learning to process their own mistakes and flaws, due to the constant flow of instructions and criticism coming from the sidelines. This can lead to an athlete developing a fear of making mistakes which in turn can lead to physical compensations in the throwing technique creating overuse injuries due to poor mechanics within the young athlete. While the parental pressure demonstrated above may not reach "Marinovich levels" of social pressure it can lead to accelerated burnout and injury in an athlete whose entire athletic existence is tied to a specialized sports environment. (Gould,2023)

Elite Status (Intrinsic/Extrinsic)

The rise and perceived importance in participating in Travel Sports is another little discussed Social Pressure that often comes with specialization and could lead to social isolation. An often-costly endeavor, travel sports are perceived as elite in comparison to recreational sports in both cost and level of competition. While the better level of competition is one of perception, the extra cost of travel sports is factual. With costly food, travel, and lodging expenses for weekend tournaments or showcases. Team dues and equipment fees in order to participate. There is a perceived elitism of both skill and socioeconomic status in being on a travel team. (Sadler,2022) Along with the elitism, comes an increased pressure to perform on the athlete, and a feeling of failure when expectations are not met. These increased extrinsic and intrinsic social pressure can lead to loss of enjoyment, emotional exhaustion and burnout in the young athlete. Within the chasing of the "elite status" youth athletes often tend to apply the intrinsic social pressure to remain elite through overwork, overtraining, and poor training practices within the deliberate practice framework. While the Extrinsic Social Pressure through the deliberate practice framework such as reminding children of the costs of travel ball, elite coaches, and trainers, and position specialists apply a greater deal of pressure that can lead to overwork and an eventual overuse injury in a Youth Athlete.

Social Isolation (Intrinsic/Extension)

Peer acceptance either perceived or legitimate, based on performance can increase social pressure as a player desires to be accepted and ties their self-worth among their peers' acceptance of them. In a specialized environment in which the athlete only has the social circle of fellow

specialized athletes the increased pressure to play well or feel ostracized from their friend group. This pressure can lead to social burnout, increased pressure to perform, loss of enjoyment. (Gould, 2023)

The social pressure due to specialization under the influence of travel ball can also lead to social isolation for the athlete due to missed opportunities to socialize with peers outside of sport due to the intense travel schedule, practices, games, and commitments. Those missed opportunities to socialize with non-teammates can lead to social isolation, loneliness and anxiety in the specialized youth athlete. This sense of isolation only seems enhanced when the athlete is failing, (extrinsic) or feels they are failing (intrinsic) to meet their performance goals.

As one further researches, and analyzes both the intrinsic, and extrinsic social pressure attached to highly competitive youth sports. According to Dr. Ashwin Rao the team physician of the University of Washington, “There is a big debate about youth sports specialization and professionalization, where adolescent and younger athletes are asked to practice and play in a manner similar to professionals, this can lead to injury and burnout, and many young athletes can be turned off to this level of stress, and hence sport, at a young age.” “These effects and impacts are still being studied,” added Rao. (Weinstock,2022) However, with the number of studies that have been conducted, evidence points directly to overuse injuries being connected to specialization.

Even more concerning is that intense social pressure on an athlete, especially one who is specializing in a sport can be directly linked to and compound pre-existing issues whether known or unknown in the young athlete.(Weinstock,2022) For example, an athlete specializing in baseball and knowingly or unknowingly clinically depressed, or suffering from anxiety, and involved in a peer group of baseball players, and driven parents, could be sent into a spiraling

depression, or worsened state of anxiety by a hitting slump. This problem could be affected through parental pressure (extrinsic), due to increased financial contribution for the specialized sports experience. through intrinsic pressure based on their own fear of failure, or perceived social isolation due to failure, or a combination of both.

Social Media (Intrinsic/Extrinsic)

Regarding Social Pressure in athletes Social Media Sites such as Facebook, Instagram, Tik Tok and Twitter, all play a significant part in increasing both intrinsic and extrinsic social pressure on the youth athlete. With Sites such as Rivals.com ranking students as young as 6th grade on a national scale. Parents dedicating Instagram pages to their 4th graders baseball "career", and every aspect of an athlete's endeavors being viewed under the critical microscope of social media can cause immense intrinsic and extrinsic social pressure on an athlete. In an environment where the first rule is "do not read the comments." It is very easy for an athlete or their parents to allow themselves to be driven by the extrinsic social pressure of the "social media coach.", and perceived social status, to be driven intrinsically by the personification of the comments. These pressures can add to the immense social pressures facing the specialized young athlete.

Extrinsic Social Pressure through parents can evolve from the parent's fear of missing out (FOMO), on an opportunity to get exposure for their athlete, and to do so pressure their athlete into a state of overwork and overuse in order to do so. While well intentioned, when done incorrectly it opens their athlete up to unfair and unsolicited criticism from strangers and allows for an increase in intrinsic social pressure. These applied pressures from outside and often

unknown sources can lead to an athlete overworking their body without proper rest and leading to a minor or major overuse injury.

Study 2: Sleep Deprivation on the Specialized Athlete

When discussing Gladwell's 10,000 hour approach in Figure 1, an estimated 50-70 hours a week were inserted to accommodate rest. However, as previously mentioned that was done utilizing theoretical numbers and is often not the case for the specialized athlete and their sports schedule. However, according to a study conducted on French Athletes ages 6-18 it was found that "*Female athletes, athletes who self-reported a history of clinically diagnosed depression or anxiety, and athletes who reported a prior sport-related injury were less likely to meet sleep recommendations. Athletes who were goal oriented in their sport pursuits were also less likely to meet sleep recommendations than young athletes who pursued sport for fun or pleasure".* (Brenner,2019)

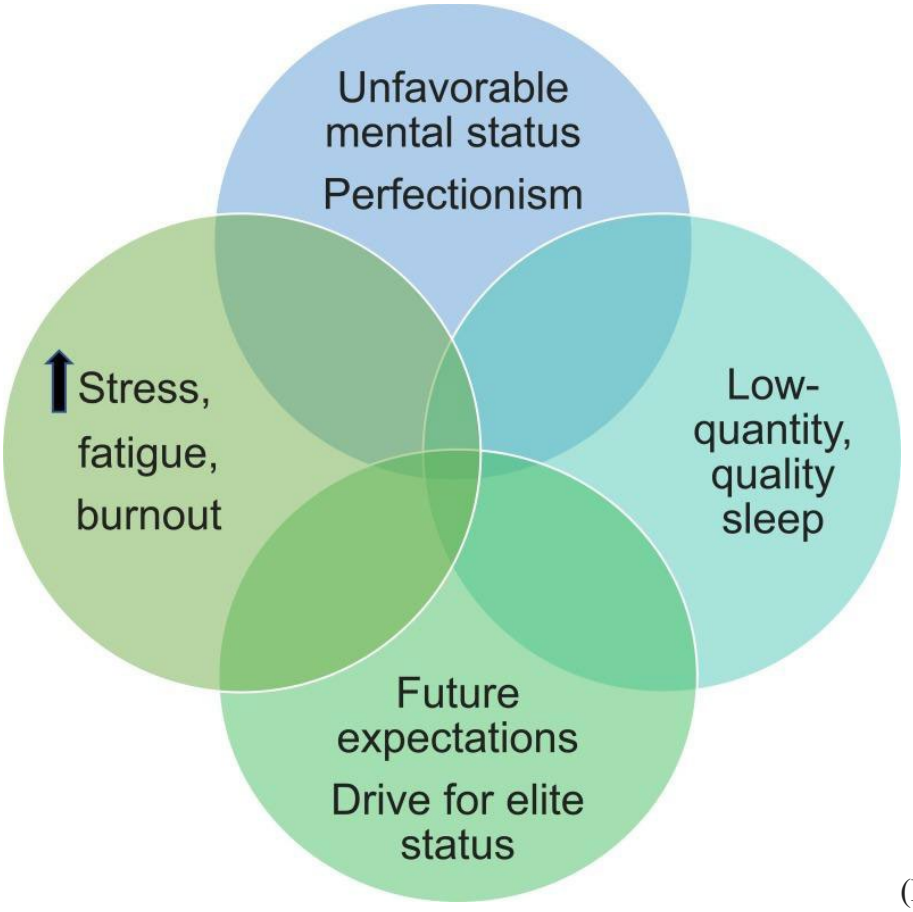
When reanalyzed by Milewski it was further determined that "found *that athletes who practiced soccer more than 10 hours per week slept less than their peers who practiced 3 or fewer hours per week, and middle school–aged boys (11–14 years old) who practiced more than 10 hours per week slept at least 0.5 hours less per night than their peers who practiced fewer hours. More than 40% of 137 elite, young French athletes with high training volumes reported poor or just sufficient sleep quality"* (Milewski,2019)

Study 2 Analysis

With an insufficient amount of sleep the athletes can and will suffer a decline in their cognitive abilities, fine motor skills, and decision-making ability. This in turn aids in increasing

other social pressures discussed above such as the feelings of social isolation due to poor performance and the extrinsic and intrinsic feeling of parental pressure on the athlete.

When these pressures are continuous throughout the time allotted to be considered a "specialized athlete" (over 8 months of a 12-month calendar), they can lead to burnout from the exhaustion of social pressure, as well as increased feelings of isolation, and failure due to the overwhelming schedule maintained as a specialized athlete. With fatigue, decline in cognitive abilities, and fine motor skills the body is already under significant physical strain. When combined with a biomechanically specific area like throwing a baseball at a high velocity the mechanics required to do it safely can fail. When the mechanics fail, and poor technique is repeatedly used overuse injuries and the risk of increase.



(Brenner,2023)

[Figure 5]

The Effects of Social Pressure on Overuse Injuries

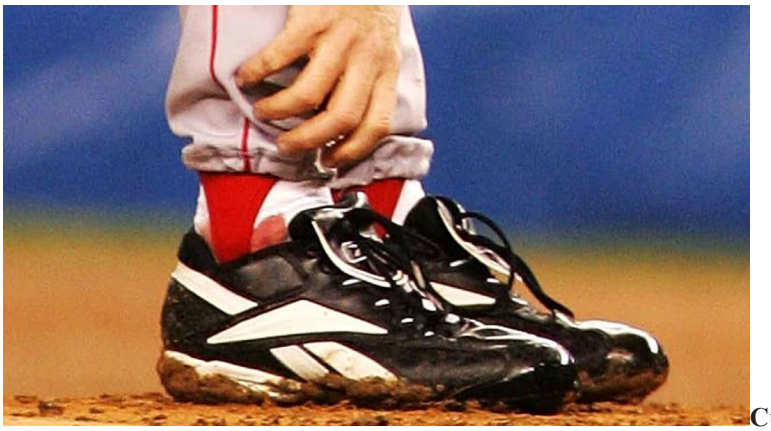
The Venn Diagram (Figure 5) is a portrayal of the Social Pressures a regular youth athlete can face within a season, with the assumption that the standard recreational baseball league lasts 3 months. An athlete reaching for “Specialization" (greater than 8 months) will theoretically experience double the stressors and pressures to perform.

A further look at Figure 3 will tell us that an unfavorable mental status, and perfectionism, both intrinsic social pressures can affect sleep in both quality and amount which in turn can lead to stress, fatigue and burnout. (Brenner 2023) These are directly related to the athletes fear of the future, and not meeting expectations of self or parents.

The intensified social pressures can lead to a physical desire for an athlete to prove themselves, and in turn ignore what is perceived as “soreness” leading to overuse injuries. Another concern within the specialized athlete is the desire to “tough it out” and play through the pain. This desire can stem from the intrinsic social pressure. Pressure to perform out of fear of social isolation for their peer group on their respective team. Fear of disappointing their team, and coaches by self-reporting the injury, and fear of disappointing their parents by not playing. These intrinsic pressures, while also prevalent in the non-specialized athlete, manifest more often in the specialized athlete aware of the pressure and high stakes environment often surrounding competitive sports. (Weinstock,2022)

The Extrinsic Social Pressure for the specialized athlete to play through pain and discomfort can occur when parents, coaches, and teammates “encourage” a player reporting an

injury to “tough it out for the team”, and often includes a motivational story about a player playing through pain. (i.e. Curt Schilling and the Bloody Sock) an event in which Schilling pitched in the 2004 American League Championship Series a week after ankle surgery.

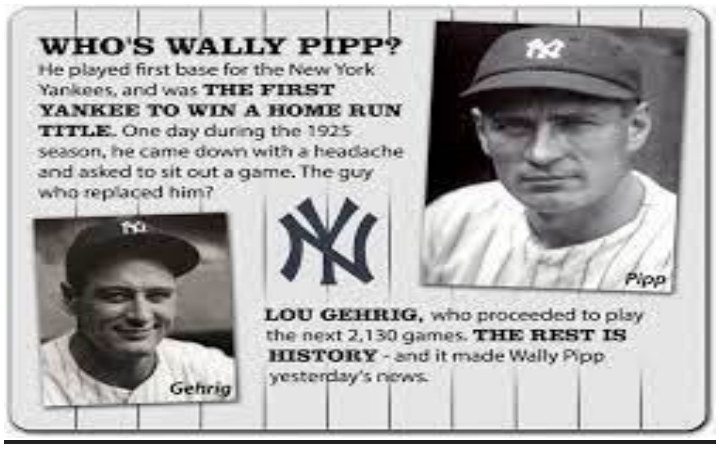


Curt Schilling’s Bloody Sock

(Reuters,2004)

The Extrinsic Social Pressure, while often well intentioned can and will inherently create more problems for the athlete if ignoring the pain is their choice. Unfortunately, with the specialized youth athlete the choice is not always theirs. Parents and coaches can often force a hurt athlete into competition for the sake of their own agenda or ego. These extrinsic social pressures which can lead to an overuse injury in an athlete reporting soreness but being pressured into playing. While the previously discussed social pressure placed upon young athletes are not isolated to simply specialized athletes, with multi-sport athletes reporting facing the same social pressures throughout their respective sports seasons. The difference lies within the amount of time one applies to the sport in question. With Specialization being clearly defined as 8 months or 60% of the calendar year. The social pressures to ignore pain, discomfort and soreness to perform are often greater, and can cause or force an athlete to create an overuse injury to relinquish social pressure.

Missed Time and Lost Place



(Credit Catholic University News)

Wally Pipp was the New York Yankees star first baseman until a headache caused him to miss a game, allowing Lou Gehrig to take his place, and play a then record 2,130 consecutive games. Pipp's story has become so iconic that the phrase "Getting Wally Pipped" is now a part of the American Sports Lexicon. Stories like this are a reason Athletes often are reluctant reporting or resting an injury out of fear they will lose their position, place or role within the team. Intrinsically, an athlete will feel the social pressure to play through soreness and pain leading to an overuse injury for fear of losing their role on the team.

Overuse Injuries

Social Pressures on the Specialized athlete can increase the risk of an overuse injury, and the injury risks increase significantly according to the player's age. Meaning a Pre-pubescent

athlete is more likely to suffer an overuse injury due to the immature state their body is in (UTSWMed,2014)

Dr Jane Chung a sports specialist at Scottish Rite when asked stated: “There is concern that early specialization and intense training at an early age may result in negative outcomes such as increased risk of injuries such as overuse injuries and increased psychological stress, potentially leading to drop out from sports and burnout. However, there are other risk factors that have been identified for causing overuse injuries” Dr Chung provided a chart of the leading cause of Overuse injuries in specialized Athletes based on research from Dr. Brenner, and the American Medical Society for Sports Medicine.

Categorization of Risk Factors for Overuse Injury	
Intrinsic Risk Factors	**Extrinsic Risk Factors**
Growth-related factors • Susceptibility of growth cartilage to repetitive stress • Adolescent growth spurt	Training workload • Rate • Intensity • Progression
Previous injury	Training and competition schedules
Previous level of conditioning	Equipment/footwear
Anatomic factors	Environment
Menstrual dysfunction	Sport technique
Psychological and developmental factors • Athlete specific	Psychological factors • Adult and peer influences

DiFiori JP, Benjamin HJ, Brenner JS, et al. Overuse injuries and burnout in youth sports: a position statement from the American Medical Society for Sports Medicine. Br J Sports Med.2014;48: 287-288.

[Figure 5] (Brenner,2021)

The research categorization of figure 3, follows the physical intrinsic and extrinsic factors that can lead to overuse injuries in young athletes. If one is to review this chart objectively, they can conclude that excluding the intrinsic risk factors of the Adolescent Growth Spurt, Anatomic

Factors and Menstrual Dysfunction, that Overuse Injuries are completely preventable, and sports specialization is a major cause of them.

An in depth look at Brenner's chart tells us at the very top of the intrinsic chart, that repeated overuse and stress of the growth cartilage can contribute to an overuse injury, and the chances increase with the athlete carrying an excessive training workload, and competition schedule. When all these factors are taken into consideration, it would be easy to see how an overuse injury could occur. However, when the chart is looked at again the state of physical condition the athlete is in can also play a factor in how quick a point of overuse can be reached, yet the state of physical conditioning can also stand alone as a factor leading to overuse through overtraining. If a youth pitcher engages in an intense and rigorous strength training program combined with a full baseball schedule, there will not be an appropriate amount of time for recovery and lead to overtraining due to a lack of periodization. With periodization being defined by appropriate Macrocycles (seasonal training plan), mesocycles (4–6-week training cycle), and micro cycle (2–3-day cycle of training plan) through a designated length of time. With each cycle allowing for adequate rest and recovery. The overtraining can create a muscular imbalance which causes an alteration in technique and leads to an overuse throwing injury.

Poor Technique can lead to overuse through repeatedly stressing the cartilage through improper movement causing stress to bone ligament and tissue damage. The stress is exacerbated when an enhanced training schedule based on poor technique, and competition schedule is applied to the athlete in question.

The Psychological Factors contributing to overuse are related to the social pressures discussed above. According to Brenner they are individualized and specific to each athlete. For some athletes batting .350 for the season may be a personal goal, while others it may be finishing

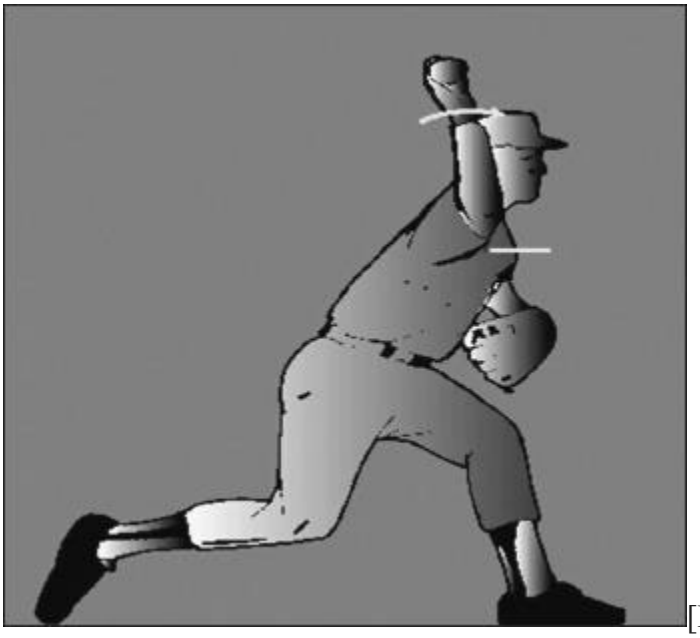
the season with a winning record and Earned Run Average under 2.00, meaning that with each athlete there is a specific goal in mind. However, those personal goals can serve as a reason to allow an athlete overreach in practice and training and develop an overuse injury. When the adult and parental pressures factor in the risk of an overuse injury increases through the previously discussed social pressure. (Brenner,2020)

The Genesis of an Overuse Pitching Injury

In order to understand how a throwing injury from Overuse occurs, one first has to understand the biomechanics of a baseball pitch and its relation to the kinetic chain checkpoint of the immature, and underdeveloped body. According to Dr Gary Calabrese; *"The repetitive overhead motion in baseball places extraordinary stress on the musculoskeletal system. Shoulder and elbow force and torques have been extensively studied and suggest that injuries are primarily thought to be related to repetitive soft tissue microtrauma experienced at the extremes of motion during the pitching motion"* (Calabrese,2013)

[Figure 6] (Calabrese,2013)

Calabrese elaborates further by stating that a pitch is divided into six smaller phases of motion. The phases in sequential order being the wind-up, stride (early cocking) [figure 4], late cocking, acceleration, deceleration, and follow through. Within those six phases there are "microphases" or sub-segmented movement patterns necessary for fluid and coordinated movements. "The wind-up phase has components of balance and initial forward momentum while the stride encompasses arm path, foot placement/contact, stride length, stride angle, arm position at foot contact and the relationship of speed and timing between the lead leg hips and dominant shoulder segment. Late cocking (figure 6) where the risk of overuse injury is highest, incorporates elbow position in flexion, shoulder external rotation and trunk inclination,



[Figure 7] (Calabrese,2013)

while acceleration includes shoulder internal rotation velocity, trunk forward movement towards target, and body position at ball release. Deceleration [Figure 6] and follow through include trunk positioning, lead leg extension, and dissipation of force through upper extremity horizontal adduction" (Calabrese,2013)

 [Figure 8](Calabrese,2013)

The phases, and sub-segmented movements in a pitch put a significant amount of stress on the arm and require precise and consistent technique. Every time an athlete throws a pitch the movements, and sub-segmented movements are repeated. These movements put an enormous amount of strain on the body, and when repeated consistently without proper rest and recovery the microtears, and stressors within the arm that were initially created worsen to the point. where an overuse injury occurs.

Common Overuse Injuries for Pitchers

The most common overuse injuries that are Baseball specific are labral tears, dead arm Muscle Strains, Throwers Elbow, and UCL Strains, and Tears. (PremierHealth,2019) The Professional team at Premier Health further elaborate on these injuries by providing the parameters of each specific injury,

Muscle strain: Muscle strains happen when athletes have partial tears or stretch injuries to their muscles. They are classified as Grade 1, 2 or 3, depending on how severe the injury is. Grade 1 is just a stretching injury of the muscle. Grade 3 is a complete tear, which is thankfully less

common. Baseball's repetitive nature puts high stress on certain muscle groups, placing these muscle groups at higher risk for this type of injury.

Labral tear: This injury is a disruption or stretching to the structure surrounding the socket part of the shoulder, known as the glenoid. The labrum gives stability to the shoulder, so when it's disrupted or torn, it makes the shoulder potentially unstable.

"Dead arm": This is a general/non-specific diagnosis that can be caused by multiple injuries or multiple issues in your shoulder. Most often, "dead arm" happens in throwing athletes, causing them to have decreased control, accuracy, and velocity. Some pitchers who have "dead arm" don't know they have it, they just can't throw as fast or accurately as they used to.

Thrower's elbow: Also known as medial epicondylitis, this syndrome causes pain on the inside part of a thrower's elbow. It creates enough discomfort that the thrower not only notices the pain, but it also affects their throwing motion. Though it's usually caused by overuse or sudden increased use, it can also be caused by incorrect throwing technique.

UCL elbow strain: This strain is similar to thrower's elbow but is specific to the ulnar collateral ligament (UCL), which is on the inside part of the elbow. A UCL elbow strain is caused when the ligament is stretched or partially torn. Though this usually happens over time, it also can occur during a traumatic injury. Throwers will notice pain on the inside of their elbow, and the injury can lead to decreased velocity and poor ball control.

While each specific injury listed above can affect the mature arm (18 years of age) significantly, its effects on the immature arm can be catastrophic, if not treated and managed effectively through proper treatment and physical rehabilitation.

UCL Tear: Studies have shown over the past 20 years Ulnar Collateral Ligament Tears, a traumatic elbow injury directly linked to overuse and excessive torque on the pitching elbow, and once mainly found in Major League Baseball Pitchers. Has shown an average increase of 2.3 % per year in pitchers under the age of 18. (Jayanthi,2013) Jayanthi like many others believes this is directly related to the increase in athletes choosing not only to specialize in one sport in this case baseball, but to further specialize into one position which in the case of UCL tears is Pitcher.

UCL Tears and Tommy John

The result of the increase in UCL Tears in Youth Pitchers is the dreaded "Tommy John Surgery" also known as Ulnar Collateral Ligament (UCL) Reconstruction. An invasive surgery that requires a new UCL to be fabricated and reattached the elbow through holes drilled in the bone and sutured into place.

First conducted in 1974 by Dr Frank Jobe, it was done to correct pitcher Tommy John's injury. From the origin of the surgery until 2003 an average of ten per year were conducted in athletes under the age of 18. By 2022 the average has increased to 80 per year in the same age range. (Streeter,2023) Orthopedic surgeons have connected this increase to overuse, improper recovery time, and unnecessary strain on the immature elbow by throwing breaking balls that employ a significant amount of torque on a weak, immature, or underdeveloped arm. While an Average of 80 per year does not seem significant in relation to the number of young athletes playing baseball nationwide that would meet the classification of specializing.

Tommy John on "The Tommy John" Surgery

The Tommy John Surgery is an invasive surgery, to repair the torn Ulnar Collateral Ligament (UCL), and often occurs in the throwing arm of pitchers. In the procedure, the Ulnar Collateral Ligament in the medial elbow is replaced with a tendon from elsewhere in the body. The surgery comes with an average 1-year recovery time.

So, commonplace has the surgery become in young athletes, that former Major League Pitcher Tommy John, the surgeries namesake had this to say when asked about it; "It doesn't bother me to watch my legacy being upstaged by an operation that has saved plenty of ballplayers' careers. What does bother me is that my name is now attached to something that affects more children than pro athletes. I was in my 30s and playing major league ball for nearly a dozen years before needing the operation. Today, 57 percent of all Tommy John surgeries are done on kids between 15 and 19 years old. One in 7 of those kids will never fully recover." (Centeno,2021)

A study released in 2015 reported that 57% of athletes who underwent Tommy John Surgery were between the ages of 15-19 (High School to College Freshman Age), indicating that pitching injuries due to overuse are a significant problem in youth sports, and are only worsened when the athlete chooses to specialize in a sport such as baseball with a sub-specialized focus of pitching. When combined with poor technique and lack of recovery as mentioned and discussed in Figure 3. The immature elbow will eventually see damage. When interviewed about UCL Damage in Young Pitchers, Orthopedic Surgeon Weimi Doughigh stated regarding specialization and arm injuries "It is so important to educate families to what the risks are." Douoghih is an opinion of merit having performed the operation on a pitcher who was ten years old, based on the fact his parents and coaches had him throwing curveballs with poor technique on an underdeveloped arm without proper rest causing the tear. (Streeter,2023) The studies above indicate that Specialization without proper coaching and moderation can lead to significant damage to the immature arm and athlete through overuse.

Overuse Pitching Injuries Prevention

As previously defined overuse injuries as *"when tissue is damaged due to repetitive demand over a period of time."* (Wang,2023) This occurs when a constant repetitive motion with or without correct biomechanics causes tissue to become inflamed, torn or damaged. Furthermore, they (the athlete) are micro-fracturing their bones, and micro-tearing their muscles and tendons. (Wang,2023) When the microfractures, and tears are not given the appropriate amount of time to heal the condition can worsen through overuse and cause an overuse injury to become an acute injury (i.e., Ulnar Collateral Ligament (UCL) Inflammation evolving into a UCL Tear.), an injury that requires surgery and significant recovery time. Regarding the UCL tear it has been directly connected to overuse. (Andrews 2023) According to Dr. James Andrews one of the nation's leading Orthopedic Surgeons, the following is a list of recommendations to prevent overuse pitching injuries.

Dr. Andrews Recommendations to Prevent Overuse Injuries are as follows.

- **Warm up properly by stretching, running, and easy, gradual throwing-** A Dynamic Warm Up Specific to the motions an athlete would use on the mound, followed by a gradual pitching warm up is recommended to prepare the body for the challenge ahead.
- **Rotate playing other positions besides pitcher-** Various positions on the baseball field require different movement patterns of the Body. Alternate positions to allow certain parts of the shoulder to rest.

- **Concentrate on age-appropriate pitching-** A common problem in baseball that is exacerbated by specialization is pitch selection on immature(pre-pubescent) pitching

arms. Breaking Balls (pitches that rotate or move horizontally before descending and being caught. Put a tremendous amount of stress on the wrist, elbow, rotator cuff, and shoulder. The repeated usage of those pitches can result in an overuse injury that can harm the development of the immature arm. According to a review by Dr. Trent Tamate titled "*Curveballs in Youth Pitchers: A Review of the Current Literature"*. It was determined that age-appropriate pitches exclude ALL breaking balls until approximately age 14. (Tamate,2019)

- **Adhere to pitch count guidelines, such as those established by Little League Baseball-** Pitch counts have been put in place to adhere to the recommendations of medical professionals designed to protect the arm of the pitcher as it develops and grows. According to Little League Baseball guidelines the pitch counts are as follows:

Baseball Pitch Count BY League Age and Appropriate Rest Days Following (Little League.org,2019)

AGES 6-8

◆ 50 pitches per day

AGES 9-10

◆ 75 pitches per day

AGES 11-12

◆ 85 pitches per day

AGES 13-16

◆ 95 pitches per day

Baseball pitchers league age 14 and under

- **◆ 1-20 Pitches = 0 Days Rest**
- **◆ 21-35 Pitches = 1 Day Rest**
- **◆ 36-50 Pitches = 2 Days Rest**
- **◆ 51-65 Pitches = 3 Days Rest**
- **◆ 66+ Pitches = 4 Days Rest**

Baseball pitchers league age 15 and 16

- **◆ 1-30 Pitches = 0 Days Rest**
- **◆ 31-45 Pitches = 1 Day Rest**
- **◆ 46-60 Pitches = 2 Days Rest**
- **◆ 61-75 Pitches = 3 Days Rest**
- **◆ 76+ Pitches = 4 Days Rest**

While Little League Baseball maintains a strict pitch count protocol, and faithfully enforces it. The problem arises when the specialized athlete becomes involved in multiple leagues, teams or travel teams (see below), which often leads to a lapse in communication, or extrinsic and intrinsic social pressures playing into a pitcher who specializes in a pitcher throwing without age appropriate and adequate rest on their arm.

Avoid pitching on multiple teams with overlapping seasons- According to Lindsey Barton Strauss, JD *"Baseball pitchers who play for multiple teams with overlapping seasons are at increased risk of injury from exceeding mandatory or recommended pitch limits. While playing on more than one team at a time may give an athlete more opportunities to develop his skills, and while the amount of pitching may be limited by league rule or the judgment of the coaches, it also increases the risk that he/she may end up exceeding mandatory (in the case of Little League) or recommended (in the case of USA Baseball) pitch limits (or the 100 inning per season limit recommended by the American Sports Medicine Institute. Because of a lack of communication and coordination between coaches, it may be up to you, as his parent, to keep track of your child's pitch counts and days off and to insist that the coaches not exceed those overall limits.* (Strauss,2010) In order to ensure this is happening the parent(s) of the athlete as well as the athlete must communicate their concern to all coaches involved without allowing intrinsic or extrinsic social pressure to manifest and control the situation.

Don't pitch with elbow or shoulder pain, if the pain persists, see a doctor-Pain is the Body's alarm system for greater issues. When pain in a joint, bone, or tendon presents itself it is a sign of bigger problems. To ignore the pain only irritates it and eventually worsens the condition from something that could simply be a short-term break from play to a long-term injury.

Don't pitch on consecutive days- In Accordance with the suggestion to **Avoid pitching on multiple teams with overlapping seasons.** This requires the parent(s) and the athlete to resist the extrinsic and intrinsic social pressure to perform and communicate with the coaches involved about the usage in order to prevent further injury.

Don't play year-round- Directly correlated with the definition of Specialization (over 8 months or 60% of the calendar year). Year-round participation in baseball, or any sport for that matter often does more harm than good. Even before the application of Deliberate Practice Framework and the employ of specialist coaches. Year-Round Sports allows for little mental or physical recovery. Which as previously noted, leads to overuse injuries in athletes.

Sports Trainers Viewpoint

Specialization, a fairly new Youth Sports Trend has also garnered attention from the National Athletic Trainers Association (NATA), which according to a study of 1000 athletes both one sport (specializes) and multi-sport (unspecialized), reported that specialized athletes self-reported at a **2:1 ratio** more injuries than their multisport counterparts. (Gould,2023) Beyond the injury aspect the fine motor skills and conditioning from participating in multiple sports as opposed to specialization in which one specific plane of motion and movement pattern is worked until the point of overuse. Overuse injuries related to specialization have been such a concern that N.A.T.A. has established recommended guidelines to protect the Athlete from overuse injuries from Specialization. While these guidelines are not official, they have been highly recommended by N.A.T.A. to reduce the risk of overuse injuries.

N.A.T.A. Recommendations.

1.**Delay Sport Specializing in a single sport for as long as possible:** Adolescent and young athletes should strive to participate in, or sample, a variety of sports. This recommendation supports general physical fitness, athleticism, and reduces injury risk in athletes. Furthermore,

the fine motor skills developed in various sports can allow for a healthier and more complete and well-rounded athlete. A 2017 survey stated that of the 253 NFL Draft Picks chosen in that year's draft 222 (87%) of them played multiple sports growing up. (Hilbert,2017) With the various sports serving as a time to recover from football's demands as well as work on the supplementary skills, speed, strength, and conditioning required to their main sport at a high level.

2. One team at a time: Adolescent and young athletes should participate in one organized sport per season. Many adolescent and young athletes participate or train year-round in a single sport, while competing in other organized sports simultaneously. Total volume of organized sport participation per season is an important risk factor for injury. This rule is also complimented by Rule 4 (see below) in which the athlete is encouraged to match practice hours with years. When playing or in this case pitching for multiple teams simultaneously and maintaining a full schedule of practices and games for multiple teams a player will easily surpass the hours per week recommendation, and the situation worsens depending on the younger the player is in relation to weekly hours.

3. Less than eight months per year: Adolescent and young athletes should not play a single sport more than eight months per year. N.A.T.A. further elaborates that these 8 months should not be in succession but divided up to minimize the risk of overuse injuries. It is recommended that the down time between seasons can be used for conditioning, establishing strength and conditioning and recovering prior to the next season. (Gould, 2023)

4. No more hours per week than age in years: Adolescent and young athletes should not

participate in organized sport and/or activity more hours per week than their age (i.e., a 12-year-old athlete should not participate in more than 12 hours per week of organized sport). A standard difficult to meet and maintain when an athlete is involved with multiple teams, with weekly or semiweekly practices and games.

5.Two days of rest per week: Adolescent and young athletes should have a minimum of two days off per week from organized training and competition. Athletes should not participate in other organized team sports, competitions, and or/training on rest and recovery days. The scheduled rest days allow for the athlete to shut the body down and recover from the week's training schedule.

6. Rest and Recovery time from organized sport participation: Adolescent and young athletes should spend time away from organized sport and/or activity at the end of each competitive season. This allows for both physical and mental recovery, promotes health and well-being, and minimizes injury risk and burnout/dropout.

7. Pre-participation physical exams (PPEs): Student-athletes are urged to undergo a physical examination prior to beginning a new sport (or prior to the start of a new sports season), in order to screen for potential risk factors, including injury history, stature, maturity, joint stability, strength and flexibility. The pre-sport physical is essential to an athlete’s health, safety and wellbeing. However, in the event the athlete has already been “specializing” it provides a Physician with an opportunity to check for potential or current overuse injuries.

The NATA recommendations follow a training style within the industry known as *Periodization*. A training method in which the athlete works through a specific training program built around a specific time frame or training approach. The two types of common training methods that can be safely followed to reduce the risk of an overuse injury are *linear, or undulating periodization.*

Linear Periodization is a workout and training plan broken down into time and training with a focus on specific blocks of training. Within Linear Periodization there are progressions within each workout's micro cycle. This type of periodization allows for progression based on individual skill level, and compliments the goal of LTAD.

Undulating Periodization functions on a high/low volume and intensity structure in which the athlete will alternate within the training cycle based on a daily,weekly,or monthly cycle. When utilized properly with the goal of LTAD, Undulating Periodization properly functions within the NATA recommendations. (Adams,2016)

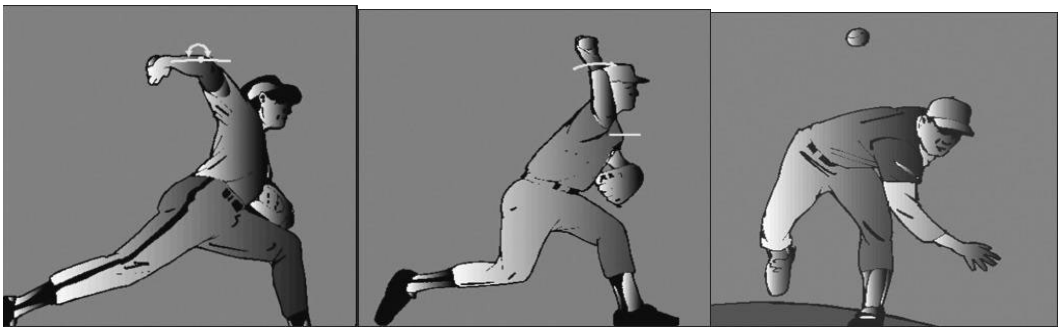
Risks and Fear of Reinjury

Kinesiophobia

Kinesiophobia is defined as an excessive irrational and debilitating fear of movement or physical activity. The fear of motion is associated with a feeling of vulnerability to injury in response to movement. (Physio-pedia,2023) The condition while being psychological in nature

can lead to a decrease in performance, refusal to return to the field of play or re-injury. Kinesiophobia can cause an athlete to alter the proper mechanics that led to the overuse injury, which can lead to poor sport technique, a previously mentioned [Figure 3] Extrinsic factor leading to injury and reinjure the recently healed pitching arm.

Kinesiophobia could lead to a pitcher who normally used the proper pitching technique from [Figures 6-8] altering or modifying the technique as a means to compensate for the injury, and in doing so, reinjuring or creating a new injury due to the technical alteration of the pitching motion.



[Figure 7] [Figure 8] [Figure 9]

Reinjury risks

In his 2019 Ted Talk, Dr. Verma discusses the re-injury risks, and long-term effects from overuse injuries stating that approximately 60% of youth athletes who obtain an overuse injury will re-injure themselves and/or suffer complications from the injury later in life. Transforming an injury that could have been avoided by proper load management [Figure 3] into a problem.

Categorization of Risk Factors for Overuse Injury	
Intrinsic Risk Factors	**Extrinsic Risk Factors**
Growth-related factors • Susceptibility of growth cartilage to repetitive stress • Adolescent growth spurt	Training workload • Rate • Intensity • Progression
Previous injury	Training and competition schedules
Previous level of conditioning	Equipment/footwear
Anatomic factors	Environment
Menstrual dysfunction	Sport technique
Psychological and developmental factors • Athlete specific	Psychological factors • Adult and peer influences

DiFiori JP, Benjamin HJ, Brenner JS, et al. Overuse injuries and burnout in youth sports: a position statement from the American Medical Society for Sports Medicine. Br J Sports Med.2014;48: 287-288.

[Figure 9]

With one of the leading causes of reinjury being both intrinsic and extrinsic social pressure. Where the athlete forces themselves to play, and in this case pitch while ignoring the pain and discomfort. This mindset can end in catastrophic overuse injuries, and significant loss in playing time due to injury.

Scientific Conclusion

The data is in and it is concise. Specialization in a sport can lead to overuse injuries. More specifically, specialization as a pitcher can cause long term damage to the athlete and their throwing arm and shoulder. One of the biggest causes of these injuries rather deliberately or inadvertently is social pressure. The extrinsic pressure placed on the specialized pitcher to win, throw harder and faster, to increase his pitch selection, improve his fastball, win games, trophies, and championships. Make the elite travel team and earn that scholarship. So, the money mom

and dad “invested” in your career provides a significant return on it.

When extrinsic social pressure is applied. Intrinsic social pressure often follows. Although one can intrinsically pressure themselves without an external motivator through fear of the above-mentioned loss of social status, position or spot on team due to injury or need for rest. The problem arises when the social pressure applied causes the athlete to ignore soreness, pain, and discomfort, serving as the body's natural alarm system and continues to throw until the minor soreness becomes a significant overuse injury.

To further elaborate, the data shows that specialized athletes are more likely to suffer an overuse injury due to the immense intrinsic and extrinsic social pressure applied within the environments in which they hone their craft where there is less opportunity for rest and recovery due to the financial pressure, elite status, and perceived peer pressure attached to being a specialized athlete. While social pressure exists in the non-specialized sports world too, the risk of an overuse injury is less likely due to the different movement patterns a multiple sport athlete is subject to

When an athlete is specializing there comes an inherent amount of social pressure. If the athlete fails to manage the social pressure accordingly a reduction in sleep, a decline in mental health and chances of an overuse injury increase significantly. The physical overuse injury happens in a chain reaction like manner, as an increase in social pressure both extrinsic and intrinsic, on the overworked and specialized pitcher can lead to poor sleep and mental health. With the lack of appropriate rest, and poor mental status the pitching form can and will break down leading to poor technique and muscular compensation due to soreness. When this poor and

improper technique is repeated an overuse injury will occur.

Even if rest and mental state are not affected by social pressure, the pitcher's immature arm is only designed to withstand a set amount of wear and tear before the shoulder, elbow, or wrist begin to show signs of wear, and the body's "alarm system" begins to tell the athlete something is wrong. This is done by a feeling of discomfort or pain when the pitcher throws. If the social state of the pitcher is one in which speaking up to the parents and coaches is not conducive, beneficial, or possible, an overuse injury will likely occur.

Based on the research conducted and provided, it can be proven that there is a direct correlation between social pressure, specialization, and overuse injuries in baseball pitchers, and if it is not properly controlled and managed through appropriate strategies to include but not limited to proper periodization, monitoring, rest, and appropriate social guidelines and boundaries. Then an overuse injury is extremely likely to occur.

Solutions to the Problem

If one is akin to following trends, they could believe that Youth Sports Specialization will only increase and is not going away. If that assumption is accurate then we are likely to see an increase in Overuse Injuries in young pitchers, if the aforementioned suggestions from N.A.T.A. and Dr. James Andrews are not followed and applied on a national level, the data and information provided support the idea that Pitcher Specialization will lead to overuse injuries.

However, medical professionals have provided concrete solutions to mitigate a

potentially growing problem. The underlying issue with preventing the problem of overuse injuries in pitchers lies within the athlete and support system (parents and coaches) following the advice of the numerous professional personnel and medical experts. Until the athlete learns how to control intrinsic social pressures and resist the extrinsic social pressures the problem will only seemingly increase on a nationwide scale. A problem that could be controlled with self-regulation. So, what is the solution?

A Plausible Solution

The Solution to preventing overuse injuries caused by specialization in pitchers would be education and enforcement. If leagues would educate parents and coaches on the dangers of specialization, and overuse injuries, and apply strict enforcement to a pitch count and appropriate rest we could hope to see overuse injuries decrease.

The contrary factor to that issue is the multiple baseball leagues in which an athlete is able to pitch in simultaneously, which is a direct contradiction to the recommendations of Dr Andrews, the National Athletic Trainers Association. (N.A.T.A.) Each enforcing their own guidelines for pitch counts and rest and the lack of communication across the leagues could still lead to a young pitching arm being worked to the point of overuse.

In order to combat this issue, I would recommend USA Baseball to form a governing body like USA Boxing in which coaches are required to attend annual continuing education courses, and seminars. (USA Boxing,2023) As well as pitchers similar to boxers being required to carry a passbook in which innings pitched and pitch count can be logged and dated per game,

event or tournament and recorded in compliance with age-appropriate restrictions and signed by a representative official of USA Baseball. Like fighters, players would have to register with one specific team to prevent players playing across multiple leagues simultaneously and be subject to annual performance physicals. While this might not be a catch all due to pop up tournaments, rebel leagues, and travel teams showing up seemingly overnight, it could assist significantly in mitigating arm injuries due to overuse. These solutions are all based on the education/ reeducation of coaches, and parents as well as an unbiased enforcement agency such as USA Baseball stepping in to assist.

If this idea was correctly applied and enforced it would remove the extrinsic social pressure on Youth Baseball Players, especially pitchers to play on multiple teams, as well as stop coaches and parents both malicious and well-meaning from pressuring their players to pitch and play through pain and discomfort for "the good of the team", and serve as an oversight board to protect players. To combat the issue further I would like to see USA Baseball step in with "dead times" in which affiliated teams, clubs and organizations can not practice, scrimmage, or play games up to the equivalent of four months divided into 2 month intervals throughout the calendar year. This would ensure that athletes, especially youth pitchers have a sufficient opportunity to rest their arms and recover from the rigors of the season.

I would like to challenge the National Collegiate Athletics Association (NCAA), as well as Major League Baseball (MLB), and the Major League Baseball Players Association (MLBPA) to become an active voice, in the prevention of baseball specialization specifically with Youth Baseball Pitchers. This could be done with the proper education of coaches, parents and athletes conducted by leagues, and qualified officials. The data and information could be

passed in such a manner, of comparing the average Major League Baseball Pitchers (world class athletes) training schedule to that of a specialized pitcher as an example of proper periodization, versus overuse.

Instead of Specialization in sport I believe the approach of Long-Term Athletic Development (LTAD) should be taken, with age appropriate motor skills, and sport specific skills being the primary focus of the season. A shift in approach to LTAD from specialization. According to the National Strength and Conditioning Association (NSCA), LTAD, is a youth-centered approach to physical activity and development. LTAD is focused on meeting the needs of children at any developmental level to promote fun, positive sports and fitness experiences which in turn help set the foundation for a lifetime commitment to healthy activities. (NSCA,2023) By taking an active transition from a specialization focused sports environment to one focused on long term athletic development. One can set a youth athlete up for a healthier life, post sports without the risk of long-term life altering injuries, or resentment of sports, and family.

Glossary of Key Terms

Acute Injuries- Injuries that occur due to trauma or force.

Deliberate Practice- A type of practice in which the athlete is training deliberately in sport specific methods. A practice in which everything is structured and rigorous with a specific goal in mind to improve a set of skills or abilities to further improve on the chosen specialization.

Domain specificity- A theoretical position in cognitive science (especially modern cognitive development) that argues that many aspects of cognition are supported by specialized, presumably evolutionarily specified, learning devices, within the chosen domain of sport.

Extrinsic Social Pressure- The outside sources of social pressure applied on the athlete to succeed.

Intrinsic Social Pressure- A pressure that an athlete places upon themselves to succeed.

Load Management-Load management is defined as the deliberate temporary reduction of external physiological stressors intended to facilitate global improvements in athlete wellness and performance while preserving musculoskeletal and metabolic health.

Long Term Athletic Development- An athlete centered approach focused on meeting the needs of children at any developmental level to promote fun, positive sports and fitness experiences which in turn help set the foundation for a lifetime commitment to healthy activities.

Macrocycles- A seasonal training cycle within a periodization schedule.

Mesocycles- A 4-to-6-week training cycle within a periodization schedule.

Microcycles- A 2-to-3-day training cycle within a periodization schedule

Multi-Sport Athlete- An athlete that rotates to various sports, often depending on seasonal changes.

Overuse injury -An injury that occurs when tissue, tendon, bone, ligament or joint is damaged due to repetitive demand over a period.

Periodization-Periodization is a cyclical method of planning and managing athletic or physical training and involves progressive cycling of various aspects of a training.

Physically Healthy- no long term or short-term injuries formed or caused by overuse due to sports specialization.

Social Pressure -The influence that is exerted on a person or group by themselves or another person or group.

Specialization- participating in a single sport for more than 8 months or 66% of the calendar year and quitting all other sports.

Ulnar Collateral Ligament (UCL)- A ligament that runs on the inner side of the elbow to help support it when performing certain motions, such as throwing.

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