Working title (previously skateboarding kinesiology): Another radical pain graph (RPG) approach to combining numerical descriptions with short form textual summaries of bodily ailments arising from learning skateboard tricks

David Leifer

05/29/2024

dissertation

ABSTRACT

Skateboarders have a negative perception for a variety of reasons. Between trespassing for skate spots, soft narcotic usage, or disorderly conduct, casual fans might be intimidated in beginning skateboarding. With great exercise comes great responsibility and here is an attempt at chronicling a several months long experience learning basic skateboarding tricks. The introduction section includes a summary of the participant's physiological history by first reviewing participation in youth athletics and continuing through more organized groups. Prior body weight composition is also included for background on the development of the cardiovascular and muscular systems. Exercise and mental health is reviewed during the ten years of higher education, graduate school, and early career. Also included are references to the history of skateboarding, an exercise history of the participant, ollie progression images, video game development outline, and a summary of a hyper vigilantly recorded exercise regimen for rehabilitation. The intent of this individual review is to record the series of steps for future participants to avoid identical mistakes.

INTRODUCTION

Several paragraphs are devoted to the history of skateboarding as told by internet documentaries, first hand accounts, and educated guesses as to the origins of the sport as they happened concurrently with political and sociological trends in the United States (U.S.). The traditional authoritative former military turned security guard versus the elitist skateboarder is a cliche yet merits inclusion to illuminate this inland small city reviewer's preconceptions towards the sport's primarily U.S. coastal origins. An overview of the subject's medical history for a deeper understanding of the body's reaction to the vigorous stress of skateboarding since even introductory movements in the sport present a significant challenge to moderately conditioned people. Several sports were played between the ages of 5 and 12 with a concentration on learning mental discipline through martial arts as opposed to youth contact football. The smaller class sizes were hoped to lead to increased direction during a time in which irreparable harm might occur in growing children participating in contact sports.

Body weight, height, and activities are also estimated during later stages of puberty when freetime led to a concentration on athletics. College, graduate school, and early career exercise habits are summarized wherein body weight and ability seems to be connected to the use and non-use of antipsychotic medication. Another summary previews the remaining background

section which reviews the articles cited for scientific support. The methods display several tables about pain and calorie intake with associated counter measure activities described within included paragraphs. The results section includes ollie progression images and are used to dissect the form of stationary and moving ollies. This section also details an outline of the free and open source (FOSS) video game development technologies available for those curious in spending several hundred hours crafting a skateboarding game. The conclusion section reviews the material described with additional closing remarks.

Summarization of skateboarding history

With the proliferation of plastic technology came the desire to create improved roller skating wheels. As told by a local 1970's skater, wheels were made from metal before polyurethane wheels were disseminated throughout the country to support roller skating. It is difficult to find the first original invention of the skateboard as there seems to be many people that had a similar idea at the same time in heating inexpensive plastics to form wheels. The wheels were then attached to boards and used to surf hills on land similar to surfing waves in the ocean before modern skateboarding slowly evolved from the empty pools of southern California. Having an excuse to carry a shield and weapon in major cities as undersized people was effective to guard against feral dogs and other attacks.

Stage name and identity cloaking methods through makeup originated through the 70s and 90s liberal arts school skateboarders to avoid authoritative confrontations and retain the ability to secure employment. Police in general viewed skaters as they arose during the 1970s southern California as high school and college aged nerdowells working part time jobs as lifeguards before becoming unemployed skaters during the drought when pools were drained to save water. It is surmised that the lack of immediate humidity around these homes in the dry desert air from the drained pools led to an increase in dry skin caused by a buildup of static electricity. Unbeknownst to the general populace in the rapidly expanding Los Angeles suburbs, the new attitudes of pubescent teenagers clashed with aggravated full time working adults suffering under the same conditions and disguises were necessary to avoid retribution from veterans perturbed by the similar sound of ollies to gunshots.

Further efforts to conserve water emerged as pool covers were used to collect evaporated moisture. The drought ceased after two years from oscillating El Nino and La Nina climate patterns and the pools refilled. Trespassing frequency increased in search of houses that were both for sale and had pools or properties whose owners were out of town. Loud late night parties featuring belligerently intoxicated youths ensued and upset everyone. Veterans effectively indoctrinated into military service through patriotism experienced post-traumatic stress disorder (PTSD) and were upset upon return to the United States that people were indifferent. The most loudest and unaware were most college attendees who had also been indoctrinated into anti-war pacifism using nearly identical sociological marketing schemes. Instead of being rewarded as

heros like their parent's generation had after returning from World War II, veterans experienced snide remarks from people born into a different socio-economic class.

As United States manufacturing jobs disappeared to the very continent veterans had spent years fighting, they were also unable to secure the newly minted office jobs because they were unqualified. Campus in general for a newly discharged 23-27 year old attending college on the GI Bill was a foreign experience to the clockwork 0500-2200 army life in which every movement is carefully coordinated by officers. They had to patiently endure the 18-23 demographic and in all likelihood their highschool sweethearts were probably spouting half absorbed feminist ideals that were the opposite of U.S. social norms prevalent throughout the 1950's and early 1960's. Other traditionally masculine forms of media were implicitly exploiting these attitudes to sell products and a misled nationalistic attitude emerged.

Affordable newly inhabited apartments near campus for the former working class veterans would also contain roccous new forms of loud electric guitar. Isolated alcoholism emerged within this group to cope with the stress of no sleep and little connection with their socially immature classmates leading to low scores and dropouts. Academia and the government attempted to curtail the issues by investing in satellite schools in smaller cities but the lack of prestige and no access to expensive modern scientific facilities found at major public universities rendered the new graduates as unemployed and working the same service industry jobs as they would have without attending universities. Even worse of an outcome was they blamed academics for wasting four years of their life and continued to act unstable. Having not grown up with the now widely consumed cannabis and hallucinogens, taking these substances in heroic doses as they would with alcohol to find solitude with other school enrollees initiated psychotic like episodes. Many of these people were unemployed and wound up as police or security guards since both of these tasks are difficult and have staffing issues because of the unhealthy lifestyle and daily corralling of inebriated adults.

Construction workers began building skateparks in destitute corners of the urban landscape to keep noise from intruding upon more respectable and expensive parts of the city suburbs. These skateparks were often made by nonskaters with no account of the radical physics in skateboarding. The sport is an advanced movement and beginners bombing ten foot half pipes made from cement broke several limbs, starting lawsuits against the privately run parks until they were no longer economically viable. After the skateparks closed the skaters took over random dilapidated public city structures until gentrification occurred in the early 2000's and the newly militarized police force baited them into committing random acts of aggression wherein they lost employment and became estranged from friends or family and had to move elsewhere.

The initial othering of skateboard participants during the early origins led many in the 1980's onward into choosing either a Letterman jacket and the 1970's style of sport or the now commercialized punk rock aesthetic adjacent to skateboarders. Video games like Mario for the late 1980's Nintendo Entertainment System (NES) are loosely derived from skateboarding without explicitly risking the commercial appeal of the game with the untested popularity of skateboarding. Skateboarding duality is best represented by the perception of vert and street

skaters in the X-Games in the late 1990's with jocks who lived in larger cities near correctly built vert ramps and the prototypical anarchy idealist who lacked access to facilities and made former manufacturing abandoned warehouses and school yards the home of their skate practice. Both groups of people were typically more wealthy and affluent to afford the unemployment and 10 hour days for several years needed to get proficient enough to land a board sponsorship.

Commercial appeal peaked in the early 2000's when skaters and non-skaters flocked to skate parks in search of entertainment similar to popular television shows like Jackass and Ridiculousness and video games like Tony Hawk Pro Skater and the Skate series. The race to get good enough for a board sponsorship debilitated several participants who progressed through the sport too quickly without learning the fundamentals. People who could barely ollie straight over curbs were jumping off 10 stairs dozens of times to get footage not realizing that skaters that could pull these stunts were already established vert skaters that were in an area without access to an indoor skatepark. The advent of internet money on video websites proliferated face swapping computer vision and was one of several final nails in the coffin of skateboarding as a popular sport. Why risk a limb getting footage when a multidimensional mathematical approach earns more money, ignoring the purpose of the sport in the first place which was alleviating boredom and developing coordination to find outlets for pent up energy.

The added attention provided for a backdrop of the development of the negative ideas towards skateboarding while lone wolves from the group of new participants grew up with the view that they could do nearly anything without fear of consequence. The loners believed they could stealth their way using the aforementioned disguises and were justified because they were being hassled by mall security but ultimately assisted the decline in popularity of the sport. There were also trolls that would destroy spots frequented by skaters and blame them in retribution for some over compensating mental problem. By the early 2010's many people who grew up skating had retired to longboard cruising which eventually fell out of fashion by 2015 onward. The decommercialization actually benefits amateurs who can now find rarely inhabited skateparks to practice unencumbered. Learning muscle coordination and anatomy while attempting to alleviate muscle soreness with stretches is a good lesson the sport still has to offer students.

Early adolescence exercise and body composition

The subject participated in several activities from ages 5-12 including a summer local baseball league, flag football, and American karate. Martial arts instruction attempts to instill discipline while enjoying yourself getting beat up. Not losing your temper is challenging because of the awkward falls and injuries while being pestered by mall security. Soccer was also played for several years from ages 5-8 and contributed to developing basic motor coordination function along with the aforementioned parks and recreation sports, school recess, and physical education. The right clavicle from the subject's point of view was broken after a jungle gym flip at age 7. Henceforth anatomical references using left or right direction are from the point of view of the study's participant.

Athletics continued in middle and high school from ages 13-18 participating in American football, powerlifting, and track and field shot put and discus. Body composition is encapsulated by the person's body weight and rough estimates of powerlifting numbers. From ages 13 to 14 body weight increased from 165 to 190 and gained several inches in height. A basement based olympic style 45 pound barbell and bench with 300 pounds of free weights contributed to learning proper technique. An offseason regiment of squatting every other day three times a week while bench pressing every other day twice a week at minimal weight for several months helped build muscle coordination while increasing height and weight. Quality checks for form were performed by the participant's father frequently in the first few months in an effort to prevent catastrophic injury then sporadically as muscle memory improved. By the last months of middle school the squat had increased to 5X5 at 300 pounds and the bench press one repetition maximum exertion was around 160 pounds.

Puberty exercise and body composition

A summer training program at the high school was attended from ages 14 until 17 which concentrated on an hour of plyometrics followed by an hour of olympic style lifts. Body weight increased to 195 pounds and 71.5 inches tall (5'11") and bench press increased to 185. During powerlifting at age 14 the maximum squat increased to 405 with an old powerlifting suit and knee wraps. Juggling three balls was practiced to relative proficiency while four balls was learned to a beginners ability. Shot put increased in weight from 8 to 12 pounds and a personal best distance increased to 41 feet while the discus also increased in size and weight and maxed out at 110 feet. One year later a longboard was purchased but irregularly ridden. During the summer at age 16 an exercise program was followed at a physical therapy branch from the hospital concentrating on building balance and correcting emerging muscle imbalances. From ages 15 until 16 body weight increased to 215 and 235 pounds respectively with maximum squat increasing from 485 to 605 pounds. Shot put distance went from 46 to 54 feet while the discus increased to ~120 feet. Three weeks of physical therapy and several sessions of chiropractic adjustments during this time along with rest and recovery helped mitigate back pain.

From ages 16-17 body composition shrunk to 205 pounds with the loss of body fat while retaining overall muscular frame with nearly equivalent one repetition maximum exerted forces in powerlifting and track and field throws. Both of these sports mimic the boredom feel of skateboarding with several people sitting around for a few minutes between activities. Endurance to play two ways in football was the primary reason for this body composition change. The 40 yard dash as measured by an unofficial combine was 4.95 with approximately 16 repetitions at 185 bench press with terrible form. A grade one lateral ankle sprain occured as a 17 year old football player.

Higher education exercise and body composition

Although several D1-AA coaches were interested in walk-on or partial scholarships in the northern great plains states, his athletic numbers were not professional. As a 17 year old he socially and infrequently enjoyed a marrijuana cigarette. With high test scores but mediocre grades he attended a regionally based division three satelite college affiliated with the flagship public university. Regular consumption of cannabis occured from 18-20 with infrequent alcohol use and a handful of acid and mushroom trips. Football was played from 18-20 and body composition increased from 205 to 255 before nearly the entirety of his class exited the football program caused in part by excessive news coverage of chronic traumatic encephalopathy (CTE). The 18-24 college demographic are usually oblivious to current events however the massive proliferation of smartphones delivering social media derived news shoved these related topics into the hands of people unaccustomed to continual computer access and the 24 hour news cycle. The head coach said in the weeks leading up to this exodus that the subject would continue to play offensive line on the scout team for the remainder of the two years thus inciting a permanent departure from organized athletics.

Post-football life led to losing 30 pounds within half a year. Halting cannabis use for several months as a 20 year old led to weekly alcoholic binging before continuing smoking nearly every day until age 22 when intoxicant usage became less frequent. Rugby was played from 21 until 23 and weight dropped from 205 pounds to 180 pounds over a summer while longboarding five miles a day to work, lifting regularly, and having almost no money for food. The subject's left acromioclavicular (AC) joint suffered a grade 1 sprain after falling from an ill-begotten elastic bamboo wooden longboard traveling 30 miles an hour down a moderately sloped hill. The fall occured as the board's bamboo elasticity sprang slightly while at the penultimate bump near the bottom. A more rigid board with precision trucks was purchased for continued transportation and downhill enjoyment.

Post-higher education exercise and body composition

As a newly graduated 23 year old the study participant moved in with their parents. Between artificially generated internet nightmare fuel and local security guards wearing the same three dimensional printed masks, it felt like people were following the subject and a three week stay in a psychiatric facility led to four years of antipsychotic usage where body weight increased to 230 pounds and several muscles atrophied while doing minimal exercising.

Body weight decreased to 217 while working an office job from 27-28 before ballooning back up to 230 after moving and changing jobs several times. The paper's participant had acquired several hundred hours pushing a bamboo longboard and more rigid downhill longboard from ages 22-23. A cruiser was also built using the retired bamboo longboard's trucks and wheels and a cheap skateboard deck. While in graduate school, the cruiser was used primarily for transportation and only a few dozen hours of usage were logged. After leaving his job because of more automated internet clown shenanigans, he again moved back with his parents from ages 29-31. As a 29 and 30 year old, several dozen hours were logged pushing and sliding down steep

inclines. Additionally several hundred miles of running were logged. The summer as a 30 year old the participant added lifting weights twice a week and running middle distance to get to a body weight of 215, followed by 205 through several months of learning skateboarding tricks at 31.

The remaining sections of this paper will summarize the peer-reviewed medical articles in the background section and outline the anatomical muscular strengths and weaknesses discovered while learning skateboarding tricks in the methods. The results and discussion sections include still images displaying good and bad form while performing basic skateboarding tricks in an attempt to improve technique. A history of skateboarding adjacent video games is also provided along with the outline for developing a game using FOSS. Continuing education for ways to improve the process of skating is located in the same section and final summaries of lessons learned can be found in the conclusions.

BACKGROUND

What strikes this layperson of anatomy and kinesiology most is the increased risk for bodily injury while starting a new sport like skateboarding. The most obvious injuries are random bone breaks from progressing difficulty of tricks too rapidly but it was more of a curiosity to see if the fundamental motions of skateboarding would lead to long term bodily impairment. One such search for information revealed information on the Newton forces generated from falls of various heights conducted by researchers at Ohio University. Their study examined gymnastic participants and a non gymnastic control group to compare the Newton force on the legs for drop landings from various heights. They found that gymnasts experience more Newton force because they land with stiff or minimal flexion of the lower extremity joints to acquire more points within the sport as compared with non-gymnasts performing the same study's measurements. The article implies that muscle memory of gymnasts land in a more rigid condition and would have greater risk for lower body injuries but the paper's inclusion in this review is to summarize the physics force of landing (1). Immediate damage to cartilage because of physiological activities was studied in vivo using magnetic resonance imaging to measure deformation as performed by Austrian and German researchers. The study supports evidence that cartilage regains voluminous form within 90 minutes of physical activity and that reduced loads because of immobilization from activities such as surgery are associated with cartilage atrophy. Excessive exercise is not associated with thicker cartilage mass (14).

Another relevant concern for more permanent bodily injury from skateboarding is the assessment of various environmental effects on body compositions as it impacts joint inflammation. The two primary sources of joint swelling are osteoarthritis which is breakdown of cartilage from decades of usage commonly found in the elderly and rheumatoid arthritis where the immune system attacks its own cartilage. Both of these primary forms of arthritis are related to genetics and environmental factors. One Chinese study that examined 12,000 people over 16 years found an association of tap water drinkers with more healthy cartilage than well, surface,

or spring sources which implies that ease of access and employees dedicated to sanitation would increase clean water consumption by the healthy cohort (2). The information coding of well water seems ambiguous as a well water station might draw water from mechanical pumping lowering the difficulty of acquisition.

Building from this information is a study conducted by the United Kingdom Universities of Birmingham and Aberdeen that examined the water content of in vitro bovine cartilage concluding that more hydrated bones had less stiff cartilage and would probably have less joint related issues (3). Hellenic Mediterranean University and University of West Attica researchers found that many endurance athletes lack salt from overhydration and low sodium diets commonly known as hyponatremia (4). It is applicable to skateboarding because low body weight skaters might eat low sodium diets while lacking the ability to stay properly hydrated, leading to prematurely damaged cartilage. Body composition in adolescent sports participants were examined and found that obese children suffered fewer injuries (5). One possible explanation is that excess fat provides cushioning between blows in uncoordinated and rapidly growing limbs in children experiencing puberty. Someone new to skateboarding would have similar awkward falls for several months from a lack of coordination maneuvering the board and it would follow that additional padding would reduce the chances of significant injury. Long term effects would include bad eating habits leading to adulthood obesity and health complications like diabetes, hypertension, and increased risk for heart attack, stroke, and early death raising taxes to support the medical bills. Guidance to fluid replacement is summarized by the American College of Sports Medicine (12) wherein customized pre-hydration rates before exercise were developed for the variable sweating loss of the participant. The goal for hydration during longer activities is to prevent greater than 2% body weight loss from water expenditure.

Additional injury prevention strategies include improvements to muscular tissue through increasing muscle mass which appears to lead to less bodily injuries in a study by University of California Davis. They examined loss of muscle strength as it relates to increased injury rate in the elderly with the general idea being that thicker muscles absorb and pass more Newton force than atrophied muscles (7). Although skateboarding is a primarily lower body sport, muscle coordination and development of the upper body muscles is deemed necessary for balance by kinesiologist researchers in Germany and Slovenia who measured a group of participant's balance with hands on thighs, outstretched, and flailing about. The outstretched and flailing arms contributed more to balance than hands on thighs (6).

Researchers also looked at the accumulation of muscular fibrosis in animals subjected to performing repetitive usage and attempts to minimize the scarring through stretching and resting versus resting alone. Injury risk seems to increase without breaks from repetitive absorption of Newtonian forces. They found that small amounts of physical stretching and avoiding the activity that tore the muscles could reduce fibrosis when compared with resting alone (8). A comprehensive review of the physiological processes involved in skeletal muscle tissue fibrosis and the efforts to reduce existing damage is available in the National Library of Medicine government website as conducted by researchers at Duke University. Several of these are not

approved for usage outside of trials because of the probability for misuse (9). The only muscle that cannot regenerate itself is the heart and there is significant potential for abusing STEM cells in a quest for immortality. Scientists at the University of Cincinnati and Western Michigan examined similar novel approaches (0).

Other studies reviewed for this paper include a small sample of high arch footed sprinters being faster than low arch sprinters (15). There are several theories hypothesized by this writer as to the cause of this observation such as an increased tolerance for pain from intense exercise measured by the vector of narrower shoes morphing feet. Since the study is not a longitudinal examination of the sprinter's foot morphology before, during, and after the inclusion of intense track and field exercise, it is difficult to draw meaningful conclusions from the paper. Soft narcotic use in the form of cannabis is perceived to occur in the sport of skateboarding and a paper from the 1970's was reviewed that studied THC as a histamine antagonist in animal cells (16). It implies that cannabis works to reduce inflammation. This was surprising since it was assumed that consuming the flower portion of the cannabis plant containing concentrated amounts of THC would elicit a histamine response in the form of an allergic reaction. Histamine in general increases fluid to the areas where the alergin is detected to deliver required nutrients to dispel the foreign substance and could possibly increase bodily padding from fluid retention. It is also possible that couch lock or consuming weed and not moving for several hours while alleviating dry mouth from smoking and increasing the study's hydration levels are the cause of the antihistamine properties.

METHODS

Study period and board setups

The participant learned stationary skateboarding tricks in a basement in western Wisconsin from January 21st, 2024 through May 30th, 2024 and will serve as the study period. More time was spent outside during April and May learning tricks while moving in accordance with moderate temperature and precipitation weather patterns commonly found throughout inland mid-latitude North American climates. Hours were estimated in a Google Sheet, a popular tabular data entry application. From January through March 15th, the exclusive employment of a reused longboarding reverse kingpin truck and 59 millimeter diameter 85a durometer polyurethane double width wheels designed for moderate speed sliding was attached to an inexpensive 8.25 inch width skateboarding deck whose tail had been manually chiseled and sanded down an inch to minimize the random kick from a damaged tail. This board will hereafter be referred to as a cruiser. In the middle of March, the longboarding trucks were replaced with equally tall skateboarding kingpin trucks for more effective practice. By April 25th another skateboard was built through internet shopping including standard 52 millimeter 99a durometer wheels, 7.75 skateboard deck, and appropriately sized skateboard trucks. The deck was further modified to move the front trucks back several millimeters for an increased front nose length. The included

middle cone bushings and bottom washers were replaced with a manually split cylindrical longboarding bushing and improved washer for increased hardness and less board directional stick when landing ollies.

Between 2009-2024 it is estimated that a longboard had been pushed by the participant 301.25 hours regular stanced and 215.25 hours switch stanced. Longboard slides include 48 hours regular practice and 3 hours switch at moderate rates of speed. From the time periods of 2015-2016 and 2024 it is estimated that 54.25 hours have been spent learning skateboarding tricks regular stanced and 16.75 hours have been spent switch stanced. Approximately a dozen hours had been spent in 2015 and 2016 learning the shuvit, ollie, and kickflip to minimal success.

Regular stanced heel and tail slide had accumulated over 20 hours each while switch stanced heel slide and tail slide had accumulated one and eight hours respectively. The participant is unable to heel slide regular or switch with the slide glove on the ground but can only tail slide with the slide glove down. About one hour had been spent on learning regular manuals combining 2016 with 2024 practice totals. Minimal time has been spent on switch manuals. Once the weather improved in early April, skateboarding outside commenced which included regular and switch hippie jumps and hippie 180 jumps totalling 2 and 1 hours respectively while regular and switch frontside 180 revertesque movements totaled 2 and 1 hours. The end of March saw the addition of learning stationary frontside and backside 180s regular stanced totalling 6.25 and 2.25 hours. It is estimated that 4 hours have been spent attempting to regular stanced kickflip but success has thus far proved elusive.

Bodily annoyances

Through the inclusion of a well lighted mirror in the participant's home, it was discovered that several sites of acne and scalpel hair loss were induced by either static electricity induced dry skin or poor skin moisturizing and itching with a bacteria laden hand. This is relevant to the discussion of skateboarding kinematics since small cutaneous injuries hurt in an exaggerated fashion when falling. At the macroscale, constant itching of dry skin might serve as a distraction to the skateboarding participant while initiating an unnecessary immune response at the microscopic level. The idea of cleaning and moisturizing severely dry cutaneous skin at joints where pain has become an issue is evidenced by the reduction of pain in the anterior tibia and fibula regions of the skater's leg. The anecdotal evidence might have tangentially related causes such as stretching and reducing the workload toward the middle of the skateboarding trick experiment but is supported by how muscular fiber i-band lengthens and shortens as nerve fibers contract with the transmission of electricity across nerve endings similar to electrical or communication lines buried underground or underwater that have faster transmission rates because of lower loss of electrical connection. Salt water is a good conductor of electricity compared to water without other elements and the theory for moisturized skin would direct the flow of electrical current more effectively than dry skin with salt water from sweat. This effect is

an untested or researched hypothesis but the directly observed benefit is that moisturized skin typically scars less after subcutaneous injury (17).

The idea of minute detail attention harkens back to other hyper-specific athletic participants such as basketball three-point shooters, american football placekickers, and penalty shootouts in hockey and soccer. Late timeouts, theatrical injuries, and intoxicated spectators are employed as psychological weapons in an attempt to derail concentration. Coaches attempt to mitigate these issues by recreating the environment in practice with auditory speakers. Specifically related to skateboarding, the loud pop of a skateboard might startle and otherwise break the intense concentration necessary to perform the desired aerial acrobatics. Practicing the jumping motion of the gymnastics-like movement with the inclusion of breaking small sticks serves as an auditory and visual que in building muscle memory to perform the desired function. Potential downside to auditory practice and skateboarding in general is the loudness. Ways to mitigate the negative auditory sociological effects of skateboarding would be to geographically position practice sessions close to either construction sites or highways although airborne pollution would most likely damage the lungs and reduce enjoyment.

Injuries and rehabilitation

Near the end of the fourth week of April an errant no-comply kicked the board nose into the medial section of the patellar tendon which turned brownish and was thought to cause severe knee pain for two weeks. Such an injury is inconsequential in normal functioning however it severely limited skateboard practice. The bruise is reminiscent of playing fullback from 13-15 when a helmet would bruise the knee in the same spot while somehow missing the cumbersome knee pads. Investigation included Osgood-Schlatter disease that causes a painful lump below the kneecap while children are experiencing growth spurts though this diagnosis is doubtful as tibial tuberosity is identical on both legs and pain is on the bruise to the subject's right of the patellar tendon. The subject previously reported knee pain while exercising several years prior. As the bruise healed and the femoropatellar issue persisted, other diagnoses to the origin of pain were examined.

The first attempt to mediate the issue included nerve flossing or stretching (Figure 1) the leg muscles to reduce inflamed muscles surrounding the peroneal nerve that runs from the top of the foot up the front of the shin and laterally around the back of the knee (8).

Nerve	Tension Test	Provider Treatment	Patient Home Care
Sciatic	Tension Test	Nerve Floss	Self Floss
Femoral	Tension Test	Nerve Floss	Self Floss
Peroneal	Tension Test	Nerve Floss	Self Floss

Figure 1: Flossing tests and stretches to reduce knee pain. The graphic was produced by a chiropractic doctor's blog and is one of the top 20 Google search results for the term ‘sciatic nerve flossing’.

This helped immediately in reducing pain while walking and jumping but skateboarding proved tremendously difficult. The aforementioned football lateral ankle sprain might have been another source of the issue and was subsequently moisturized and stretched. Another injury that was investigated was the AC sprain whose surgery the doctors and participant elected to skip because of long recovery time and the probability that the same injury was likely to reoccur because of lifestyle choices. Since the raised acromion would lower the scapula muscle dropping the serratus anterior and posterior into the abdominal obliques and hip adductors, it stood to reason that this might effect kinematic function of walking and running gait during exhaustion when respiratory and circulatory systems began to fail to deliver adequate oxygen to the skeletal-muscle tissue to hold symmetrical posture. Taping the shoulder in place helped stabilize the arm and torso movements while returning to skateboarding but afterwards the shoulder hurt which made the practice ineffective and not viable for continuation.

Film of professional skateboarders and the participant were reviewed to examine moving ollies and see if the sport itself was to blame or the user. Moving jumps progressed higher and awkward landing frequencies increased as the participant became more exhausted from the two hour sessions. Since purposely hyperextending knees in an exaggerated motion similar to the caved stiff lower knee landings resulted in similar right knee nerve firings as the pain described in the injured left knee, it is agreeable that overexerted ollie lands were part of the issue though the source of the pain was still a mystery. Wildly swinging the arms for balance while overtired would contribute to pulling muscles attached to the left knee and is partially responsible for normal movements (6). Skateboarding switch is effective in mitigating overuse from the left leg however it was thought that a broken clavicle from adolescence would lead to identical problems

on the right knee besides increased risk of trauma to the exposed appendix and other internal organs. It is tempting to progress through the sport quickly but the chances of muscular damage increases. Professional skateboarders are impressive because they devoted several thousand 10 hour days eating, stretching, and skating all without causing permanent muscle damage by attempting a trick outside of their abilities.

Additional thought was placed on the origins of the left knee pain when it occurred to the participant that the knee pain had started while consuming tobacco and alcohol frequently to cope with working 8 hour night shifts as a hospital janitor and contracting as a software developer. These self medication methods are unhealthy for a variety of reasons but the main takeaway is that substance use contributes to inflammation. The combined stresses of the two physical and mental jobs along with inflammation from substance use means that skateboarding was not the original cause. The knee pain subsided after cessation of intense work but progression of distance running over three months to 15 miles reinitiated the pain shortly thereafter, indicative of overuse. Although the two issues of AC joint and motor coordination while tired don't help, it was not the original source of the knee pain.

Injuries and rehabilitation for hip snap

Once the knee pain subsided, the next bodily part that seemed to be anomalous to regular function was a snapping internal hip band on the same left leg as the left knee pain. This issue has been occurring since the subject's high school years and might be related to the intermittent right lower back pain, though they were not a debilitating barrier to athletic performance. The two common hip snap causes are internal with the iliopsoas (IP) and external with the iliotibial (IT) band. It was hypothesized that the IP band was causing painless hip snaps over the iliopectineal of the lower pelvis while doing excessively elevated knee and external hip rotations during repeated ultra high ollies with an extremely heavy skateboard. Through the Thomas Test the left psoas was found to be less flexible than the right, lending evidence to an inflamed IP and left lateral pelvic tilt which indicates asymmetrical hips where the left hip is higher than the right. Stretching the entirety of the hip flexor seemed to reduce the issue. Since the participant was a highschool football place kicker overloading the left hip to kick right footed along with pushing a longboard for significant hours with body weight on the left leg, the snap was tested. The opposite left foot was used to perform 20 moderate rugby punts where there was no hip snapping immediately afterward by testing a high raised left knee but 15 harder left punts resulted in more frequent snapping. The right hip also snaps after an identical moderate and hard kick series and excessively high externally rotated knee raises.

It was then thought to increase left leg motor coordination and flexibility by kicking tennis and rugby balls and also by pushing the skateboard switch with body weight concentrated on the right hip. Lack of motor coordination is especially apparent when attempting to learn the kickflip with severely inconsistent left footed board striking. Medial right heel pain occurs after excessive walking, running, or standing and is a result of externally rotating and flattening the

right foot while tired. Without conscious thought, the patient casually stands with weight loaded onto the left foot and with a slightly ducked left foot which is what led to this conclusion and fits with the unbalanced muscle theory derived from pushing mainly regular for several hundred hours. Another hypothesis is that driving for an extended period with the right foot rotated to switch from gas to brake while commuting to work and driving around larger cities exploring for several hours a week from 2017-2022 possibly contributed but it is a difficult theory to test and it is much more likely that exercise related muscular imbalance is the cause.

More inquiries found that flexing the glutes and lower back reduced hip snapping. It was then thought that there was left glute atrophy and overdevelopment of the left tensor fascia latae and left vastus lateralis of the quadricep from running but not lifting during the pandemic. Two years of minimal activity from antipsychotic use also contributed to the muscle reduction. Delving further into the anatomical processes involved, the muscles attached to the left pelvis have become elastic to their limit and are unable to easily keep their correct physiological positioning while maintaining left footed ground contact because the left hip is slightly raised. The additional stress from athletic overuse tightens the strained muscles and they are unable to remain upright which causes left IT or IP hip snap as the left knee rises higher than 90 degrees and externally rotates (6). The same hip snap occurs on the right leg when the top of the pelvis dips backwards to gain hyper vertical knee elevation. Hip snap in general is probably a lack of motor coordination whereby overusing the knee inflamed the left muscles and right multifidus on the lower back. The left quad, adductors, and calf are more strong and flexible from the excessive 2024 ollies and the newly built muscles are not yet motor coordinated (6). The lack of coordination is evidenced by the mistriking of the rugby ball toward the ankle on the foot, occasionally double kicking the ball off the toe.

Still a third theory arose as the cause of the hip snapping as evidenced by recollection of the process in high school. The right side of the lower lumbar spinae muscles compressed slightly from overloading the right leg during heavy powerlifting squats as a teenager and overdeveloped the left quadriceps and right gluteus maximus. A common failure part is transferring the squat from hamstrings and glutes to the quadricep half way through the motion. Slightly overloading the right leg at this point decreases arched lower back and square shoulders while using the left abductors and right glutes. Pushing longboard 75% of the time for several years further contributed to the muscle imbalance as did falling and lacerating or bruising the left glutes during downhill longboarding potentially causing muscular fibrosis (0, 9, 11, 13).

Another possible contributing factor was sitting on the left glute while working a 9-5 job for almost a decade due to the outstretched right arm using the mouse. The elevated AC joint further compounds this left glute sitting position by influencing the instinctual desire to stabilize the left arm position. From this muscle imbalance the left IT band becomes inflamed from overuse stretching over the greater trochanter on the femur bone head. The patellar tendon then becomes aggravated and causes the knee pain issue. Paresthesia or cutting off the supply of blood to the leg to the point of numbness can hinder athletic performance (10) which may have played a role in uneven glute muscle development during four months of strength training while

working from home during the pandemic in 2020. Warming up the glutes prior to exercise seems to eliminate the hip snapping from raising the knee and lowering it. The hip doesn't snap at all when squatting which is one of the final positions of the ollie as the rear leg also raises up during the jumping motion.

Mental stamina seems to fade in and out at 5 second intervals in hyper concentration tasks as judged by the juggling of four balls and supported further by playing musical instruments. That might be a reflection of the nutrient delivery system circulating oxygen to the brain and muscles through respiration and cardiac cycles which occurs more frequently during the last third of skateboarding practice. The combination of all of these activities results in an easily aggravated IT band which then shortens further from inflammation around the femur greater trochanter. The participant laid in bed primarily on his back for several days while performing minimal hamstring and IT stretching. This reduced knee pain and he was able to return to skateboarding at his leisure. Excessive cardio exercising is the primary issue that contributes to poor form and IT band issues because of a slight leg muscle imbalance. It was recommended to strengthen the core with abdominal exercises, left glute through single leg squats, and right quad through practicing switch longboarding, skateboard tricks, and left rugby punts until the muscles are even and more identically motor coordinated. The laterally rotated right foot could also be mediated through strengthening adductors on that side.

Skateboarding trick technique

Technique review through self captured still video while learning stationary and moving ollies on the larger cruiser board occurred during February and March. More work was performed while moving around during the month of April and no video was recorded. The last week of April the participant upgraded his setup to a narrower board with symmetrical nose and tail, lighter trucks, and wheels almost half the width of the wheels used on the previous cruiser. The wider wheels polyurethane durometer is primarily intended for sliding down steep gradients at moderate speeds and this change allowed for slow mid thigh ollies before getting hurt from a combination of hastily calibrated truck bushing configuration and over-exertion. Both issues were caused by becoming giddy with excitement.

Each session lasted between 30 and 90 minutes or until ollie height decreased and form dissolved. During these first two months it was noticed that technique ability increased as muscles reacclimated to the movement during the duration of the exercise. It typically took several ollies to relearn the proper movement before ability slowly disappeared as the subject became tired. By the 5th of April stationary ollies had become routine while moving ollies were good about half of the time. At the time of writing at the end of May 2024, fast moving ollies still curve slightly to the left and are a function of foot placement, timing, and overdeveloped left abductors in terms of flexibility and strength compared to the other major leg muscle groups. There are two image sequences that are included below that highlight issues that occurred during February while learning stationary ollies. The first set is outdoors and highlights bad form in

several areas of the initial squat (*Image set 1*) while the second set of images displays poor left high knee (*Image set 2*).

Image set 1: Inward back right leg knee cave and squatting too deeply for the movement.

Image set 2: The foot is not high enough on the nose of the board at the top of the jump and overcompensates leveling out the tail of the board.

The next series of ollies displays a similar right knee cave though it is not the purpose of its inclusion (*Image set 3*). Some of these issues might be a function of poor setup through bad grip tape and an asymmetrical nose to tail ratio. Erroneously flipping the board becomes more of an issue while doing moving ollies when the board flips and the subject lands on their toes stressing the achilles tendon. It is even worse at higher speeds when the board flips into primo and the plantar fascia muscles at the bottom of the feet land on the side of the board. Wearing sole inserts while performing tricks and pushing regular and switch are essential to build muscle thickness through repetitive muscle tearing and avoiding issues like plantar fasciitis which typically stem from excessive standing, walking, and running. Practicing getting into primo and landing looks stupid but increases the skill necessary for proper board control.

Image set 3: The left foot is not dragged perpendicular to the forward direction and does not reach the tip of the nose of the board. The main issue is the front left foot is too far to the right of the truck screws causing the board to rotate clockwise slightly.

The frequency of improved stationary ollies increased from the middle of February until the participant could consistently perform the movement. An example of such an ollie is shown below from the third week of practice (*Image set 5*). A small amount of clockwise rotation occurs and this level of skill was rare during these early weeks of practice. About three weeks later another stationary ollie is viewed with excessive rear knee cave and subsequent slight board tilt (*Image set 6*). The slight board tilt might be a result of performing too frequent ollies and the form should be avoided to minimize risk of abductor injuries. More reasonable form can be found in *Image set 7* with nearly identical height as the previously examined ultra inward knee squat.

Image set 5: A solid early February ollie featuring a front foot too far toward the side of the board causing a small amount of clockwise rotation.

Image set 6: Another proficient ollie near the end of the first month, this session the subject tried inwardly caving the tailside knee for higher jumps contributing to clockwise board rotation.

Image set 7: A more reasonable attempt from around the same date. The frequency of improved form increased until the end of the study period.

The next series of images examines the ollie while in motion (*Image set 8*). The attempts at moving ollies were mostly mediocre with low jumps or rocket ollies with the nose going straight up as visualized below. The rocket ollie is indicative of a front foot positioned too far back from the nose and is a result of translating stationary ollies to moving ollies. *Image set 8* was one of the more improved ollies with good front foot to nose tip and leveling of the board. Unfortunately the ollie occurred toward the end of two hours skating when the muscles were exhausted leading to bad toe placement, externally rotating the front foot, and subsequently bringing the forward leg backwards to land. The problem of a left angled landing becomes apparent as speed increases which is consistent throughout the recorded videos.

Image set 7: The tail of the board does not level out indicating a rocket ollie.

Image set 8: A rare and more improved ollie from the first month learning tricks with the front foot externally rotating causing leftward landing.

Recording ceased around the end of March as the weather improved and the subject could now ollie with some consistency at slow speeds. This meant that ollies could now be attempted over curbs, down inclines, and over larger irregularities in paved side streets while pushing around. *Image set 9* still has several technique issues, the most glaring is the excessive depth in squatting prior to the ollie. In sports like powerlifting the glutes have to break parallel with the hip to count as a successful motion. Although several street skaters appear to be squatting that low to log high ollies, they are also positioned more forward facing and have far superior balance through practice. A more three quarter depth was employed after the two week rehabilitation by the middle of May with several successful curb and drainage cap clearances while landing a handful of ollies off curbs whose level of difficulty seems less complicated than jumping onto.

Image set 9: The inexperienced skaters squat depth is too low, overloading the forward left leg and causing balance issues with the previously described clockwise board flip.

RESULTS

After the patellar tendon on the knee became sore, several charts were developed to track the activities for the month of May. The first table included is one to track the pain induced from excessive exercise (*Table 1a*). A key in the Appendix helps understand the abbreviations used for brevity in the body parts injured (*Appendix 1*). An associated textual box was included to record the lacerations and bruises directly caused by skateboarding and is included in a paragraph below the tables. Record was also kept to track the duration and activity as a short summary and is included in parallel with the laceration paragraph. Diet and weather were logged and included below (*Table 2*).

Dat	Stm	Feet	Ankl	Caf	Kne	Qua	But	Gro	Abs	Bac	Lat	Tra	Sho	Chs	Tric	Bic	Nec	Hea
01	4	5	4	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5
02	2	5	2	5	2	2	2	2	5	5	5	5	4	5	5	5	5	5
03	3	5	3	5	3	4	4	4	5	2	4	2	2	2	2	5	2	2
04	4	5	4	5	4	5	4	5	5	4	5	4	4	2	2	5	4	4
05	4	5	5	5	4	5	5	5	5	5	5	5	5	5	4	5	4	5
06	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
07	5	5	4	5	5	4	4	5	4	5	5	4	5	5	5	5	4	4
08	5	4	5	5	5	5	4	4	5	5	5	5	5	5	5	5	4	5
09	2	4	4	4	5	5	2	5	4	4	5	2	2	4	2	5	2	4
10	4	5	4	5	4	4	4	4	5	5	5	4	4	5	4	5	4	5
11	5	5	4	5	4.5	5	5	5	5	4	5	5	5	5	5	5	4	5
12	5	5	5	5	5	5	4	5	4	5	5	5	5	5	5	5	5	5
13	4	5	5	5	4.5	5	5	5	5	5	5	5	5	5	5	5	5	5
14	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
15	4	5	5	5	4	5	4	5	4	4	4	4	5	5	5	5	4	4
16	5	5	5	5	4.5	5	5	5	5	5	5	5	5	5	5	5	5	5
17	5	5	5	5	4.75	5	4	5	5	5	5	5	5	5	5	5	5	5
18	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
19	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	4	5
20	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5
21	4	5	5	5	5	5	4	5	5	5	5	4	5	5	5	5	4	5
22	4	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5
23	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
24	4	5	5	4	5	4	4	4	2	5	4	4	5	5	5	5	2	4
25	4	5	5	4	5	5	5	5	4	4	4	4	2	4	4	4	4	4
26	5	5	5	5	5	5	5	5	5	5	5	4	4	5	4	5	4	5
27	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
28	2	5	5	5	5	4	2	2	4	4	4	4	4	5	5	4	4	4
29	4	5	5	5	5	4	2	2	5	5	4	4	5	5	5	5	5	5
30	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	5	5	5
31	5	5	5	5	5	5	5	5	2	5	4	2	4	4	5	5	4	4

Table 1a: Scale of 1-5 describing the pain or stamina the participant felt during the month of May. Five is good and one is bad.

Date	Calories	Salt	Fat	Prot	Carb	Alc
01	2800	4	4	2	3	4
02	1900	2	4	4	2	0
03	2600	2	2	2	2	4
04	1700	1	1	1	1	0
05	2400	1	1	1	1	0
06	2100	1	1	1	2	0
07	1900	1	1	1	1	0
08	2300	1	2	1	1	2
09	2100	2	1	1	1	0
10	3200	5	4	4	4	0
11	2250	4	2	2	2	2
12	2000	1	1	1	1	0
13	2000	1	2	1	1	2.67
14	2000	2	2	2	1	0
15	2000	1.5	1	1	1	0
16	2000	1	1	1	1	0
17	2000	1	1	1	1	0
18	1900	1	1	1	1	0
19	2500	3	1	1	2	0
20	2200	2	2	2	2	2.67
21	2200	1	1	1	1	0
22	2400	2	2	1	4	4
23	2400	2	4	4	2	0
24	2300	1	1	1	1	0
25	2200	2	2	1	1	0
26	2200	2	2	2	2	0
27	2200	1	2	2	2	0
28	2600	4	4	4	4	11
29	1900	2	1	2	1	6
30	2160	2	1	1	2	1
31	2200	1	2	2	1	0

Table 2: Summary of the participant's diet is included to visualize body composition. Calorie intake is loosely associated with activity level and alcohol.

During the end of the first week with the new skateboard on April 30th, a harder fall occurred while performing several moving ollies in a row as a result of a combination of less familiarity with the narrower deck and lighter trucks and wheels while also being tired from over an hour of continuous skating. The injuries sustained were a large lateral left abductor bruise over the gluteus medius that took 11 days to fully heal. The same skate session accumulated the aforementioned medial knee bruise distal of the patellar tendon that occured when the nose of the board was kicked in an attempted no-comply. That bruise took 15 days to heal and is a reflection of the injuries location with almost no muscle or fat between the bone and the skin when compared with the hip bruise which generated more Newtons of force but yielded a faster full recovery time because it occured on a large muscle group. Several thousand calories amid moderate alcohol use were consumed the following day after moderately stretching the legs for over an hour to minimize severe knee pain before performing 15 minutes of plyometrics and two miles of walking. This caused additional inflammation and brought awareness to the problematic knee pain. Smoking tobacco or drinking alcohol in general increases inflammation and serves a similar purpose.

May 2nd was devoted to stretching and performing upper body exercises with over a mile of walking. Pre-warm up tests by dropping the weight onto a single leg into a half squat were done to estimate leg pain. Two days were devoted to rest and modifying the new skateboard which resulted in alleviating much of the leg soreness. On May 4th several stationary ollies and FS180s were practiced before running and walking two and one miles respectively. The next day a short walk with jumping and skipping that mimicked skateboarding movements was performed to little issue. May 5th also included moisturizing and massaging the entire dermatological organ. It should be mentioned that most of the previous month had been severely dry with low humidity as the northern Mississippi valley climate's pollen peaked with temperatures oscillating around 50 degrees at night and 75 during the day. In addition it was noticed that forcing sleep on the right side stopped the right lower back pain that may have been aggravated by excessive exercise and a left sided sleeping position. The following three nights were slept exclusively on the right side until the other side of the lower back began to have issues. In fact the right back pain experienced throughout athletics might stem from an inflamed left IT band as a result of squatting heavily. Not conditioning exercise habits early in life leads to lack of muscular volume and coordination resulting in more severe problems such as skipping exercise altogether later in life and developing obesity related medical conditions.

May 6th included 45 minutes of skateboard related plyometrics before running over a mile performing jumps similar to skateboard movements. The next day the left shoulder was taped into place and minimal knee issues occurred during a shorter hour long skateboarding session outside. Another short mile walk to keep the legs mobile while jumping occured. The

knee joint still had issues while landing at exaggerated angles. The shoulder began to tighten up later that afternoon and a ball and slingshot were used to perform under shoulder motions. This was done to avoid rotating the entire shoulder muscle and causing pain. May 8th a half an hour of plyometrics and upper body followed by a lighter 2 miles run and 1 mile walk bouncing a tennis ball for mobility happened. Stretching occurred later that night to help sleep.

May 9th the body was very sore primarily in the glutes and upper body from the previous few days. Over an hour of skateboarding while stationary was performed to test the knee function, which held up. A tennis ball was either bounced or juggled while walking three times over the next four or five hours. Hip snap was investigated and stretched for IP band relief. The following day a short walk and run while juggling occured before over an hour and a half of left footed rugby kicks and short sprints. This assisted with relearning motor coordination in the newly developed left lateral quadriceps and abductor muscles. Stretching also occured that night concentrating on the IP and tensor fascia latae. May 11th had several stretching instances and tennis ball rehabilitation walks while exercising the core and glute muscles with bodyweight exercises. The next day tennis ball rehabilitation and skateboarding outside occurred with more pacing between several ollies. May 13th was devoted to not moving. On May 9th-10th several thousand calories were consumed from fast food pizza resulting in unnecessary salt intake. An inability to consume enough water to replace sweat coupled with almost no fiber inflamed the lower colon and caused kidney pain. From May 13th-19th excessive fiber from various bean and whole grain sources were consumed which eliminated the digestion issues.

May 14th one and a half hours of stationary skateboarding occurred with several ollies and frontside and backside 180s both regularly stanced and switch. More work began in developing foot muscle strength by practicing getting into and out of primo. He also walked and juggled before resting the next day. May 16th psoas exercises were included before resting. The next day he walked one mile while kicking a tennis ball before performing several stationary ollies and pacing a 15 minute skateboarding session ollieing over sewer caps and doing a couple reverts and 180 jumps. Faster ollies toward the end resulted in clockwise rotations of the board which were landed slightly to the left where the root cause is poorly placed front toes. May 19th was devoted to walking and stretching the IT bands which would ultimately alleviate the entire left knee pain issue. Over stretching the right IT band caused a similar pull on the patellar tendon in the knee.

May 20th through the 26th a micromanaged schedule was kept and is a general summary of the activities of the previous several months. The morning included waking up at 0800 and cooking for 30-45 minutes. This week included higher fiber foods. Coffee was consumed about an hour after eating before playing an instrument for 30-60 minutes. 15 minutes of relaxation occurred before testing the legs with either a tennis ball or rugby ball. Plyometrics, skateboarding, or free weight exercises occurred for an hour before stretching for 15-60 minutes and eating for an hour. 3-6 hours were then devoted to resting before eating again and testing mobility by walking and juggling. 15-45 minutes were devoted to stretching before playing guitar for an hour and sleeping by 2300.

The next week was less detailed but most of the same activities were performed. Juggling four balls had increased from several catches to 30 over the two weeks of rehabilitation. Skateboarding trick ability progressed from bunny hop stationary ollies and moving rocket ollies at the end of January to slow mid thigh ollies and faster jumps over curbs by the end of May. Stationary shuvits became high flipped pop shuvits along with learning stationary front and backside 180s. Regular manuals and both stanced hippie jumps and 180 jumps were also learned while awkwardly landing several slowly moving regular frontside 180s. The landing of the hollowed kickflip has still remained elusive.

Instead of drinking 10-14 alcoholic beverages a week as occured from the start through early May, intake was minimized to several per week before binging at the end. Body composition also was reduced from 217 to 205 pounds in about two months which fits within the recommended guidance for safe weight loss of about a pound per week. From the ten days of alcohol consumption, six of the days had excessive calorie intake while three of the days high sodium fast food meals were consumed. The first ten days of May exercise hurt tremendously which probably contributed to eating more food while May 11th-18th had minimal calories while not moving for several days and performing rehabilitation exercises. The period of May 19th-May 30th witnessed moderate calorie intake ranging between 1900 and 2400 excluding an erroneous day on May 28th with 2600.

Basal metabolic rate (BMR) estimates seem to vary wildly because of the difficulty of obtaining a robust sample and humans begin to conserve energy as starving is initiated as a survival method. Guessing calories burned is also a difficult task without access to things like accurate body fat percentage aquatic scales, continual heart rate monitors, sleep studies, and photogrammetric or magnetic resonance imaging quality controlled by more intrusive volumetric tissue sample methods. Medical data with precise measurements is highly sensitive and the potential for misuse makes it a prime target for theft. Luckily most people shared their superficial information two decades ago on social media websites and biometric information one decade ago with heart rate and sleep cycles through smartphones and watches. An effective strategy for weight loss is to have basic needs met during unemployment, keep calories between 2000-2200 and burn between 300-700 every day.

Educational skateboarding video game

Several thousand hours have been spent learning software and hardware through FOSS to perform complicated computations and it would be a disservice to the several decades of work by thousands of people without a reference to computer science. In addition to skateboarding the participant resumed music and drawing at a high school level, around the artistic ability it was left at when cessation occured. An outline is included for developing a video game combining several sketches with computer vision, graphics libraries, and music in an art school version of Skate meets Guitar Hero. The technologies employed are first described with their capabilities followed by a summary of learning C++ syntax and installing libraries to display a video synced

to a keyboard button. Review was performed on the available open source Graphical User Interfaces (GUI) available to render such caricatures and basic keyboard commands that could be used are included as a reference to learning the kinematic functions of skateboarding flips.

Long ago in the distant era of the 1980's, there weren't that many computer scientist enthusiasts as the business world entered an Artificial Intelligence (AI) winter. Although algorithms and data structures proved tremendously useful in automating menial tasks, understanding and the infrastructure necessary to power the internet was slowly being developed. Since every time a major change in communication has brought global warfare, excessive attention was paid to designing the visual internet resulting in things like hiring freezes or outright layoffs. During this time the federal government also realized the bloat it had amassed and began severing unneeded services without understanding why information technology people were on the payroll in the first place. Although it may look like programmers do nothing all day, if a server that they installed was having difficulties and they were no longer employed, it created headaches for non-experts to understand the systems. Lack of concise technical documentation meant that it would be impossible to fix the server and would be easier for the replacements to rewrite the programs. From this hiring freeze blossomed unemployed hobby programmers in the early 1990's who developed free boot drives for popular computers in an attempt to attract gainful employment. The rise of faster internet speeds meant easier distribution of the software whose internal components could be analyzed to continue computer science education. As more people became unemployed software developers, so too did the open source ecosystem complete with GUI, compilers, and their own programming languages.

For this experiment a Raspberry Pi 4 was used from December 17th, 2023 through January 10th, 2024 to understand the basics of C++ and relearn the fundamental components for software. The next few weeks were spent learning Assembly as it relates to lower level hardware components as found in the Raspberry Pi 4 manual. The hardware was a system on a chip with 4 gigabytes of random access memory. The specific physics components of material science in how electrons flow or don't through chips imprinting the machine code representations of logical sequences of thought into silicon memory is beyond the scope of this review. The electrical engineering aspect of translating binary into more useful assembly and C++ based on the clock speed of the central processing unit proved to be a fruitful endeavor in understanding how the lower level languages interact with the hardware. The compiler used is the standard GCC 10 found on a Ubuntu server with LXDE as the front end for easier web browsing. The setup is very similar to early 2000's Windows XP and the internet speed was throttled to emulate long wait times between bit loading reminiscent of that decade.

The first few days were spent learning C++ syntax through W3 schools and manuals before beginning compiling the popular computer vision library OpenCV. A basic hello world C++ file was written to match a keyboard letter to a musical scale note and would serve as the framework for the remainder of the exercise. The next two days were spent learning about different variations of OpenCV installations in order to open an image with the library. Upon completion, the task of playing a video file commenced for the next two weeks. The main

problem was an incompatibility with various backends until ffmpeg was finally compiled alongside OpenCV. Static versus dynamic helper libraries were used in various iterations of installation. The aforementioned C++ file with a scale keyed to piano videos was successfully compiled for a user to enter a keyboard stroke and the associated video would popup. From there the possibilities are several from common computer vision tasks like face melting to programming electronic dance music visualized by a series of videos keyed to various frequencies.

An included file with 1000 digits of pi was included with the idea of making a piSong. Audio was not included in the installation and led to the reading of mp3 files and learning more about explicit C++ headers. Ffmpeg exists as a standalone command line library which could be used to do the audio playing within a BASH file though a more elegant solution probably exists. This was an older version of OpenCV that used an audio library that had been renamed entirely so the programmer would have to read the entire library and change file names and references. This is an arduous process used as a teaching tool for computer science majors and a more elegant solution would be to write an mp3 codec if someone was overly dedicated. Easier installation methods exist but lack customization as manipulating audio especially has the potential for misuse. The other issue with my code was how the program exited after showing one video which would be solved by including a GUI instead of persisting the program through command-line input.

The next objective was to select a GUI for the piano keyboard to persist, so as to create the desired video game interactions. This task was similar to archeology in researching references to libraries from over a decade ago. OpenGL would be the easiest bet as their library is well documented however SDL is lighter weight and more of an understanding in the details would be accomplished. After installing SDL, several of the dependencies were examined and it was discovered that much of the code was over two decades old. Libgles2-mesa-dec especially looked useful as an advanced programming interface for 2D and 3D graphics rendering on embedded systems. The name Mesa could be in reference to the nerd club or to the Black Mesa project found in Half Life since that video game was popular in the early 2000's and would resonate with hobbyist programmers from the era seeking to make a video game which might be prohibitively expensive with the added cost of paying for programming language licenses.

While learning guitar over the past two years, drawing has sporadically emerged as a more quiet outlet. Several of the images are included below that could serve as the framework for a college-esque art project video game with guitar music (Images 2-10).

Image 2

Image 3

Image 4

Image 5

Image 6

Image 7

Image 8

Image 9

Image 10

Images 2-10: Black and white pen and pencil sketches for use in a skateboarding game.

This attempt at combining 9 hobbies into a culminating paper without referencing geographic information systems continues with the creation of a table and associated abbreviations for directional movement for the limbs to concisely articulate the complexities of skateboarding tricks. (*Table 3a*, *Table 3aa*, and *Table 3aaa*). The game mechanics are similar to such video games as Dance Dance Revolution or Guitar Hero, instead substituting keyboard presses for additional purchased hardware.

Trick	Balls	Catches	Keyboard Presses
Ollie	4	5	↓RK, ↑LK, ↑LA/↑RA, ←LK, ←RK, ↓CR
Pop shuvit	4	5	⬋RK, ⬈LK, ↑LA/↑RA, ←LK, ←RK, ↓CR
BS180	5	8	⬋CR, ↓RK, ↑LK, ↑LA/↑RA, ⬈CR, ⬈LK, ⬈RK, ↓CR
Kickflip	5	8	↓RK, ↑LK, ↑LA/↑RA, ⬋LK, ↑LK, ↑RK, ⬈LK, ↓CR

Table 3a: Skateboard movement and keyboard press. Two additional columns are included describing the difficulty in comparison to juggling balls and the number of catches it takes to master the skateboard trick.

Limb	Abbreviation
Left Knee	LK
Right Knee	RK
Left Arm	LA
Right Arm	RA
Core	CR
Left Foot	LF
Right Foot	RF

Table 3aa: The limb and abbreviation used.

Direction	Abbreviation
Down limb	↓
Up limb	↑
Back limb	→
Forward limb	←
Right limb	⬉
Diagonal right limb	⬈
Diagonal left limb	⬊
Left limb	⬋

Table 3aaa: The limb direction and abbreviation.

DISCUSSION

CONCLUSIONS

In a sport like skateboarding where small adjustments severely impact performance, even minute details such as excessive salt, poor sleep, and low fiber can become a barrier to improving because it lengthens your recovery time from bodily injuries or lowers your concentration. Pushing long distances on a cruiser switch and regular is an essential skill in developing thicker plantar fascia muscles on the bottom of the feet to avoid catastrophic foot issues. Rotating the forward foot left or right diagonally while pushing targets either the abductors and adductors more thoroughly however testicular torsion is possible with an externally rotated front foot. Skateboarding does not build gluteus muscle mass as effectively as more established free weight lifts like barbell squats. Primo also helps with foot muscle development and assists with learning to fall with the board while building board control. Technique issues were unearthed for higher ollies, primarily in foot placement. If you want to jump higher in the ollies, go faster with your front toes placed closer to the screws toward the front of the board while jumping higher and kicking the tail more. Guiding the board with the back foot at the top of faster ollies also improves direction.

Newly acquired shin bruises are a good exercise for comparing the psychology of American football offensive line or Rugby forwards with skill position players or backs. The linemen and forwards think the skill position and backs are weaker for resting after similar injuries but tendon bruises are debilitating to fast cutting when compared with explosive stationary movements of linemen. Emphasis should be placed that skateboarding tricks are plyometric exercises and not continual cardio. Once the participant gets tired form disappears with the left knee over raising and the right knee caving in the back. It should also be noted that you will likely break something participating in this sport and that it is very addictive. Added pressure to perform while participating in skateboarding in a group is not ideal for people unable to accept teasing when resting injuries and permanent bodily damage might occur.

APPENDIX

Abbreviation	stm	feet	ankl	caf	kne	qua
Body Part	stamina	feet	ankle	calfs	knees	quadriceps
Abbreviation	but	gro	abs	bac	lat	tra
Body Part	gluteus	groin	abdominals	lower back	upper back	trapezius
Abbreviation	sho	chs	tric	bic	nec	hea
Body Part	shoulders	chest	triceps	biceps	neck	head

Appendix 1: Three sections of abbreviations and body parts are associated with *Table 1a*.

REFERENCES

1. Gardberm T., Kenter K. Yong L. Fibrosis following acute skeletal muscle injury: mitigation and reversal potential in the clinic. *Journal of Sports Medicine (Hindawi Publishing Corporation)*. 2020 Sep 1. doi: 10.1155/2020/7059057.

2. Seegmiller J.G., McCaw S.T. Ground reaction forces among gymnasts and recreational athletes in drop landings. Journal of Athletic Training. 2003 Dec;38(4):311-314. PMID: 14737212.

3. Zhang Y., Wu T., Shen S., Xiong y., Wang X., Yang J., Chen X., Lu Y., Lei X. Association between drinking water sources and osteoarthritis incidence in Chinese elderly population: national population based cohort study. *Frontiers in Medicine (Lausanne)*. 2022 Feb 3;8. doi: 10.3389/fmed.2021.759514.

4. Crolla P., Lawless B., Cederlund A., Aspden R., Espino D. Analysis of hydration and subchondral bone density on the viscoelastic properties of bovine articular cartilage. *BMC Musculoskeletal Disorders.* 2022 Mar 8;23(1):228. doi: 10.1186/s12891-022-05169-0.

5. Veniamakis E., Kaplanis G., Voulgaris P., Nikolaidis P. Effects of sodium intake on health and performance in endurance and ultra-endurance sports. *International Journal of Environmental Research and Public Health*. 2022 Mar 19. doi: 10.3390/ijerph19063651.

6. Ezzat A., Schneeberg A., Koehoorn M., Emery C. Association between body composition and sports injury in Canadian adolescents. *Physiotherapy Canada*. 2016;68(3):275-281. doi: 10.3138/ptc.2015-59.

7. Boström K., Dirksen T., Zentgraf K., Wagner H. The contribution of upper body movements to dynamic balance regulation during challenged locomotion. *Frontiers in Human Neuroscience*. 2018 Jan 26;12:8. doi 10.3389/fnhum.2018.00008.

8. Hughes D., Wallace M., Baar K. Effects of again, exercise, and disease on force transfer in skeletal muscle. *American Journal of Physiology-endocrinology and Metabolism*. 2015 July 1;309(1). doi: 10.1152/ajpendo.00095.2015.

9. Barbe M., Panibatla S., Harris M., Amin M., Dorotan J., Cruz G., Bove G. Manual therapy with rest as a treatment for established inflammation and fibrosis in a rat model of repetitive strain injury. *Frontiers in Physiology*. 2021 Nov 4;12. doi: 10.3389/fphys.2021.755923.

10. Plikus M., Wang X., Sinha S., Forte E., Thompson S., Herzog E., Driskell R., Rosenthal N., Biernaskie J., Horsley V. Fibroblasts: origins, definitions, and functions in health and disease. *Cell*. 2021 Jul 22;184(15). doi : 10.1016/j.cell.2021.06.024.

11. Menorca R., Fussell T., Elfar J. Peripheral nerve trauma: mechanisms of injury and recovery. *Hand Clinics*. 2013 Aug;29(3):317-30. doi: 10.1016/j.hcl.2013.04.002.

12. Sakamoto M. Effects of physical agents on muscle healing with a focus on animal model research. *Physical Therapy Research*. 2021 Feb 24;24(1)1-8. doi: 10.1298/ptr.R0011.

13. Sawka M., Burke L., Eichner E.R., Maughan R., Montain S., Stachenfeld N. American college of sports medicine position stand, exercise and fluid replacement. *Medicine & Science in Sports & Exercise*. 2007 Feb;39(2):377-90. doi: 10.1249/mss.0b013e31802ca597.

14. Shadrin I., Khodabukus, Bursac N. Striated muscle function, regeneration, and repair. *Cellular and Molecular Life Sciences*. 2016 Nov;73(22):4175-4202. doi: 10.1007/s00018-016-2285-z.

15. Eckstein F., Hudelmaier M., Putz R. The effect of exercise on human articular cartilage. *Journal of Anatomy*. 2006 Apr;208(4):491-512. doi: 10.1111/j.1469-7580.2006.00546.x.

16. Sudhakar S., Kirthika S., Padmanabhan K., Kumar G.M., Nathan C.V.S., Gopika R., Samuel A.J. Impact of various foot arches on dynamic balance and speed performance in collegiate short distance runners: A cross-sectional comparative study. Journal of Orthopaedics. 2018 Feb 2;15(1):114-117. doi: 10.1016/j.jor.2018.01.050.

17. Türker R., Kaymakcalan S., Ercan Z. Antihistaminic action of (--)-trans-delta 9-tetrahydrocannabinol. Archives internationales de pharmacodynamie et de thérapie. 1975 Apr;214(2):254-62. PMID: 239651.

18. Ud-Din S., Wilgus T., McGeorge D., Bayat A. Pre-Emptive Priming of Human Skin Improves Cutaneous Scarring and Is Superior to Immediate and Delayed Topical Anti-Scarring Treatment Post-Wounding: A Double-Blind Randomised Placebo-Controlled Clinical Trial. *Pharmaceutics*. 2021 Apr 8;13(4):510. doi: 10.3390/pharmaceutics13040510.

Curriculum Vitae
David Leifer
Reuploaded GitHub: https://github.com/DavidLeifer

Employment
Freelancing
GIS Developer
La Crosse Wisconsin, December 2021 - March 2022
Wrote code and technical documents for a Mac and Windows sequencer program to find an approximate solution to the shortest route for garbage collection using the HERE API for geocoding, distance matrix, and algorithm. Various iterations of the program used increasingly complex sequencers until an implementation of the Branch and Bound algorithm was modified from GitHub along with information from a machine learning textbook. Developed a web visualization tool with an animated time-slider and login using PHP, MariaDB, Google Cloud Platform, and OpenLayers. Briefly researched existing tools for vector and raster conversions for tile serving in an existing web application.

Ulysses Group
Geospatial Analyst
St. Louis Missouri, September 2020 - November 2021
Used Photoshop to adhere to complex cartographic standards and reviewed documentation to update charts. Georeferenced several hundred charts a week.

United States Census Bureau
Cartographic Technician
Jeffersonville Indiana, September 2019 - September 2020
Updated land boundaries with ArcGIS and QGIS. Called local governmental officials for the Boundary Validation Program with email and spreadsheet documentation. Prepared and sent mail to governments.

SIU- Carbondale
Research Assistant, Teacher's Assistant
Carbondale Illinois, August 2017- May 2019
Used a previous student's program to scrape Tweets related to energy using the Twitter API. Developed a sentiment analysis script using the Natural Language Processing Toolkit and prepared the tabular data for analysis. Attended student recruiting functions for the Geography department. Took attendance, graded papers, and held office hours for an undergraduate environmental geography course.

Continental Mapping Consultants

LiDAR Data Processor
Sun Prairie Wisconsin, April 2017 - August 2017
Processed street level LiDAR data for the Minnesota Department of Transportation highway inventory including mile markers and pavement lines. Instructed new employees on data processing methods and reported linework progress to managers.

Power of Ground
Geospatial Intern
Eau Claire Wisconsin, February 2016 - May 2016
Used Python, QGIS, and short term four dimensional unmanned aerial systems to estimate the volume of construction sand removed from mining sites. Recorded results with spreadsheets and presented the information in a research capstone course and poster competition.

UW- Eau Claire
Research Assistant, Student Assistant
Eau Claire Wisconsin, January 2016 - August 2016
Developed a refined poster presentation on sand mining operation surveys using unmanned aerial systems. Graded papers and held office hours for an introductory geographic information systems course.

Angling Technologies
GIS Intern
Eau Claire Wisconsin, July 2014 - November 2015
Downloaded, georeferenced, and digitized hiking, snowmobile, and equestrian trails for use in a web application. Contacted government and private organizations using email to acquire maps not posted online and recorded results in a spreadsheet.

Other Employment
Custodian, security guard, referee, delivery driver, traveling arena vendor, grocery attendant

Education
Southern Illinois University - Carbondale
Masters of Science, Geography 2017-2019

University of Wisconsin - Eau Claire
Bachelors of Art, Environmental Geography, 2011-2016

Academic Publications and Awards

Li R., Crowe J., Leifer D., Zou L., Schoof J. Beyond big data: Social media challenges and opportunities for understanding social perception of energy. *Energy Research & Social Science*. 2019;(56). doi: 10.1016/j.erss.2019.101217.

American Association of Mining and Reclamation Travel Grant, St. Louis Missouri, 2018, $250.

UWEC Office of Research and Sponsored Programs Travel Grant, San Francisco, 2016, $750.

University of Wisconsin Eau Claire Geography and Anthropology Travel Grant, San Francisco, 2016, $500.

Academic Posters and Presentations

Weinert J., Leifer D., Literature Review of Unmanned Aerial Systems for Agricultural Crop Monitoring, Southern Illinois University Carbondale Student Poster Reception, Carbondale Illinois, 2018.

Li R., Leifer D., WebGIS Application to Visualize Historical Reclamation Research Sites Using a Modified QGIS2Web Framework, American Society of Mining Reclamation, Presentation, St. Louis Missouri, 2018.

Hupy J., Hupy C., Leifer D., Sawall P., Bomber M., Nesbit S. Lowering Overhead Costs of Sand Mining Using Unmanned Aerial Systems, ESRI User Conference Poster Session, San Diego California, 2016.

Hupy C., Hupy J., Leifer D. Streamlining unmanned aerial systems image post-processing using Pix4D, QGIS, and the SAGA volume algorithm, GeoTech Center Poster Competition, Cyberspace 2.0, 2016.

Wilson C., Leifer D., Development of a Multi-Platform Volunteered Geographic Information Application for Monitoring Invasive Species of Asian Carp in the Upper Mississippi River System, Association of American Geographers, Poster and Auditory Presentations, San Francisco California, 2016.

Moothart E., Anderson N., Adams H., Williams A., Smuhl R., Cottrell E., Kleist B., Leifer D., Sawall P., Wysocki A., Faulkner D., Knickpoints : Evidence of a Domino Effect on Tributaries to the Lower Chippewa River, Celebration of Excellence in Research and Creative Activity (CERCA) Poster Session, Eau Claire Wisconsin, 2016.

Wilson C., Leifer D., Development of a Multi-Platform Volunteered Geographic Information Application for Monitoring Invasive Species of Asian Carp in the Upper Mississippi River

System, Celebration of Excellence in Research and Creative Activity (CERCA) Poster Session, Eau Claire Wiaconsin, 2016.

Hupy C., Waard M., Leifer D., Applying GIS Technologies to Identify Sources of Chloride Pollution Within the Lower Chippewa River Basin, Celebration of Excellence in Research and Creative Activity (CERCA) Poster Session, Eau Claire Wisconsin, 2015.

Software and Hardware

Hardware

Manuals

RaspberryPi 4, Intel x86, WAN/LAN/etc.

Software

Operating Systems

Debian Linux, Ubuntu, Ubuntu Server, MacOS, Windows.

Web Servers

GeoServer, Tomcat8, Jupyter Notebook, Google Cloud Platform, Amazon Web Services, Docker, Kubernetes.

Geographic Information Systems and Remote Sensing

ArcMap, ArcGIS Pro, ArcGIS Online, QGIS, ERDAS, SPSS.

Programming Languages

Python, C++, BASH, MariaDB/MySQL/PostgreSQL, HTML/CSS/JS.

Libraries

Lower level

GDAL, OpenCV, SDL, linux commands.

JavaScript

Node package manager (npm), NodeJS, OpenLayers, ArcGIS API for JavaScript.

Python

Numpy, scipy, rasterio, flask, django, nltk, matplotlib, pandas, pysal, seaborn, shapely, geopandas, glob, time, sys, os, etc.

Continuing Education

Machine Organization and Assembly Language from Washington University's Computer Science 378 course.

Python and spatial statistics from Colorado University, Boulder's Earth Science laboratory and associated professors GitHub courses.

Algorithms and data structures on Coursera and MITx Online.

HackerRank programming challenges to efficiently implement algorithms with big O notation.

Eight lectures on the theory of physics, Max Planck.

Review of Mayo, Cleveland Clinic, and National Library of Medicine's articles on common medical issues arising in middle age especially psychiatry.

Limited understanding of chemistry and material science.

Open Source Contributions
Video piano keyboard using OpenCV and Linux, 2023-2024.

Playing a specific song using a RaspberryPi 4 local area network, Flask, and Minikube by estimating a smartphone's position within a building, 2022.

Launching a hand drawn rocket upon the completion of a shift using no libraries in JavaScript, 2022.

Examining El Nino and La Nina mid Pacific equatorial sea surface changes compared with continuous surface temperature and precipitation as a climate change pipeline, 2020-2021.

Introductory spatial statistics for two dimensional representations of baseball, wildfires, and short form text blogs using Jupyter Notebooks, 2016-2017.

Reviewing unmanned aerial system hardware components and flight planning, 2015.

Organizations
Gamma Theta Upsilon, Geography Academic Honors Society
2019 - Present

American Society of Mining and Reclamation
2018 - 2019

Association of American Geographers 2015 - 2019

UW-Eau Claire Rugby Club
2014 - 2016

UW-Eau Claire Football
2011 - 2013

Hobbies (in hours)
Less than 1000
Skateboarding/longboarding and exercising.

Between 1000-3000
Weather, music, memeology.

Exceeding 3000
Computer science