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Exercise Education of Western Michigan University Students who use the University Recreation Center

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Abstract

According to the American College of Sports Medicine's (ACSM) annual survey data, various modalities of resistance training are reported in the top 20 ways to exercise in 2022. According to the Nationwide Children's Hospital, there has been a significant increase in acute care visits resulting from resistance training as it becomes more common to train without proper professional oversight (Nationwide Children's Hospital, 2010). Many exercisers watch, replicate, or take advice from friends in the weight room; however, professional instruction is key for a safe workout experience. Injuries can and do occur on resistance machines, treadmills, and stair mills with little to no guidance. Emergency rooms saw a 215% increase in resistance training injuries between 2003 and 2010 (Gray and Finch, 2014). The purpose of this study was to investigate the possible correlation between students who have experienced an injury in the weight room and their exercise education. Students who actively use the Recreation Center at Western Michigan were asked to complete a survey which included questions regarding preferred exercise modalities, training experiences, injuries, and other related topics. Results of these surveys show that there was no direct correlation, neither positive nor negative, between exercise education and exercise injuries sustained while resistance training. There was however a strong correlation between gender and difficulty returning to exercise following injury. There was an overall negative response from students regarding an equipment orientation course, both optional and required.

Background

According to the American College of Sports Medicine's (ACSM) annual survey data, various modalities of resistance training are reported in the top 20 ways to exercise in 2022. Resistance training using one's own body weight and resistance training using free weights are both among the most popular fitness trends and have been for the last decade (Thompson, 2022). Resistance training is exercising a muscle or muscle group against resistance which can be in the form of body weight, free weights, or weight machines, all of which are present in Western Michigan University (WMU) Student Recreation Center (SRC).

Resistance training, also known as strength or weight-training, is well established as an effective method for developing musculoskeletal fitness and is currently prescribed by many major health organizations for improving health and fitness levels, athletic performance, and for the prevention and rehabilitation of orthopedic injuries (Hass et al., 2012). Research has shown that resistance training is the most effective way to increase and sustain lean body mass (Hass et al., 2001). The ACSM's guidelines indicate that an average healthy adult should participate in at least two days per week of resistance training that focuses on eight to 10 exercises that target the body's major muscle groups. Adhering to a resistance-training regimen routinely for at least 10 weeks, can result in stronger muscles, increased movement control, and better balance, among other things (Westcott, 2012). Over time, performing the same resistance activities at the same weight and using the same repetitions will become easier for an individual due to increased stamina. It is important for individuals to reevaluate and continue to progress their resistance-training programs by engaging the body in progressively higher levels of weight and repetitions to match their new strength and stamina (Better Health Channel, 2018).

Resistance training has many benefits for both average adults and athletes. For all populations alike, resistance training has been found to decrease the risk of several chronic diseases. Risk for diabetes, arthritis, and heart disease, and osteoporosis is decreased for a person who practiced resistance training. Resistance training is an effective way to increase muscle strength and tone, which protects the body's joints creating more stability to decrease the chance of injury. Another benefit of resistance training is that it can help with weight management by increasing the muscle content of the body. As amount of muscle in the body increases, more energy is burned overall, even at rest. In addition to burning more calories, the body utilizes fat to gain muscle, therefore decreasing the fat mass of the body. Between the psychological and weight management benefits, most adults see an increase in self-esteem with resistance training (Better Health Channel, 2018).

With resistance training, as with all physical activity, comes increased risk for injury. According to the Nationwide Children's Hospital, there has been a significant increase in acute care visits resulting from resistance training injuries as it becomes more common to work out without proper professional oversight. Injury risk is greatly decreased when the individual has received training regarding proper weightlifting techniques and follows an exercise program from a certified professional. The most effective and safest way to perform resistance training is when the participant is guided by a certified instructor or has received instruction regarding prescribed resistance training guidelines (Nationwide Children's Hospital, 2010).

Once an injury takes place, Barker from the Boston Children's Hospital says it will affect the individual beyond the point of injury. An injury not only can affect a person's mental, emotional, and physical wellness in addition to other contributing factors such as social, occupational, financial, and environmental wellbeing. Exercise is known to stabilize mental

health so taking a physical break to recover from an injury can be difficult. It can also be hard to return to exercising after an injury whether it be due to fear of reinjury, stress, or unreasonable expectations which is why the proper medical care is an important part of injury recovery. Reinjury is less likely when the athlete works with a medical professional like a physical therapist to help them regain function after their injury. This professional can also help guide the exerciser on reentering exercise when the time is right and at the right intensity (Barker, 2021).

Following injury, an athlete must recover both physically and psychologically. Returning to the activity which caused an injury requires a lot of courage. Understanding what caused the injury and how to avoid it in the future allows the athlete to return to training more confidently. However, males and females have been found to process injuries differently. Females are more likely to experience generalized anxiety disorder and stress from an injury can bring out the anxiety symptoms (Herrero et al., 2021). According to a study of Anterior Cruciate Ligament (ACL) reconstruction post-op athletes, females scored lower than males on ACL Return to Sport after Injury (ACL-RSI) questionnaires. While both genders showed increasing scores as time went on, female scores were lower than male scores at every check point during recovery (Kostyun et al., 2021). In addition, when investigating factors associated with the ACL-RSI, it was found that females who continue to score low will commonly never return to the activity that causes their initial injury (Webster et al, 2018). Other factors correlated with lower psychological readiness to return to activity included an older age, a longer time between injury and surgery, and lower overall sport participation prior to injury (Webster et al, 2018).

Western Michigan University takes pride in their 32-million-dollar student recreation facility. The SRC's large weight room and cardio areas are popular spots for students to get their workout in. Access to the SRC for undergrad students is included in tuition making the on-

campus gym a desired location to workout not only for the price but also for its location on campus. The SRC weight room and cardio room have collectively had over 42,509 participant uses for the spring 2022 semester. Look inside and you will see friends critiquing one another and many students using free weights, resistance machines, and other modalities to stay fit. Staying active and injury free is the ultimate goal; however, injuries do occur in WMU's SRC weight rooms as well as those across the country. Emergency rooms saw a 215% increase in resistance training injuries between 2003 and 2010 (Gray and Finch, 2014). Based on SRC use and normal distribution, it can be expected that half of the survey participants have engaged in exercise education, and half have not. Similarly, it can be expected that half of SRC users have experienced injury and half have not. It would support our hypothesis if exercise education and injury are related based on the survey results. Also being investigated are SRC uses, returning to exercise following injury, and student willingness to take part in injury prevention through an exercise safety course.

Methods

After receiving approval from the Institutional Review Board (IRB), students were recruited to be subjects via email, flyers, social media posts, and word of mouth. Subject inclusion criteria included being an enrolled WMU student, being between the ages of 18 and 26, using the WMU SRC, and agreeing to informed consent. Subject exclusion criteria consisted of not being an enrolled WMU student, being outside of the 18 to 26 age range, not using the WMU SRC, and declining the informed consent. 110 participants took the survey, 60 of those participants did not exhibit exclusion criteria and completed their surveys in full. These participants took a survey via Qualtrics which included 15 questions regarding their SRC use, exercise education, and exercise injuries. Participants took less than five minutes to complete the survey, which was active and accepting responses from January 24 through March 14, 2022. The survey questions and answer choices can be found in Appendix A.

Results

There were 110 people total who participated in the study. 40 were excluded due to age, enrollment status, and not using the SRC. Of the participants who met the criteria, there were 21 males (35%) and 39 females (65%). A third option for gender or prefer not to say was also listed for participants to select; however, there were not any participants who identified in that category for a total of 60 participants who completed the survey. This could be the effect of two things. First, that females may be more likely to stop and take a survey. Second, that more females may be using the SRC than males.

The exercise education data is skewed significantly from normal distribution. As seen in *Table 1*, the number of participants that have had exercise education (83%) is significantly higher than those who have not (17%) (α=.05 X^2 (1, N=60) =26.67, p<.00001). In a similar way, in *Table 2*, when dividing the exercise instruction by professional and non-professional education yielded significant results (α=.05 X^2 (1, N=60) =21.9, p=.00002). In *Table 3*, a comparison of professional and non-professional education. Significantly more participants indicated having had professional exercise education. Compared to that same expected normal distribution, significantly fewer participants indicated only non-professional education such as from a friend or via self-research and still significantly fewer participants indicated no education at all. Of the included 60 participants, 43% answered yes to injuries and 57% answered no for exercise related injuries. This is consistent with normal distribution (α=.05 X^2 (1, N=60) =1.067, p=.3017). Comparing education and injury rates among participants did not indicate any strong trends in either direction in *Table 4*. There appeared to be no correlation based on the data collected (α=.05 X^2 (2, N=60) =.3305, p=.5654). When comparing each variable separately with gender no correlation was found. Gender does not appear to correlate with exercise education or injury

rates found in *Table 5* and *Table 6*, respectively. α=.05 X^2 (2, N=60) =.1319, p=.7165 and α=.05 X^2 (2, N=60) =1.3157, p=.2514, respectively).

One half of participants who have experienced an exercise injury were apprehensive to return to exercising, as seen in *Table 7*. This statistic itself is on par with normal distribution and is not significant. However, when cross compared with gender, 92% of respondents who were apprehensive to return to exercise were female. The 13 respondents that were not apprehensive, when compared with gender, fell into a normal distribution with 50% being each female and male. Females are significantly more likely to be apprehensive when returning to exercise following an injury than males (α=.05 X^2 (2, N=26) =4.8872, p=.0271). Some of the participants who reported that they were discouraged after injury had injuries like ankle sprains, knee fractures, and concussions. Some of the participants who were not discouraged from returning to exercise had injuries like ankle sprains, overuse injuries to the shoulder, and shin splits.

Table 1: Goodness of Fit Test Exercise Education and No Exercise Education

Education	Number of Participants
Yes	50
No	10

α=.05 X^2 (1, N=60) =26.67, p<.00001

Table 2: Goodness of Fit Test Professional Education, Non-Professional Education, and No Education

Education	Number of Participants
Professional	37
Non-Professional	13
None	10

α=.05 X^2 (1, N=60) =21.9, p=.00002

Table 3: Goodness of Fit Test Injury Incidence

Injury	Number of Participants
Yes	26
No	34

α=.05 X^2 (1, N=60) =1.067, p=.3017

Table 4: Chi Square Exercise Education and Injury

	Education yes	Education no	Totals
Injury yes	19 (31.67%)	7 (11.67%)	26
Injury no	27 (45.00%)	7 (11.67%)	34
Totals	46	14	60

α=.05 X^2 (2, N=60) =.3305, p=.5654

Table 5: Chi Square Gender and Exercise Education

	Exercise Education	No Exercise Education	Totals
Female	33	6	39
Male	17	4	21
Totals	50	10	60

α=.05 X^2 (2, N=60) =.1319, p=.7165

Table 6: Chi Square Gender and Exercise Injury

	Exercise Injury	No Exercise Injury	Totals
Female	19	20	39
Male	7	14	21
Totals	26	34	60

α=.05 X^2 (2, N=60) =1.3157, p=.2514

Table 7: Chi Square Gender and Returning to Exercise Following an Injury

	Discouraged	Not Discouraged	Totals
Female	12	7	19
Male	1	6	7
Totals	13	13	26

α=.05 X^2 (2, N=26) =4.8872, p=.0271

Participants were prompted to choose all the exercise modalities they use at the SRC from a pre-selected list found in *Figure 1*. 87% of participants selected that they use cardio equipment when they exercise at the SRC, 73% selected free weights, 65% selected body weight exercises, 53% selected weight stack machines as well as cable machines, and 10% chose other. Some of the participants that chose other indicated use of the pool and the basketball courts which were not listed. The most popular exercise instruction was self-research, which 40% of participants indicated. The second most popular instruction was within sport training during high school (28%), with from a friend following at third most popular (25%), shown in *Figure 2*. Two

of these top three instruction modalities are considered non-professional. The participants could choose multiple modalities, so many of the non-professional choices were combined with other professional choices.

Figure 1: Fitness Modalities Participants Utilize at the SRC

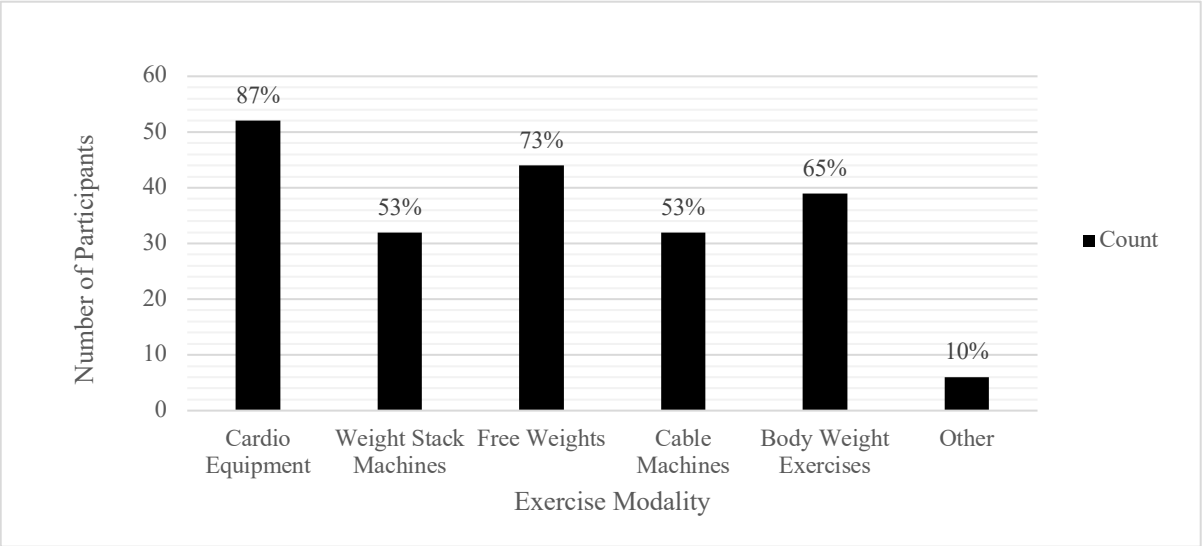
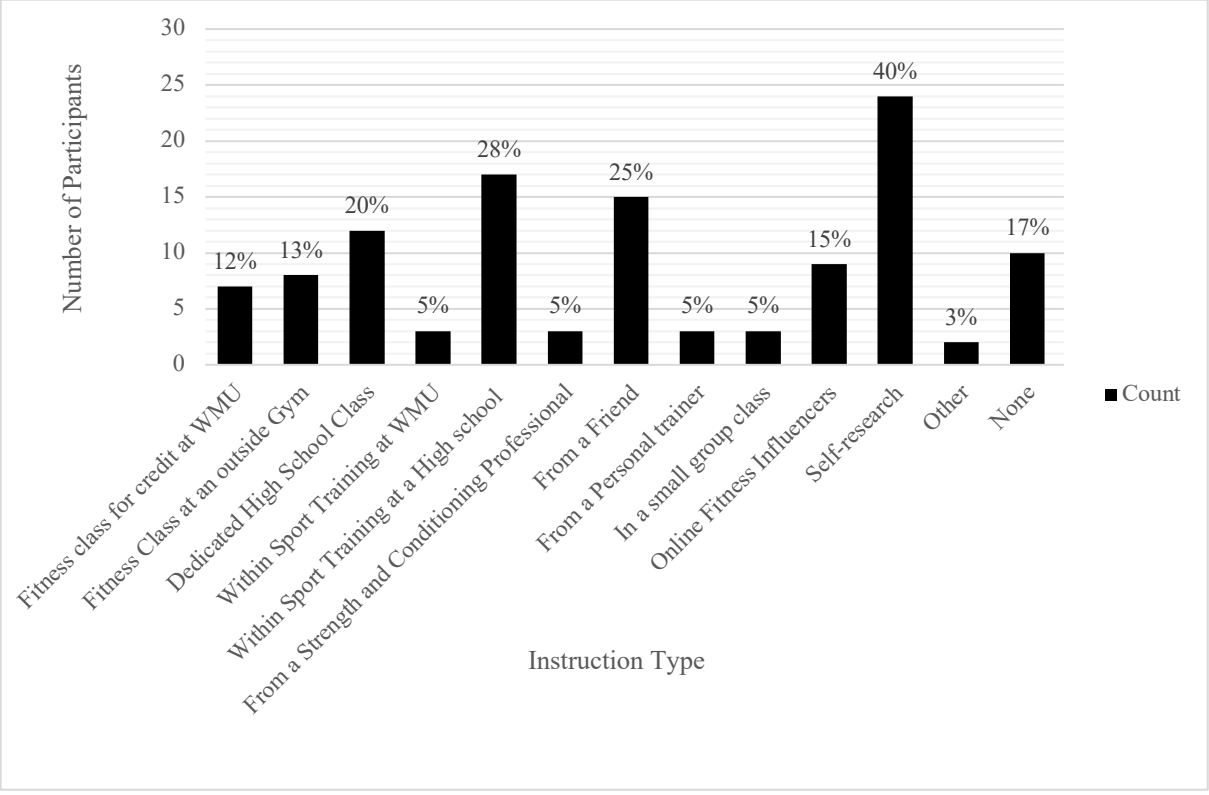


Figure 2: Resistance Training Instruction



Discussion

According to Kerr et al., adolescents aged 13-24 are the most likely age group to experience exercise injury based on the emergency room epidemiology investigation. While we hoped that with a large percentage of participants having had exercise education there would have been a lower percentage of injuries as well. However, about half of participants in our study reported injury. The age group we investigated in this study was 18-26, most of which fall into the most likely to experience injury category (13-24 years) investigated by Kerr et al. Some of our participants were reporting injuries from three to five years ago which would also be in that 13-24 age range. The increased injury rate in this group is the result of the combination of immature bodies, increased exposure to exercise both structured sports and recreational. They have access to gym classes at school, varsity or club sports, intramural sports, exercise facilities like the WMU SRC, trails, rock climbing and much more. While they have access to exercise equipment and gyms, they may not have access to professional instructors. Classes and memberships can get expensive, and this age group may not have the disposable funds to spend on those things, as highlighted in other studies (Kerr et al., 2010).

As discussed in Lavallee and Balam's study, An Overview of Strength Training Injuries: Acute and Chronic, it is important for medical professionals to have open communication with patients regarding exercise safety. Approximately half of the participants in our study had experienced an exercise injury and education is the most important injury prevention tool. Lavallee and Balam investigated chronic and acute exercise injuries. They found that exercise injuries are more commonly in the form of acute injuries. They also discovered that exercisers were less likely to have reinjury when their treating healthcare professional reviewed lifting form or other exercise safety with them before returning to exercise (Lavallee and Balam, 2010).

Although we found no correlation between gender and exercise injury, Kerr et al. reports that males are more often injured than females in their study titled, Epidemiology of Weight Training Related Injuries Presenting to Unities States Emergency Departments, 1990 to 2007. Our finding of no correlation could reflect the lack of male participants. Also, since 2010, more females have joined the exercise world which could also account for some evening out in gender injury statistics. While free weights appear to be the modality resulting in the most injuries based on previous studies, we must also acknowledge the misuse of machines and how that causes injury. According to Kerr et al., as well as observation of the WMU SRC, exercisers often sit down at a machine and begin exercising at whatever weight selected by the previous user on the machine. Many exercisers will also move the pin of a machine without looking, meaning they are exercising at an unknown weight. Machines, just like free weights, require professional training or oversight. Though they pose decreased threat of injury caused by poor form than free weights, injuries of overexertion and unsafe practices are just as common on machines (Kerr et al., 2010).

The strongest correlation that we found was between gender and apprehension to return to exercise following an injury. Consistent with the previous study by Herrero et al, females are generally more apprehensive to start exercising again following an injury than are males. This reflects the psychological differences between genders. While rehabilitation is commonly focused on strengthening the area of injury, each patient requires an individualized approach, and this includes considering psychological differences between the genders. Females are more likely to experience anxiety, depression, and other mental illness, all of which play a part in recovering from an injury and returning to activity. Anxiety around reinjury is common in females and can be alleviated when the exerciser works with medical and exercise professionals to prepare them

both physically and mentally for their return to activity. Males also need those professionals to successfully return to exercise, but generally experience less anxiety than females. 80% of injured athletes reported a psychological hardship related to their injury or recovery (Wolanin et al., 2015). Especially for females, the team aspect of a sport is protective against mental illness. According to Herrero et al.'s study, when an athlete is unable to participate, the team mentality decreases, allowing depression and anxiety to increase. These increases will also contribute a female's difficulty returning to sport following injury (Herrero et al., 2021).

The data we collected regarding a hypothetical safety class at the WMU SRC revealed that many participants would not take advantage of such a course if one was offered for general use of exercise equipment at the gym. With education being one of the most important injury prevention tools, this is a concerning finding. Ohio State University, Central Michigan University, and other schools in the Midwest offer general equipment orientations within their recreation centers. Gyms like the YMCA offer an orientation too. WMU offers academic classes as part of a student's degree that include exercise safety training, but they are mostly major-specific courses. WMU also offers extracurricular, professional-lead exercise courses, but they require an additional fee. College students with little disposable funds are more likely to exercise on their own for free than to pay for a class with a professional.

Conclusion

Further investigation is warranted regarding the college recreation center exercisers, exercise education, and injury. The WMU SRC's injury rates of participants may benefit from an equipment orientation option. Our research data shows that a mandatory equipment orientation may decrease SRC attendance rates, however WMU may consider providing participants with an optional equipment orientation. An orientation geared toward individuals who are concerned about injury or who are looking for basic education may be the next step towards reduced exercise related injury at the SRC. The SRC may consider partnering with Academic Affairs, specifically exercise science and health and physical education students, to aide in the facilitation of an orientation program after they complete their foundational strength and conditioning courses. This opportunity would provide a unique hands-on experience for students to practice creating and facilitating comprehensive exercise plans, as well as give the SRC instructors for an exercise orientation program. A higher population of educated exercisers will result in decreased injury rates at the WMU SRC based on previous findings that exercise education is the best injury prevention tool.

References

Barker, J. (2020, September 8). *Sports injuries: Why ignoring pain is bad for athletes*. Boston Children's Answers. Retrieved April 3, 2022, from https://answers.childrenshospital.org/sports-injuries-pain/

Barker, J. (2021, September 9). *Not just a physical thing: The psychology of sports injuries and Recovery*. Boston Children's Answers. Retrieved April 3, 2022, from https://answers.childrenshospital.org/psychology-sports-injury-recovery/

Better Health Channel. (2018, August 26). *Resistance training – health benefits.* Resistance training – health benefits – Better Health Channel. Retrieved March 28, 2022, from https://www.betterhealth.vic.gov.au/health/healthyliving/resistance-training-health-benefits

Gray, S. E., & Finch, C. F. (2015). Epidemiology of hospital-treated injuries sustained by fitness participants. Research quarterly for exercise and sport, 86(1), 81–87. https://doi.org/10.1080/02701367.2014.975177

Gray, S. E., & Finch, C. F. (2015). The causes of injuries sustained at fitness facilities presenting to Victorian emergency departments – identifying the main culprits. Injury epidemiology, 2(1), 6. https://doi.org/10.1186/s40621-015-0037-4

Hass, C.J., Feigenbaum, M.S. & Franklin, B.A. Prescription of Resistance Training for Healthy Populations. Sports Med 31, 953–964 (2001). https://doi.org/10.2165/00007256-200131140-00001

Herrero, C. P., Jejurikar, N., & Carter, C. W. (2021). The psychology of the female athlete: How mental health and wellness mediate sports performance, injury and recovery. *Annals of Joint*, *6*(38), 38–38. https://doi.org/10.21037/aoj-20-53

Kelly, H. (2018, August 10). *4 things you should be doing to avoid exercise injuries*. The California State University. Retrieved February 3, 2022, from https://www.calstate.edu/csu-system/news/Pages/Exercise-without-injury.aspx

Kerr, Z. Y., Collins, C. L., & Comstock, R. D. (2010). Epidemiology of weight training-related injuries presenting to United States Emergency Departments, 1990 to 2007. *The American Journal of Sports Medicine*, *38*(4), 765–771. https://doi.org/10.1177/0363546509351560

Kostyun, R. O., Burland, J. P., Kostyun, K. J., Milewski, M. D., & Nissen, C. W. (2021). Male and Female Adolescent Athletes' Readiness to Return to Sport After Anterior Cruciate Ligament Injury and Reconstruction. Clinical journal of sport medicine : official journal of the Canadian Academy of Sport Medicine, 31(4), 383–387. https://doi.org/10.1097/JSM.0000000000000751

Lavallee, M. E., & Balam, T. (2010). An overview of strength training injuries. *Current Sports Medicine Reports*, *9*(5), 307–313. https://doi.org/10.1249/jsr.0b013e3181f3ed6d

Nationwide Children's Hospital. (2010, March 30). New National Study examines weight training-related injuries. Nationwide Children's Hospital. Retrieved January 28, 2022, from https://www.nationwidechildrens.org/newsroom/news-releases/2010/03/new-national-study-examines-weight-training-related-injuries

Thompson, W. R. (2022). Worldwide survey of fitness trends for 2022. *ACSM'S Health & Fitness Journal*, *26*(1), 11–20. https://doi.org/10.1249/fit.0000000000000732

Webster, K. E., Nagelli, C. V., Hewett, T. E., & Feller, J. A. (2018). Factors associated with psychological readiness to return to sport after Anterior Cruciate Ligament Reconstruction surgery. *The American Journal of Sports Medicine*, *46*(7), 1545–1550. https://doi.org/10.1177/0363546518773757

Westcott, W. L. (2012). Resistance training is medicine. *Current Sports Medicine Reports*, *11*(4), 209–216. https://doi.org/10.1249/jsr.0b013e31825dabb8

Wolanin, A., Gross, M., & Hong, E. (2015). Depression in athletes. *Current Sports Medicine Reports*, *14*(1), 56–60. https://doi.org/10.1249/jsr.0000000000000123

Appendix A

Survey questions and layout

Block 1 – Age and Enrollment

1. Please select your age group
    a. Under 18 (end)
    b. 18-26
    c. Over 26 (end)
2. Are you an enrolled WMU student?
    a. Yes (continue to block 2)
    b. No (end)

Block 2 - Gender

3. Please select your gender identity (all continue to block 3)
    a. Male
    b. Female
    c. non-binary/third gender
    d. Prefer not to say
    e. Other: fill in

Block 3 – SRC Uses

4. Please select all of the exercise modalities you use at the SRC (select all that apply)
    a. Cardio equipment (treadmill, elliptical, bike, stair stepper) (continue to block 4)
    b. Free weights (dumbbells, weight plates, squat rack) (continue to block 4)
    c. Weight stack machines (examples) (continue to block 4)
    d. Cable Machines (lat pull down, rows, triceps extension) (continue to block 4)
    e. Body weight exercises (pushups, squats, planks) (continue to block 4)
    f. Other: fill in (continue to block 4)
    g. None, I don't workout at the SRC (end)
5. When did you begin working out or exercising using the modalities chosen above?
    a. 2022-2016 (continue to block 4)
    b. 2015 or before (continue to block 4)
    c. I don't workout at the SRC (end)

Block 4 – Exercise Education

6. Have you received any training on form and/or proper uses of free weights, machines, or body weight resistance training?
    a. Definitely yes (continue to block 5)
    b. I think so (continue to block 5)
    c. I don't think so (continue to block 5)
    d. Definitely no (continue to block 5)

Block 5 – Exercise Education 2

7. In what context did you receive resistance training instruction most recently? (select all that apply) (all continue to block 6)

   a. Fitness class for credit at WMU
   b. Fitness class at an outside gym
   c. Dedicated class at a high school
   d. Within sport training at WMU
   e. Within sport training during high school
   f. From a strength and conditioning professional
   g. From a personal trainer
   h. In a small group class
   i. From a friend
   j. Self-research, watching videos or articles
   k. Online fitness influencers
   l. Other: fill in
   m. None
8. When was your most recent training experience? (all continue to block 6)
   a. Years 2022 through 2016
   b. 2015 or before
   c. Never

Block 6 - Injuries

9. Have you sustained an injury while exercising?
   a. Yes (continue to block 7)
   b. No (continue to block 8)

Block 7 – Injury Information

10. When did this injury occur? (All continue to block 8)
    a. Years 2022-2016
    b. 2015 or before
11. OPTIONAL: Please describe your injury/injuries (All continue to block 8)
12. Did this injury discourage you from returning to exercise? (All continue to block 8)
    a. Yes
    b. No
13. What type(s) of treatment did you seek for your injury? (Please select all that apply) (All continue to block 8)
    a. Primary Care
    b. Self-Administered Care
    c. Emergency Care
    d. Physical Therapy
    e. Orthopedics
    f. Massage Therapy
    g. Chiropractic
    h. Other: fill in
    i. I did not seek out medical care

Block 8 – Class Interest

14. How likely would you be to sign up for an exercise safety class lasting 1-2 hours if offered by the SRC?

a. Extremely unlikely
b. Somewhat unlikely
c. Neither likely nor unlikely
d. Somewhat likely
e. Extremely likely

15. How likely would you be to continue to use the SRC if there were a required one to two-hour class regarding exercise safety for use?
    a. Extremely unlikely
    b. Somewhat unlikely
    c. Neither likely nor unlikely
    d. Somewhat likely
    e. Extremely likely