



Research Article

Injury Frequency and Location Comparison of Full Time and Part Time SWAT Operators

Kaylee Fredella,¹ Jackeline Rodrigues,¹ Matthew Wagner,¹ Jake Labhart,² and Jennifer A. Bunn*

<https://doi.org/10.56331/52720241>

Submitted: 13 January 2023
Accepted: 6 July 2023
Published: 27 May 2024

Citation: Fradella, K., Rodrigues, J., Wagner, M., Labhart, J., & Bunn, J. (2024). Injury Frequency and Location Comparison of Full Time and Part Time SWAT Operators. *International Journal of Police Science* 3, no. 1 (2024) <https://doi.org/10.56331/52720241>

Abstract: Special weapons and tactics (SWAT) teams are primarily classified into two categories full-time (FT) and part-time (PT). FT teams generally work in heavily populated areas, where they are assigned to the SWAT unit with no other collateral duties. PT teams work in less populated/rural areas, with SWAT as their secondary role, and their primary duties are generally outside of SWAT. This study examined differences in injury locations, mechanisms, treatment, and length of injury time between PT and FT SWAT operators. Participants (PT n=48, FT n=24) completed a survey related to areas injured, length or injuries, mechanism of injuries, and care sought. There were group differences for percentage of injuries seeking medical assistance (FT: 25-50%, PT: 1-24%, $p=0.009$) and number of injuries sustained while on a live operation (FT: 1-24%, PT: none, $p=0.008$). There were no differences for number of injuries sustained during law enforcement career (FT: 3.1 ± 2.5 injuries, PT: 2.40 ± 2.2 injuries, $p=0.238$), number of body areas with extended pain (FT: 2.6 ± 2.3 areas, PT: 1.9 ± 1.8 areas, $p=0.120$), or time of sustained injury (both groups: 1-6 months, $p=0.187$). Lower back was the highest reported injured area (47%), followed by neck (14%). FT operators sustain more serious injuries than PT operators and FT operators experience more injuries while on duty. Law enforcement agencies and clinical practitioners should consider collaborating to provide FT operators with the appropriate care for their injuries. Appropriate care may effectively reduce recovery time for injuries and reduce the number of missed workdays for the operator.

Keywords: law enforcement, healthcare, South, Texas, special weapons and tactics, injuries



© 2024 Fradella, K, et al. Authors retain copyright and grant the IJPS right of first publication with the work simultaneously licensed under a [Creative Commons Attribution-NonCommercial 4.0 International \(CC BY-NC 4.0\) license](https://creativecommons.org/licenses/by-nc/4.0/).

Introduction

The Special Weapons and Tactics (SWAT) unit deals with unpredictable, high-risk situations, placing them at risk for work-related physical injuries. SWAT team operators in large, populated cities are typically full time (FT) operators. Part-time (PT) SWAT teams are generally found in smaller communities and spend part of their time as a SWAT operator and most of their time on their primary duties. PT SWAT operators work irregular schedules due to being on standby until they are needed [1] ⁱ. Although it may vary team to team, PT operators are allotted less training hours compared to FT and may have less training and operational experience as a result. Figure 1 provides a schematic of differences and similarities of FT and PT operators.

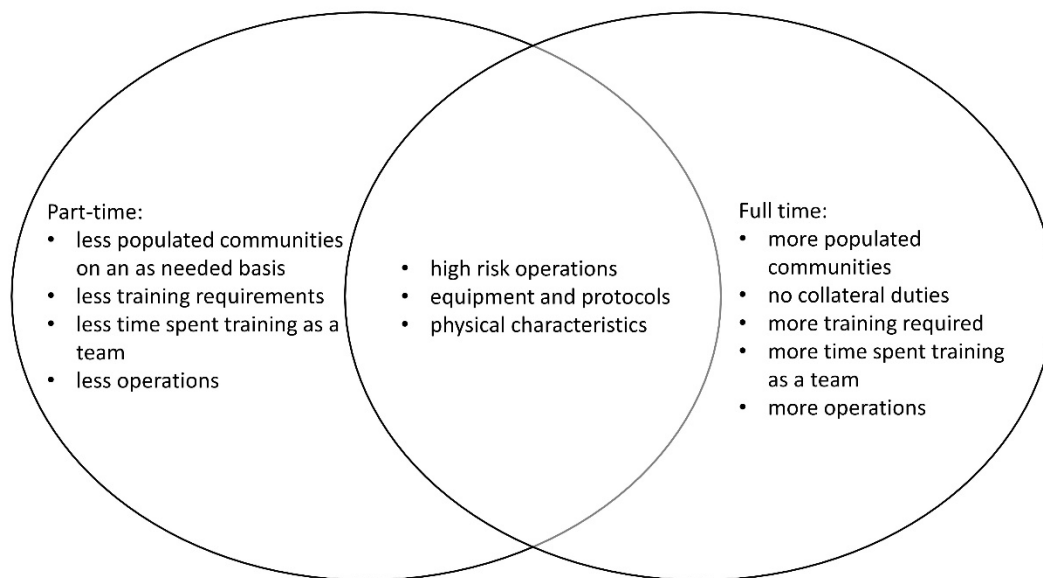


Figure 1: Differences and similarities between part-time and full time SWAT operators.

Operations often involve long periods of stillness followed by quick explosive movements that put strain on the body. The training that is currently utilized in SWAT units often does not replicate real life situations, therefore does not create the same level of intensity and physiological strain on the operators [2] ⁱⁱ. This type of abrupt change in the body puts less experienced SWAT team members at an increased risk for injuries during these operations. Reduced training time may increase the risk of injury for part-time operators because they are not as comfortable with the heavy equipment, or the stress put on the body during their drills.

The two most common locations for injuries are the lower back and the upper extremities [3] ⁱⁱⁱ. SWAT operators typically carry around heavy equipment such as shields, breaching equipment, and body armor. This added weight can become detrimental to the spinal column and result in chronic pain [4] ^{iv}. SWAT operators can also find themselves in situations where they must use self-defense or carry an injured or unconscious person which can add intense load to the spinal column. These movements and demand for fast reaction time can easily result in miscalculated movements and elevated risk for strains and sprains [5] ^v. These injuries are more prevalent in the upper extremities due to the heavy loading and explosive movements when having to utilize a firearm [6] ^{vi}.

SWAT operators train to prepare for the maximal physical exertion they will need in the field, but this is more difficult for part-time teams. Traditionally, PT operators have split duties, whereas FT operators can solely focus on SWAT, whether in training, or on live operations. This can be a disadvantage for the PT operator, who may have less time to dedicate to SWAT, or is having to split their physical training focus between two different roles. Training is designed to improve body mechanics and preparedness for operator tasks, and with less training, the operator potentially moves with reduced efficiency and has a higher risk of injury. There is also a tendency for law enforcement officers to overwork their bodies. Overuse is the third highest reason for injuries and reported around 7% of all injuries by Workers Compensation from the years of 1980 to 2008 [7]^{vii}. There are also several lifestyle choices that could affect the risk of injuries for SWAT operators. The situations SWAT operators are placed in are intense and stressful. This stress is not only psychological, but physiological and can become a burden on the body that leads to errors that may result in injury or even death [8]^{viii}. Research suggests that younger SWAT operators are at a greater risk for injury than older, more experienced operators [9]^{ix}. This could be from a lack of experience and not being equipped for the field or a problem with over ambitiousness. There is also more risk with lower ranked positions because they get more in field experience [10]^x.

Previous literature provides insight into common areas of injury in SWAT operators, but there is limited information comparing injury sites and length of injury between FT SWAT operators to PT SWAT operators. The purpose of this study was to examine differences in pain and injury locations and average length of injury time between PT and FT SWAT operators. It is expected to see a difference in locations between PT and FT SWAT team operators with a bigger emphasis on lower extremities and acute injuries in PT and back pain and chronic injuries in FT operators.

Methods

Study Design

This was a retrospective analysis of deidentified survey data obtained from a company that initially acquired the information for training courses conducted with SWAT operators. Data were deidentified by a member of the group conducting the training. This study was approved by the Sam Houston State University institutional review board as exempt.

Participants

SWAT operators from Texas and Oklahoma who participated in courses related to strength and conditioning training and marksmanship training were included in the study. Those who did not complete the survey in full were excluded from the study ($n = 5$). Female operators were excluded from the study as well ($n = 3$) due to low n -size. Operators completed the survey at the course's onset, prior to any didactic or experiential instruction. Operators self-reported whether they were members of a FT team ($n = 24$) or PT team ($n = 48$).

Measurements

Participants completed an online survey after completing check-in for the training course. The survey included questions related to participant demographics (e.g., height, weight, age), experience in SWAT and law enforcement, physical and marksmanship training, and injuries. The six questions and associated response options related to injury history were:

1. How many injuries have you sustained during your career in law enforcement special operations?
 - Responses: none, one, two, three, four, five, six, eight, ten
2. How many areas have you sustained long term discomfort/pain for an extended period (greater than 3 months at a time) while in law enforcement special operations?
 - Responses: none, one, two, three, four, five, six, eight
3. Which top 3 areas on the body have you sustained the greatest number of injuries while in law enforcement special operations?
 - Responses: elbow, knee, ankle, lower back, shoulder, head, wrist, hand, hip (side), hip (rear/glut), fingers, upper back, neck, hamstrings, calves, toes, hip (front/hip flexor), foot, latissimus dorsi, pectoralis major, trapezius, biceps brachii, quadriceps
4. During your time in law enforcement special operations from the injuries listed above, what is the longest over an extended period of time, that you have suffered an injury?
 - Responses: < 1 month, 1-6 months, 6-12 months, > 1 year
5. Of the total number of injuries, you have sustained in your career, approximately what percentage did you seek out help from a medical professional? For example, going to see a physician, physical therapist, chiropractor etc.?
 - Responses: none, 1-24%, 25-50%, 51-75%, 76-90%, > 90%
6. Of the total number of injuries, you have sustained in your career, approximately what percentage of the above noted injuries were sustained while on a live operation?
 - Responses: none, 1-24%, 25-50%, 51-75%, 76-90%, > 90%

Statistical Analysis

Descriptive statistics were calculated for PT and FT operators. Dependent variables were frequency of injury, frequency of care sought for injuries, if injuries were sustained on a live operation, number of long-term injuries (> 3 months), and duration of the injury. A Shapiro-Wilk test determined that continuous data were not normally distributed, thus all data were analyzed for group differences using a Mann-Whitney U test. An alpha level of 0.05 was used to determine group differences. Eta-squared effect sizes (ES) were calculated for each test and interpreted as small effect (0.010-0.039), moderate effect (0.040-0.139), and large effect (> 0.140) [11]^{xi}. A simple frequency distribution was used to compare specific injury areas between groups. No inferential statistics were conducted for these questions. All data were analyzed using SPSS version 27.0 (IBM, Armonk, NY)

Results

There were no differences between groups for mass (FT: 87.9 ± 21.9 kg, PT: 91.6 ± 13.1 kg, U = 833.5, p = 0.492, ES = 0.131), height (FT: 171 ± 37 cm, PT: 179 ± 9 cm, U = 663.0, p = 0.298, ES = 0.015), or age (mode FT: 26-30 years, mode PT: 31-35 years, U = 650.0, p = 0.358, ES = 0.011). Effect sizes for mass and age were small, but the effect size for height was moderate.

Differences between groups were shown for number of injuries sustained during SWAT career in which the operator sought care from a medical professional (U = 366.0, p = 0.009, ES = 0.087, Figure 2A) and the number of injuries sustained during a live operation (U = 379.0, p = 0.008, ES = 0.077, Figure 2B). The mode response for seeking medical assistance for both groups was 1-24%, but FT operators tended to report more injuries needing medical care than PT operators. The mode response for percentage of injuries sustained on a live operation were 1-24% for FT operators and none for PT operators. These effect sizes were interpreted as moderate. There were no differences between FT and PT in reporting the number of injuries sustained during their SWAT career (FT: 3.1

± 2.5 , PT: 2.4 ± 2.2 , $U = 479.0$, $p = 0.238$, $ES = 0.019$, Figure 2C), the number of body areas that have sustained long-term discomfort during their SWAT career (FT: 2.6 ± 2.3 , PT: 1.9 ± 1.8 , $U = 448.5$, $p = 0.120$, $ES = 0.032$, Figure 2D), or the longest time period of suffering an injury during their SWAT career (median response both groups 1-6 months, $U = 471.0$, $p = 0.187$, $ES = 0.022$, Figure 2E). These effect sizes were all small.

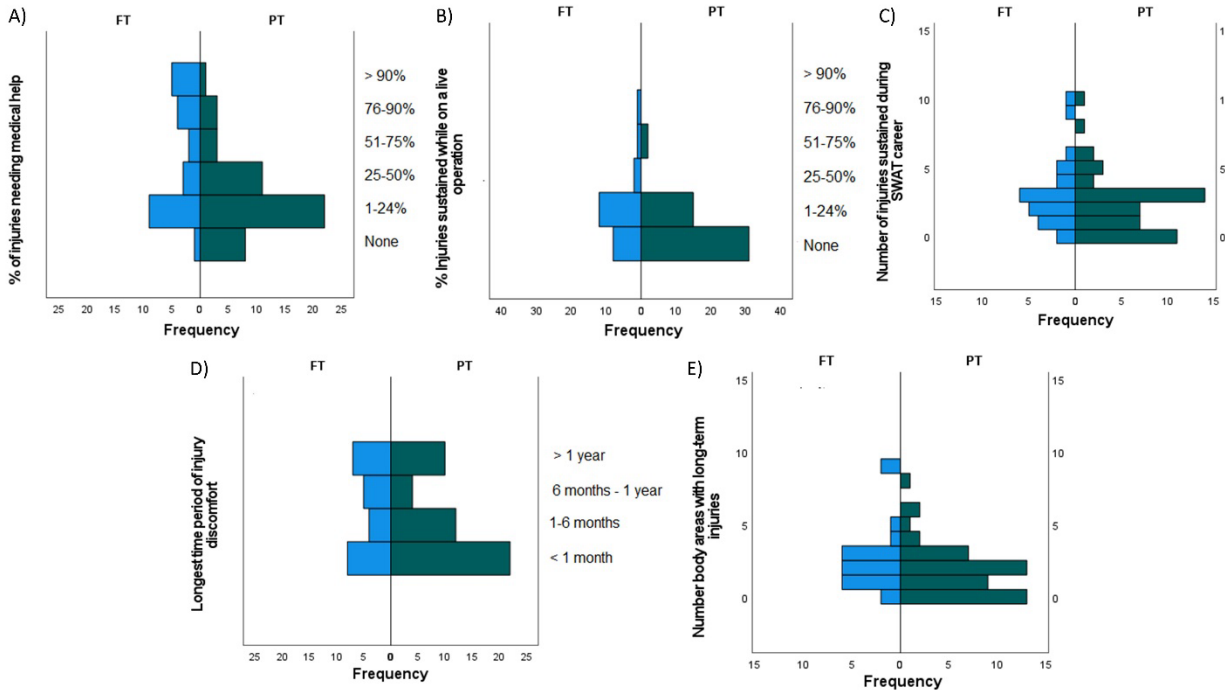


Figure 2: A) Frequency of responses from full-time (FT) and part-time (PT) operators for percentage of injuries in which they sought care from a medical professional. B) Frequency of responses from full-time (FT) and part-time (PT) operators for percentage of injuries sustained while on a live operation. C) Frequency of responses from full-time (FT) and part-time (PT) operators for number of injuries sustained during their tactical career. D) Frequency of responses from full-time (FT) and part-time (PT) operators for longest duration of discomfort from an injury. E) Frequency responses from full-time (FT) and part-time (PT) operators for number of body areas that sustained long-term injuries (> 3 months).

Table 1 shows the distribution of the top three body areas in which operators reported having sustained an injury in both raw values and as a percentage. The percentages are shaded to reflect higher incidences in red, lower incidences in green, and those in the middle are in white. The top three areas for FT were lower back (25%), shoulder (15.6%), and elbow (10.9%). The top three areas reported for PT operators were lower back (24.4%), knee (12.2%), and shoulder (11.4%). Knee and neck tied for fourth (6.3%) for FT operators and elbow was the fourth highest incidence of injury for PT operators. Overall, there was very little difference between groups in body areas affected by injury.

Table 1: Frequency and percent distribution of body areas affected by injury in full-time (FT) and part-time (PT) operators. Red boxes indicate areas of higher relative frequency and green indicates areas of lower relative frequency.

	FT	% FT	PT	% PT	Total	% Total
Elbow	7	10.9	10	8.1	17	9.1
Knee	4	6.3	15	12.2	19	10.2
Ankle	2	3.1	4	3.3	6	3.2
Quads	2	3.1	0	0.0	2	1.1
Lower back	16	25.0	30	24.4	46	24.6
Shoulder	10	15.6	14	11.4	24	12.8
Wrist	1	1.6	4	3.3	5	2.7
Hand	0	0.0	2	1.6	2	1.1
Head	2	3.1	4	3.3	6	3.2
Hip (side)	2	3.1	3	2.4	5	2.7
Hip (rear/glut)	1	1.6	2	1.6	3	1.6
Fingers	1	1.6	2	1.6	3	1.6
Upper back	2	3.1	3	2.4	5	2.7
Neck	4	6.3	6	4.9	10	5.3
Biceps femoris	0	0.0	3	2.4	3	1.6
Gastroc	2	3.1	2	1.6	4	2.1
Hip (front/hip flexor)	3	4.7	6	4.9	9	4.8
Lats	1	1.6	1	0.8	2	1.1
Trapezius	0	0.0	2	1.6	2	1.1
Foot	2	3.1	3	2.4	5	2.7
Pec major	1	1.6	2	1.6	3	1.6
Traps	1	1.6	1	0.8	2	1.1
Triceps brachii	0	0.0	2	1.6	2	1.1
Toes	0	0.0	2	1.6	2	1.1
TOTAL	64	100	123	100	187	100

Discussion

This study examined the differences in pain and injury locations and average length of injury time between PT and FT SWAT operators. The results showed that PT sustained more injuries while in live operations than FT operators, and that there is a lack of SWAT operators seeking medical attention. There were no other differences between PT and FT for the number of injuries sustained during their tactical career, the longest duration of discomfort from an injury, and number of body areas that sustained long-term injuries.

The first noted difference between PT and FT was that PT was less likely to seek medical attention for their injuries compared to FT. One possible reason for the difference is that PT have less discretionary time to seek medical attention. SWAT operators deal with unpredictable schedules making it hard to fit in doctor's appointments. The second difference is the frequency of injuries sustained while undergoing a live operation. FT is more likely to become injured than PT because they are likely going on more operations and have increased exposure. This could also be due to the

possibility that if an injury were to occur the possibility of the same area being injured again is high. FT would be more likely to seek medical attention because their schedules are more predictable (barring an emergency operation), and they are more likely to have a reoccurring injury.

There are differences in how PT and FT are structured, but at the same time they are very similar in the ways they do their job. Entrance exams vary by department, but PT and FT units typically are given the same equipment, must follow the same protocols, and are expected to perform the same task in the field. Law enforcement is made to fit certain physical characteristics and a certain fitness level, and if these officers cannot meet these requirements, they become a risk [12]^{xii}. The data showed no significant difference for the number of injuries sustained during their career. Injuries are prone to happening when the body is put in intense situations that are not within our normal scope. Both PT and FT operators put their bodies through these tough and quick situations that do not allow their body to react with correct body mechanics which increases the risk of injuries [13]^{xiii}. There was no difference between PT and FT with the duration of discomfort from an injury. This study also showed operators rarely seek medical professionals' help, so it is difficult to keep track of when injuries started and how long they lasted. SWAT operators are willing to work through their injuries and may pass it off as "not a big deal" so they do not appear "weak" or run the risk of disappointing their unit [14]^{xiv}. The culture of SWAT may drive this decision more than the injury itself. This makes it hard to tell the duration of their injuries as they usually rush their recovery, because they are working as a team and missing one person could affect the way they work. There was no difference between FT and PT for the number of body areas that sustained long term injuries. A long-term injury in this study was anything over three months. With the lack of medical professional help and their desire to get back into the field, SWAT operators are putting themselves at risk of having a reoccurring injury [15]^{xv}. This applies to both PT and FT SWAT operators because they are both passionate about their careers and are willing to put their health to the side to continue working [16]^{xvi}.

Injury frequencies throughout various areas of the body were collected. These data help to identify the body parts that are at the highest frequency risk of injuries and which body parts are at the lowest. These data can help operators take precautionary measures to areas of high frequency to help prevent injuries from occurring. PT and FT both had the highest frequency of injuries in the lower back. This is consistent with previous literature and is likely due to carrying heavy equipment and prolonged sitting followed by maximal exertion movements while in live operations. The heavy equipment can also change gait patterns and affect posture which could lead to referral pain through other parts of the body [17]^{xvii}. PT and FT also shared the second highest frequency of injuries to the shoulders, which is due to carrying heavy equipment and the heavy body armor sitting near the shoulder joint [18]^{xviii}. Elbows and knees were the third and fourth ranked most frequently injured body areas for FT but were inversed for PT. Elbows were a high frequency injury area due to the fact of increased amounts of firearms training, carrying heavy equipment (specifically overuse in the grip), and either changing body positions in extreme situations, or holding a firearm for long periods of time. Upper extremity strains and sprains account for most injuries seen in law enforcement [19]^{xix}. Knees are also a concern for injury and show a high frequency because of prolonged sitting followed by maximal exertion movements and carrying heavy equipment [20]^{xx}. They also put themselves at risk for post-traumatic knee osteoarthritis after having a knee injury [21]^{xxi}. Other areas of the body had low relative frequency in both PT and FT compared to the ones already discussed.

This study provides a general concept of injuries incurred by both PT and FT SWAT operators. The study design required the participants to retrospectively evaluate and self-report injuries over their career. This data should be viewed as exploratory because of the potential error associated with retrospection. Law enforcement agencies should consider gathering real-time data of injuries in

SWAT operators to evaluate the need for improving access to healthcare providers and the cost related to untreated chronic injuries. Future evaluation should also include the type of healthcare sought (e.g., physical therapist, family practitioner, orthopedic, chiropractor). A strength of this study is that these data were collected from SWAT operators across several agencies from urban, suburban, and rural areas within Texas and Oklahoma. This enhances the external validity of these data.

Conclusion

FT operators experienced more serious injuries than PT operators on and off duty and were more likely to seek medical attention. This information will help create a partnership between medical professionals and SWAT operators to prevent injuries. Hopefully with this partnership there will be a decrease in injuries because medical professionals can help improve body mechanics and provide more reasoning on why these injuries are happening. Ideally this should help to reduce injuries from reoccurring, which can decrease recovery time and decrease the number of days off work. The results also showed that SWAT operators do not seek medical attention as often as they should for the number of injuries reported. An important next step in the field of study is to understand what caused operators to seek medical attention and what is holding back the others from getting help.

Acknowledgments

None

Disclosures

None.

Authors

Kaylee Fredella,
Department of Kinesiology, Sam Houston State University, Huntsville, TX

Jackeline Rodrigues
Department of Kinesiology, Sam Houston State University, Huntsville, TX

Matthew Wagner
Department of Kinesiology, Sam Houston State University, Huntsville, TX

Jake Labhart
In Extremis Performance, McKinney, TX

Jennifer A. Bunn¹
Department of Kinesiology, Sam Houston State University, Huntsville, TX
1901 Ave I, Box 2301, Huntsville, TX 77341
jab229@shsu.edu

*Corresponding author.

References

- [1] J Jay Dawes, C Elder, L Hough, D Meltrose, M tierli. "Description of selected physical performance measures and anthropometric characteristics of part and full time special weapons and tactical teams." *Journal of Australian Strength & Conditioning* 21, no. 2 (2013): 52–58.
- [2] Neal R. Glaviano, Michelle C. Boling, and John J. Fraser. "Anterior knee pain risk in male and female military tactical athletes." *Journal of Athletic Training* 56, no. 11 (2021): 1180–87.
- [3] Kate Lyons, C Radburn, R Orr, R Pope. "A profile of injuries sustained by law enforcement officers: A critical review." *International Journal of Environmental Research and Public Health* 14, no. 2 (2017).
- [4] Jason Williams and Vincent Ramsey. "The need for law enforcement wellness interventions: A critical review.", *Sport Journal*, 7, (2017): 2.
- [5] Lyons et al. "A profile of injuries sustained by law enforcement officers: A critical review."
- [6] Riana R Pryor, D Colburn, M Crill, D Hostler, J Suyamal. "Fitness characteristics of a suburban special weapons and tactics team." *The Journal of Strength & Conditioning Research* 26, no. 3 (2012): 752-757.
- [7] Alfreda Holloway-Beth, L Forst, S Freels, S Brandt-Rauf, L Friedman. "Occupational injury surveillance among law enforcement officers using workers' compensation data, Illinois 1980 to 2008." *Journal of Occupational and Environmental Medicine* 58, no. 6 (2016): 594-600.
- [8] Pryor et al. Fitness characteristics of a suburban special weapons and tactics team."
- [9] R Morin, L Parker, R Stepler, A Mercer. "Behind the badge.", 2017; Tiesman et al. "Nonfatal injuries to law enforcement officers: A rise in assaults."
- [10] H Tiesman, M Gwilliam, S Konda, J Rojek, S Marsh. "Nonfatal injuries to law enforcement officers: A rise in assaults."; Morin et al., 'Behind the Badge'.
- [11] J Cohen, *Statistical Power Analysis for the Behavioural Science (2nd Edition)*, *Statistical Power Analysis for the Behavioral Sciences*, 1988.
- [12] "Healthy Police Officers Are Cost-Effective Police Officers." (1985)
- [13] Tiesman et al. "Nonfatal injuries to law enforcement officers: A rise in assaults."
- [14] D Maupin, E Canetti, B Schram, R Lockie, J Dawes, J Dulla. "Profiling the injuries of law enforcement recruits during academy training: A retrospective cohort study." 14 (2022): 136.
- [15] Ibid.
- [16] Brianna Larsen, Brad Aisbett, Aaron Silk. "The injury profile of an Australian specialist policing unit." *International Journal of Environmental Research and Public Health*. Vol. 13, no. 4 (2016): 370.

- [17] Robin M Orr, V Johnston, J Coyle, R Pope. "Reported load carriage injuries of the Australian army soldier." *Journal of Occupational Rehabilitation* 25, no. 2 (2015): 316–22.
- [18] Lyons et al. 2017; Maher et al. 2022; Pryor et al. 2012
- [19] B Larsen, B Aisbett, A Silk. "The injury profile of an Australian specialist policing unit." Lyons et al. "A profile of injuries sustained by law enforcement officers: A critical review."
- [20] Glaviano, Boling, and Fraser. "Anterior knee pain risk in male and female military tactical athletes."
- [21] Daniel I Rhon, Katheryne G Perez, Susan L Eskridge. "Risk of post-traumatic knee osteoarthritis after knee injury in military service members." *Musculoskeletal Care* 17, no. 1 (2019): 113–19.