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Effects of Technique and Dummy Mass on Law Enforcement-Specific Body Drags: Testing and Training Implications

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ABSTRACT

International Journal of Exercise Science 17(4): 1235-1249, 2024. Current law enforcement body drag tests may use dummy masses that are underweight compared to current population norms. This study aimed to determine differences in 74.84-kg and 90.72-kg body drag times when performed with a standard (pick up and stand with dummy prior to dragging), adapted (incorporation of time to lift dummy to standing), and preferred (drag with any technique) technique. Forty-three (24 males, 19 females) physically-active, healthy civilians (surrogate population for police recruits) completed drags over 9.75 m with 74.84-kg and 90.72-kg dummies using the three techniques previously stated. A 2 (mass) x 3 (technique) within-factorial ANOVA ($p < 0.05$), with Bonferroni post hoc, derived any dummy and technique differences. Thirty-five participants completed all the standard and adapted drags; all participants completed the preferred drag. There were significant main effects for dummy mass ($F_{(1,34)} = 14.762$, $p < 0.001$) and technique ($F_{(2,33)} = 23.272$, $p < 0.001$). Participants dragged the 74.84-kg dummy faster than the 90.72-kg dummy. The standard drag was completed faster than the adapted and preferred drags ($p < 0.001$). The adapted drag was completed faster than the preferred drag ($p = 0.024$). Even if a recruit is assessed with a lighter dummy, they need the capacity to perform heavier drags in the field. Activity-specific strength training during academy could aid this process. Though the time was slower, the adapted technique may offer information the standard technique does not as it includes the lifting portion of the drag. The preferred technique allowed all participants to complete the task, which could influence the drag techniques allowed if agencies increase testing dummy masses.

KEY WORDS: Casualty drag, occupational testing, police, tactical, victim drag

INTRODUCTION

A body drag, also known as a victim or casualty drag, typically requires an officer to rapidly drag an incapacitated person to safety from a hazardous environment. Officers may also be required to drag a subject who is resisting arrest (22). Dragging tasks have been recognized as being an essential part of the job for law enforcement officers (22). Krueger and Chan (22) led

research conducted for the State of California Commission on Peace Officer Standards and Training (POST), which included a survey sent to more than 5,000 officers across different law enforcement agencies. In response to questions about dragging tasks, 39% of respondents stated they were required to drag a person two times during the past two years, and 36% of these incidents were handled without assistance. Krueger and Chan (22) reported that in 88% of cases the typical distance a person was dragged by the officers was less than 10.67 meters (m), or 35 feet.

As a result of the importance of body drag tasks, law enforcement agencies may assess the ability of a recruit to complete a drag before they graduate academy. There are also some agencies that include a body drag task as part of their entry fitness standards (1, 16), although a body drag is more often completed as part of an exit examination after specific training. Dragging tasks may be completed as part of a larger obstacle course (4, 9, 11), or as an event tested by itself (25, 26, 31). A body drag completed as an individual, discrete event is what occurs within the Work Sample Test Battery (WSTB), which is administered in the state of California under the auspices of POST (36). For the body drag completed in the WSTB, recruits are required to wrap their arms underneath the arms of a 74.84-kg dummy and lift it to standing by extending the hips and knees (24-27, 29-31, 33, 36). Once standing with the dummy, recruits can commence the 9.75-m drag, which must be completed within 28 seconds (s) (29, 36). Recruits typically get 1–2 attempts to attain this standard (36).

Due to the dynamic nature of emergency situations, it would impossible to design a body drag test which encapsulates all the physical characteristics necessary in every situation. A degree of control over testing conditions is also required to ensure reliability and validity of the test. For instance, some control is exercised within the WSTB body drag as time does not commence until the recruit is standing with the dummy (25, 26, 31, 36). Depending on the strength of the recruit there may be differences in the time to pick up the dummy and stand in the ready position. However, this has not been quantified in the scientific literature. Moreover, these testing constraints might not reflect real world rescuing conditions encountered by officers, especially in situations where it would be disadvantageous to complete a drag from a standing position. There should be some consideration given to technique required to move that body mass in law enforcement testing and training, especially if different techniques could still result in an effective drag. Technique considerations for dragging tasks becomes more notable when accounting for the range of body masses present in the USA general population (14, 15, 29).

The mean body mass of the men and women in the general population of the USA has been increasing over the years (14, 15). Changes in obesity (5) and physical activity (6) rates have contributed to these demographic changes, which have important implications for law enforcement personnel. Indeed, Fryar et al. (15) documented that the mean age-adjusted body mass of men in 2015–2016 was 89.8 kg, up from 85.9 kg in 1999–2000. In women, Fryar et al. (15) stated that the mean age-adjusted body mass was 77.4 kg in 2015–2016, an increase from 74.3 kg in 1999–2000. Consequently, the dummy mass used in the WSTB, and other occupational tests, may not be representative of the current USA population (22, 24, 29, 30). Indeed, the current dummy mass of 74.84 kg is closer to what an adult male weighed in the 1960s (39). In addition

to this, the weight of the 74.84 kg dummy corresponded with the average body mass of people dragged as reported by officers in a job task analysis conducted in 1983–84 (22). In their survey data, Krueger and Chan (22) noted that 55.5% of officers reported that people they had to drag weighed from 72.57–90.72 kg. If an officer were to drag one of their colleagues, a body drag could be even more challenging. Incumbent male law enforcement officers have been found to have a body mass of 89–96 kg, while female officers weighed 67–77 kg (8, 10, 32). These masses do not include additional load worn by a police officer, who may have to carry an added 8–22 kg of equipment depending on their occupational responsibilities (3, 21). Accordingly, officers may be required to drag a colleague weighing upwards of 120 kg with their equipment. This suggests that recruits should be assessed in their ability to move heavier loads.

There is reticence to increase the mass of a dummy used during a body drag test for police for several reasons, including potential increases in test failure rates and injury risk (29, 30). However, strength development should be beneficial to body drag ability (24, 30), with Lockie et al. (30) suggesting a potential minimum required isometric strength of 100 kg in a leg/back dynamometer for the 74.84-kg body drag. Another consideration is that recruits (and officers) may be able to perform drags with heavier masses if they could use whatever technique they felt allowed them to perform the task successfully. In order to provide information to law enforcement agencies regarding testing or training relative to body drags, it is worth investigating how different techniques could influence body drag performance with a 74.84-kg dummy, the mass often used in law enforcement testing (24-27, 29-31, 33, 36), and a heavier dummy more representative of actual body drags they may need to perform. For example, a 90.72-kg dummy could be used, which is closer in mass to mean values from the general population (14, 15) and police officers (8, 10, 32).

Therefore, the purpose of this study was to investigate the effects of using different techniques on body drag performance with 74.84-kg and 90.72-kg dummies. This research used physically active and healthy male and female civilians as surrogates for a tactical population (24, 37, 38, 40). A 74.84-kg dummy was incorporated as it is often used in law enforcement occupational testing (24-27, 29-31, 33, 36). The 90.72-kg dummy was utilized as it was a mass representative of the current USA population (14, 15) and police officers (8, 10, 32). The standard technique was used (24-26, 29-31, 33, 36), where time was recorded after the participant was standing with the dummy. An adapted technique was also measured, where the time to pick the dummy from the ground to standing was included in the body drag time (24). The third approach used a preferred technique where participants were instructed to use any technique where they felt they could complete the drag. It was hypothesized that drags with the 90.72-kg dummy mass would be performed more slowly than drags with the 74.84-kg dummy mass. It was further hypothesized that the standard technique would result in the fastest body drag time for both dummy masses, as the time taken to lift the dummy to a standing position was not included in the time. However, it was also hypothesized that more participants would be able to complete the drag, especially for the 90.72-kg mass, when using their preferred technique.

METHODS

Participants

A sample of convenience using 43 participants (age = 24.14 ± 3.04 years; height = 1.74 ± 0.10 m; body mass = 77.31 ± 16.45 kg), consisting of 24 males (age = 24.38 ± 3.82 years; height = 1.80 ± 0.09 m; body mass = 85.99 ± 16.08 kg) and 19 females (age = 23.84 ± 1.68 years; height = 1.67 ± 0.06 m; body mass = 66.33 ± 8.59 kg) were recruited for this study. Similar to previous studies, physically active and healthy civilians were used as surrogates for a tactical population (24, 37, 38, 40). Specific inclusion criteria, which was self-reported by the participants, included: age between 18–40 years; currently completing the minimum recommended physical activity for cardiorespiratory and musculoskeletal fitness as described by the American College of Sports Medicine (17); and did not have any existing medical conditions (i.e., musculoskeletal injuries) that would compromise study participation. Exclusion criteria included: an age outside the specified range; not currently physical active; and the presence of an existing medical condition that compromised study participation. Participants completed a physical activity readiness questionnaire, but medical history was not recorded. The use of civilians allowed for the recruitment of males and females with different physical capacities (38). Previous research has demonstrated minimal learning effects with military-style drags (13). In the context of this study, this means that even for participants who were not law enforcement recruits or personnel, they should perform the body drag with consistency across different trials. This was important, because for consistency no participant had been previously involved with any form of law enforcement training. The study was approved by the university Institutional Review Board (HSR-18-19-109**)**. All participants received a clear explanation of the study, including the risks and benefits of participation, and written informed consent was obtained prior to testing. The study followed the ethical guidelines set forth by the editorial board for the *International Journal of Exercise Science* (34).

Protocol

The procedures for this study were adapted from Lockie et al. (24). Three testing sessions were used per participant, separated by 48–72 hours depending on participant availability. Participants refrained from intensive lower-body exercise and maintained their normal dietary intake in the 24-hour period prior to each testing session. During the first testing session, the participant signed the informed consent form and had their age, body height, and mass recorded. Height was measured using a portable stadiometer (Detecto, Webb City, MO, USA). Body mass was recorded by electronic digital scales (Ohaus, Parsippany, NJ, USA). The participants then completed a standard dynamic warm-up, which was also completed on the second and third testing sessions. Participants cycled for 5 minutes at a self-selected intensity on a bicycle ergometer, before completing approximately 10 minutes of dynamic stretching. After the warm-up, participants completed jump and strength tests that were not considered within the current study. Following these activities, participants were familiarized to the techniques required for the 74.84-kg and 90.72-kg body drags by completing practice trials as needed. In testing sessions 2 and 3, participants completed the body drags with either the 74.84-kg and 90.72-kg dummies. Which dummy was used during each session was counterbalanced amongst the participants (24). The body drags were completed in an indoor gymnasium with a

wooden floor with adhesive tape marking the start and finish lines for the 9.75 m dragging distance.

The methods for the current study were adapted from Lockie et al. (24). A 74.84-kg dummy and 90.72-kg dummy (Dummies Unlimited, Pomona, CA) was utilized for dragging. The structure for each testing session was that on a day with a single dummy, each participant completed two trials of the standard, adapted, and preferred drag technique for a total of 6 trials in one day (2 trials x 3 drags). The drags were completed in this order for all participants, with 3 minutes rest provided between trials. Dummies were always positioned face side up, with the head orientated towards the finish line, and the feet 0.3 m behind the starting line. In all trials, participants dragged the dummy as quickly as possible by walking backwards over the required distance. Time was recorded via a stopwatch by a researcher trained in the use of stopwatch procedures (26, 32, 33). Previous research indicates that testers trained in the use of stopwatch timing procedures for fitness tests can record reliable data (19). Time for all trials was recorded to the nearest 0.10 s. Additionally, timing procedures were checked with three participants across multiple trials versus time quantified by a video recording (Apple, Cupertino, CA). The analysis involved intra-class correlations, which showed that the stopwatch timing agreed with the video recording (r = 0.986, single measure = 0.983, average measure = 0.992, p < 0.001).

The standard drag start followed established procedures used in law enforcement testing (24-27, 29-31, 33, 36). Participants were required to squat down and pick up the dummy by wrapping their arms underneath the arms of the dummy and lifting it to a standing position by extending the hips and knees (Figure 1). Once standing with the dummy, the participant informed the tester they were ready. Then, the participant dragged the dummy backwards, with time not starting until the dummy's feet crossed the start line. Time was stopped when the dummy's feet crossed the finish line.

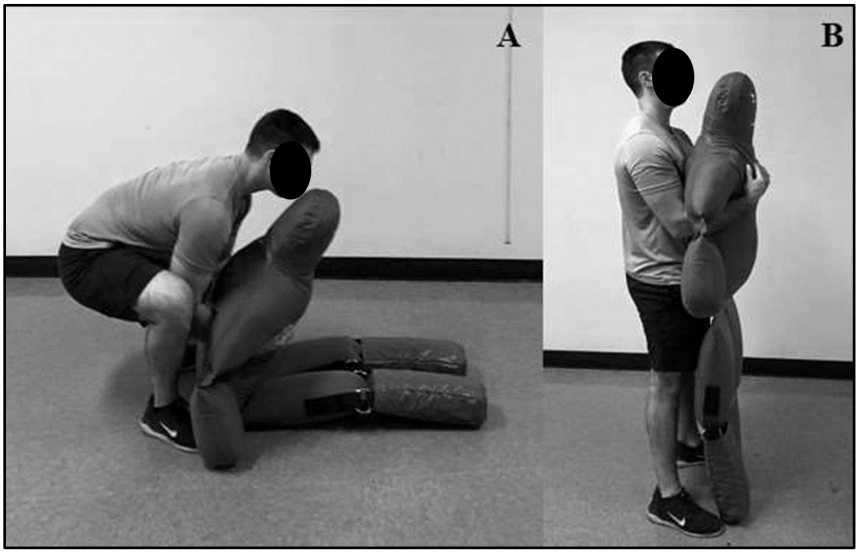

Figure 1. Lifting (A) and ready (B) position for the standard body drag.

The second method, referred to as the adapted drag start, involved the same methods as the standard start except that the participant began by standing behind the dummy. The researcher gave the participant a 3-s countdown. As soon as the countdown finished and the researcher stated "Go!", participants were to squat down, grip the dummy in the same manner as the standard drag (24-27, 29-31, 33, 36), and commence dragging. Timing commenced on the "Go!" command. The difference between the standard and adapted drag was that in the standard start, the lifting portion was not timed. In contrast, in the adapted drag, timing started immediately. Timing stopped when the dummy's feet crossed the finish line after the drag.

For third condition, the preferred technique, participants were instructed to drag the dummy in whatever manner they preferred (i.e., they did not have to pick up and stand with the dummy; they could just drag it from the ground). The researcher told the participant they should select a technique that they perceived would allow them to drag the dummy as fast as possible over the 9.75-m distance. For participants who were not able to stand with the dummy, they could just use a method where they dragged the dummy from the ground. Participants were not allowed to grasp the head, legs, or lift the dummy over their shoulders; it had to be some form of the drag. As for the adapted technique trials, participants were positioned behind the dummy, and the researcher gave a 3-s countdown before stating "Go!" to initiate the trial and timing. As for the other conditions, timing stopped when the dummy's feet crossed the finish line.

Statistical Analysis

Statistical analyses were processed using the Statistics Package for Social Sciences (SPSS) Version 29.0 (IBM Corporation, New York, USA). The body drag has been recognized as a valid test for law enforcement, and the procedures used in this study have acceptable reliability (test-retest $r = 0.74–0.86$) (18). Means and standard deviations (SD) were produced for all drag trials. The number of participants who could successfully complete all drags was noted, as well as the type of drag technique used for the preferred drag. A 2 (mass) x 3 (technique) within-factorial analysis of variance (ANOVA) was used to determine any interactions between the different dummy masses and drag techniques. Significance was set as $p < 0.05$. If there was a significant F value, post hoc analyses was conducted using a Bonferroni adjustment for multiple comparisons. Only participants who could complete all the standard and adapted drags were included in the within-factorial ANOVA. As will soon be detailed, 35 participants were included in the ANOVA calculations. G*Power software (v3.1.9.2, Universität Kiel, Germany) was used to confirm post hoc that the sample size of 35 was sufficient for a repeated measures, within factors analysis such that data could be interpreted with a small effect level of 0.27 (20), and a power level of 0.80 when significance was set at 0.05 (12). The sexes were combined within the statistical analysis, which has occurred in previous law enforcement-specific research (7, 26, 32).

RESULTS

Descriptive data for participants who could, or could not, complete all drag conditions is shown in Table 1. Thirty-five participants (23 men, 12 women) completed all the standard and adapted drags, while 8 participants (1 man, 7 women) did not. As a result, 35 participants were used for the within-factorial ANOVA. There was no significant interaction between dummy mass and

technique type ($F_{(2,33)}$ = 1.759, p = 0.188, ηp^2 = 0.096). There was, however, a significant main effect for dummy mass ($F_{(1,34)}$ = 14.762, p < 0.001, ηp^2 = 0.303) and technique type ($F_{(2,33)}$ = 23.272, p < 0.001, ηp^2 = 0.585). Participants were able to drag the 74.84-kg dummy 1.45 s faster than the 90.72-kg dummy (p < 0.001; Figure 2). For drag technique (Figure 3), the standard drag was completed faster than both the adapted and preferred drags (both p < 0.001), by 0.84 s and 1.40 s, respectively. The adapted drag was completed 0.57 s faster than the preferred drag (p = 0.024).

Table 1. Descriptive statistics (mean ± SD) for participants who completed the entire drag protocol and participants who could not complete one or more sections (i.e., standard or adapted drags) of the drag protocol.

Variable	Completed (n = 35)	Could Not Complete
Age (years)	24.34 ± 3.27	23.2 ± 1.6 (n = 8)
Height (cm)	1.75 ± 0.10	170.3 ± 9.4 (n = 8)
Body Mass (kg)	79.43 ± 17.11	68 ± 9 (n = 8)
74.84-kg Dummy		
Standard Drag (s)	5.80 ± 1.88	9.33 ± 3.20 (n = 6)
Adapted Drag (s)	6.21 ± 1.65	9.18 ± 1.38 (n = 5)
Preferred Drag (s)	6.87 ± 1.95	13.67 ± 8.12 (n = 8)
90.72-kg Dummy		
Standard Drag (s)	6.74 ± 2.50	14.90 ± 0.00 (n = 1)
Adapted Drag (s)	8.00 ± 3.52	-
Preferred Drag (s)	8.47 ± 3.79	27.25 ± 28.89 (n = 8)

Number of participants for the "Could Not Complete" group included in the mean ± SD calculation for each variable (i.e., participants who could complete that drag but not other drags in the protocol) is detailed in parentheses.

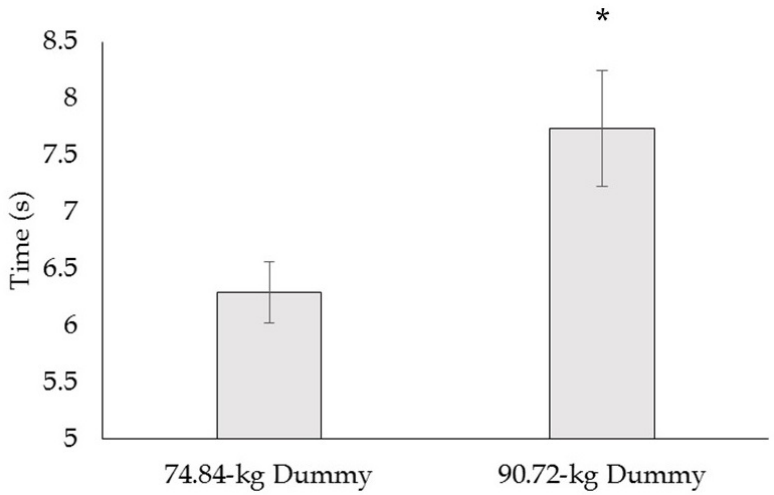

Figure 2. Estimated marginal means ± standard error for the 74.84-kg and 90.72-kg dummies. * = Significantly (p < 0.05) slower than the 74.84-kg dummy.

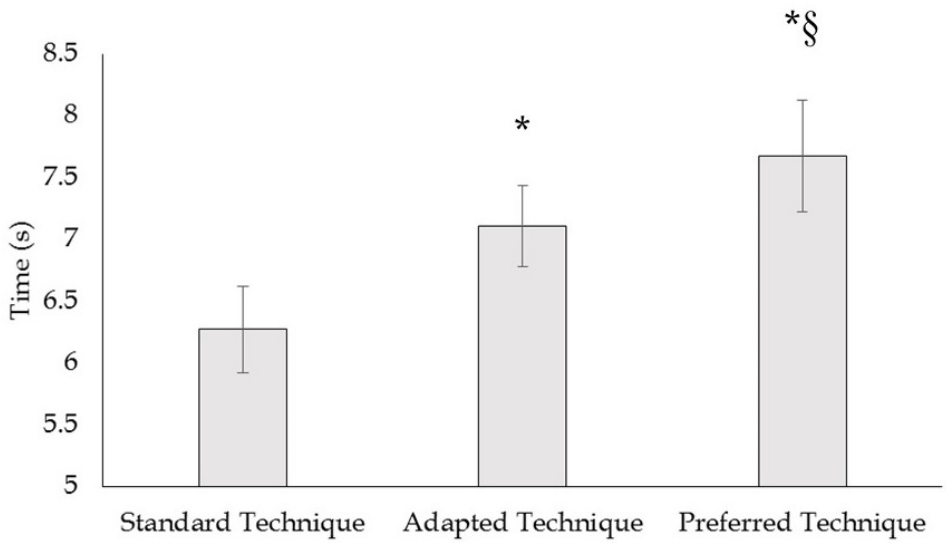

Figure 3. Estimated marginal means ± standard error for the standard, adapted, and preferred techniques. * = Significantly ($p < 0.05$) slower than the Standard Technique. § = Significantly ($p < 0.05$) slower than the Adapted Technique.

The participants were able to choose their own drag for the preferred method. As can be observed in Table 1, this meant that all participants were able to successfully complete the preferred drag with both dummy masses. Table 2 states the various techniques utilized and number of participants that chose to use it, while Figure 4 visually showcases the different techniques. Standard indicates that the participants lifted the dummy in a similar fashion to the standard drag. Mixed involved participants placing one hand prone over the armpit and one hand supine under the opposite armpit. Double over grip was having both hands prone placed under the armpits, and double under was both hands supine under the armpits.

Table 2. Type of holds and number of participants utilizing it for the preferred drag.

Description of grip	Number of participants using for 74.84-kg body drag ($N = 43$)	Number of participants using for 90.72-kg body drag ($N = 43$)
Standard	29	24
Mixed	8	13
Double Over	3	2
Double Under	3	4

Standard: participants lifted the dummy in a similar fashion to the standard drag. Mixed: participants placed one hand prone over the armpit and one hand supine under the opposite armpit. Double Over: both hands prone placed under the armpits. Double Under: both hands supine under the armpits.

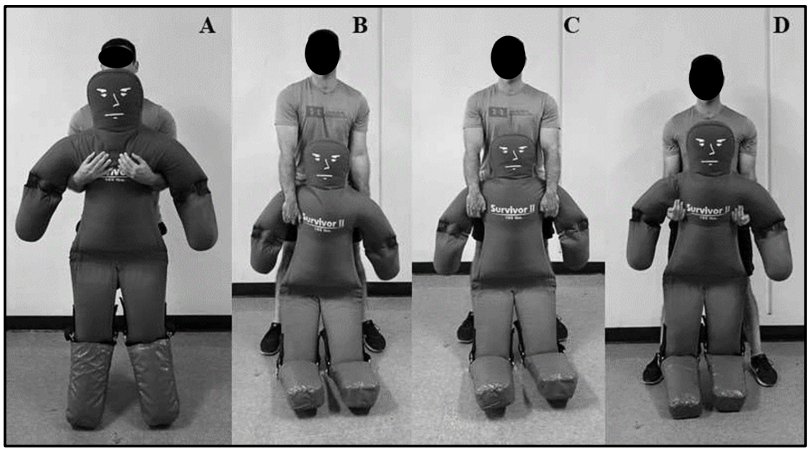

Figure 4. Preferred grips chosen by participants: (A) conventional, (B) mixed, (C) double underhand, and (D) double overhand.

DISCUSSION

The current study investigated the effects of using different techniques (standard, adapted, and preferred) on body drag performance with 74.84-kg and 90.72-kg dummies in physically active and healthy civilians. This study was important as relatively lighter dummies (i.e., the 74.84-kg dummy) are often used in law enforcement testing (24-27, 29-31, 33, 36), which occurs despite demographic changes that indicate the mean body mass of adult men is closer to the 90.72-kg dummy mass (14, 15). It was firstly hypothesized that drags with the 90.72-kg dummy would be performed slower than the 74.84-kg dummy across all drag conditions. As will be discussed, the results indicated that this was the case. Additionally, it was hypothesized that the standard drag would have a faster time than the adapted and preferred drag due to the fact that time did not include the lifting portion of the drag (24-27, 29-31, 33, 36). However, it was expected that even though some participants may not have been able to lift the dummy with the standard or adapted technique, they would be able to drag both masses if they were allowed to self-select a preferred technique. These hypotheses were also supported, which has implications for how drags could be tested and trained in law enforcement personnel in the future.

With regards to dummy mass, the data indicated that across all pooled techniques, drags performed with the 90.72-kg dummy were significantly slower than with the 74.84-kg dummy. The difference was approximately 1.45 s, which shows greater challenges in moving the heavy load. This was expected, due to the extra 15.88 kg present in the heavier dummy. Nonetheless, this data is important to present because of the existence of population increases in mean body mass (14, 15), which is also reflected in police personnel (8, 10, 32). Even if police recruits are not tested on their ability to drag a heavier mass, and indeed many agencies will not want to introduce body drag tests with heavier mass (29, 30), recruits still need the physical capacity to complete this task. It is not unlikely that any members of the general population or police colleagues that an officer would need to drag in the field would be heavier than the dummy mass they have been assessed on prior to academy graduation. These data have implications on the physical training completed by recruits during academy and strength requirements to

maintain fitness for duty across the occupational lifespan. Recruits should complete resistance training to develop their muscular strength during academy (24, 29, 30, 33). Moreover, law enforcement officers should be encouraged, and provided resources, to complete resistance training throughout their career to ensure sufficient strength to complete heavy dragging tasks.

Dragging a heavier mass during a body drag using the standard technique requires lower-body strength and power to initially pick up the dummy before moving with the load (24). Maximal strength training is not always a focus of law enforcement academy programs (28), so some recruits may be lacking in the qualities important for completing heavier body drags when in the field. Even if recruits are not assessed with a heavier mass, they should complete maximal, or near maximal, strength and power training during academy to develop the capacity to perform heavy drags (24, 29, 30, 33). Not doing so could lead to safety issues for officers who are not physically capable of dragging people. In a sample of 191 Californian law enforcement recruits, Lockie et al. (29) detailed all but one could complete the 74.84-kg body drag within the required 28 s prior to academy training. As a result, Lockie et al. (29) suggested that most incoming recruits had the physical capacity and technique to complete the WSTB drag before any specific training, so maximal strength could be developed with appropriate training. It is also interesting to note that all participants who could complete the standard 90.72-kg body drag, were able to do so within the 28-s standard used by POST for the current 74.84-kg body drag (29, 36).

The standard drag method does not account for the time taken to lift the dummy (24-27, 29-31, 33, 36), and thus was expected to have the lowest recorded time. When examining the performance for the different techniques, the data revealed that across pooled dummy masses, the standard drag was faster than the adapted and preferred drags. Specific to the adapted drag, the lifting portion added an extra mean time of 0.84 s. The implication of this finding is that law enforcement agencies that utilize only the standard method, and do not consider how long it may take a recruit to pick up the dummy prior to a drag, may be missing job-relevant information (2). The dynamic nature of on-the-job scenarios for police officers may involve lifting a person to remove them from danger. This result suggests that, while designing a body drag test that encapsulates the various scenarios that might occur poses a significant challenge for agencies, measuring the lifting portion could provide extra information that is useful for police training staff. Even if this is not an official part of an exit (or entry) examination, staff should develop a recruit's capacity to lift and drag a heavier load, as they will likely have to perform this action in the field.

The inclusion of the adapted and preferred techniques was due to these methods including the time to pick the dummy up, and potentially being more occupationally-relevant to the way rescues are conducted in the tactical environment (2, 23). Interestingly, the adapted technique, which was derived from the standard technique except that it included the lifting of the dummy within the performance time, was completed significantly faster than the preferred technique by 0.57 s. These results suggest that for a 74.84-kg or 90.72-kg dummy drag, the fastest way to move the dummy is still to lift it off the ground. However, it should be noted that even though some participants were not able to complete the drag under the standard and adapted

conditions, 100% of participants managed to complete the preferred drag. When some of the technique constraints were removed from the required drag technique, all participants were able to figure out a method to perform the drag. For law enforcement personnel in the field, this would be a requirement of drags they may have to perform. That is, they will need to figure out the best way to perform the drag, regardless of the weight of the person they need to move.

A total of four different techniques were used for the preferred drag: standard, mixed (one hand prone, one hand supinated), double over (both hands prone) and double under (both hands supine). Of these grips, 27.5% of participants chose to use a hold technique other than the standard for the 74.84-kg dummy, and 34.3% for the 90.72-kg dummy. These results suggest that when given a choice, certain participants decided to use a hold technique that may have psychologically seemed easier to perform but resulted in a slower performance compared to the standard version of the drag. However, for those participants who could not perform drags with either dummy, they were able to figure out a method to complete the task. The decisions made by participants likely related to the specific absolute strength qualities of each individual, and their perceived ability to complete the task with the technique they selected. For law enforcement testing, these data may suggest that for recruits with which the standardized technique might not work, the choice of different techniques might allow participants the ability to select a technique more effective for them. Interestingly, when using the preferred technique for both the 74.84-kg and 90.72-kg body drags, 42 of 43 participants (98% of the sample) were able to perform the drags within the 28-s standard for California's POST organization (29, 36). However, this does not preclude the need for strength and lifting technique development in recruits. Strength and technique development are important for maximizing drag performance, in addition to the prevention of injury when lifting and dragging heavy loads, potentially from awkward positions. Research suggests that absolute (as opposed to relative) upper- and lower-body strength should form the basis of this strength training (35). As noted by Orr et al. (35), absolute strength is important in body drags as a law enforcement officer will need to lift a person off the ground and drag the absolute load of the person, which remains extant regardless of the officer's body mass. Again, this emphasizes the need for strength training in law enforcement personnel, from their initial entry into the profession during academy and then throughout their career.

There are study limitations that should be noted. First, the participants were civilians, and not law enforcement personnel. This approach has occurred in numerous tactical studies (24, 37, 38, 40), because of the belief that the physiological requirements needed to perform occupational tasks should be similar regardless of the individual's background (24). Nonetheless, it would be beneficial to recreate the current research with law enforcement personnel as the capacity of civilians compared to law enforcement recruits may be different. As an example, civilians in the study by Post et al. (37), who investigated a law enforcement-specific change-of-direction speed test called the 75-yard pursuit run, were faster in this test compared to law enforcement recruits. Moreover, males and females in this study were lighter than male (~86 kg vs. 89–96 kg) and female (~66 kg vs 67–77 kg) law enforcement personnel (8, 10, 32). This could have affected the data, as body size can affect drag performance (27). As the current civilian cohort was lighter, they would move closer to 100% of their body mass with the lighter load and more than 100%

body mass with the heavier load, as opposed to officers who may move less than 100% of their body mass with the lighter load, but closer to 100% body mass with the heavier load. The methods for this study were based upon testing requirements from one state in the USA (36). Other states and agencies may mandate different lifting techniques, and use different dummy masses, for their drags. Furthermore, when dragging a colleague, officers may be able to use equipment attachments that assist with the drag, such as handles on protective equipment (35). This could change the required strength and technique needed to perform the drag. As the drags were performed in the same order for all participants (standard, adapted, then preferred), there may have been a fatigue effect for the later drags. Nonetheless, the 3-minute between-drag rest periods were used to alleviate this limitation. There may also have been a reaction time element to the adapted and preferred drags, as timing started immediately with the researcher's command. Future research could use motion capture techniques to measure time upon first movement of the participant. Lastly, the medical history of participants was not recorded, and the participant's health and injury history could have influenced their results.

The results showed that the 90.72-kg body drag across the different technique variations was performed slower than the 74.84-kg body drag. While these results were expected due to the need to move a heavier mass, the data was important to note as the heavier dummy was more applicable to the current general and police populations. Even if a police recruit is assessed via a drag with a lighter dummy, they will need the capacity to perform heavier drags in the field. Strength and technique development during academy could assist with this process. With regards to drag technique, the adapted version of the drag had a significantly slower time compared to the standard drag. The decrement in performance offers information that the standard version lacks. Should an officer be required to lift someone during an on-the-job scenario, the adapted version of the body test might be a better indicator as it incorporates the lifting portion of the drag. Additionally, in this study the preferred technique, where participants could use a technique that would allow them to perform a drag without the need to lift either the 74.84-kg or 90.72-kg dummy, led to all participants being able to complete the task. These data could influence the type of drag techniques used in police testing should there be increases made to dummy mass to match current population data.

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