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The Bigger They Are: Relationships between Body Height and Mass with the Body Drag Task in Law Enforcement Recruits

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ABSTRACT

International Journal of Exercise Science 15(4): 570-584, 2022. California law enforcement recruits must perform a body drag before they graduate academy. While this task may be challenging for smaller recruits, no research has analyzed height and body mass relationships with the body drag. Data from 643 recruits (542 males, 101 females) who completed the drag in the final weeks of academy were analyzed. The recruits lifted a 74.84-kg, 1.73-m tall dummy and dragged it 9.75 m as quickly as possible. Independent samples *t*-tests compared the sexes; partial correlations controlling for sex detailed relationships between height and body mass with drag time. Recruits were split into quartile groups (based on sample size) for height and body mass (Group 1: shortest, lightest; Group 4: tallest, heaviest). A one-way MANOVA, with sex as a covariate, and Bonferroni post hoc, compared the groups. Male recruits were taller, heavier, and completed the drag faster than females ($p < 0.001$). There were small relationships between height ($r = -0.255$) and body mass ($r = -0.211$) with drag time. When split into height groups, the shortest recruits (Group 1) completed the drag 23-37% slower than all groups ($p \leq 0.031$). When split into body mass groups, the lightest recruits (Group 1) were 23-35% slower than all groups ($p \leq 0.007$). Most females (94-96%) were placed in Groups 1 or 2. Height and body mass could influence drag performance. Taller recruits may be able to lift the dummy off the ground, reducing friction, while heavier recruits may produce more force. Female and smaller male recruits should complete strength and power training to mitigate body size limitations.

KEY WORDS: Anthropometry, casualty drag, occupational testing, police, tactical, victim drag, Work Sample Test Battery

INTRODUCTION

An essential job task for law enforcement officers is a body drag, which is a task that requires an officer to rapidly drag an incapacitated individual from a hazardous to a safe location. Due to its importance, many law enforcement recruits are tested on their ability to complete this task during their training academy as a graduation requirement (29, 33-36, 40). Set standards are often used when implementing a body drag for testing purposes. For example, in California in the US, a body drag is performed with a 74.84-kg (165-lb) dummy (which is 1.73 m tall) over a distance of 9.75 m (45). These standards are set by the Commission on Peace Officer Standards and Training (POST), and the body drag is part of a larger physical ability examination called the Work Sample Test Battery (45). To perform the drag, recruits must first pick up the dummy from the ground by wrapping their arms underneath the arms of the dummy and lifting it up to a standing position (Figure 1) (29, 33-36, 40, 45). Only then can the recruit commence the drag, which must be completed within 28 seconds (s) regardless of the height, body mass, or sex of the recruit (45).

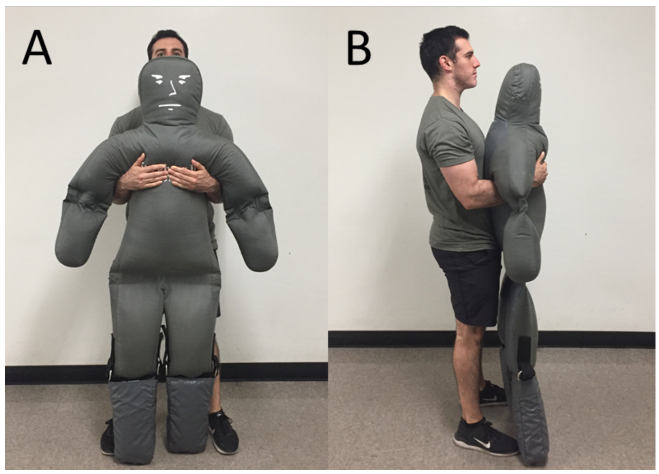

Figure 1. Anterior (A) and lateral (B) view of the starting position for the body drag.

The need to pick up and stand with an absolute load during the body drag has led to investigations of the relationships between strength (26, 33) and power (34, 40) with the 74.84-kg body drag. In male and female civilians, superior absolute (*r* = -0.666) and relative (*r* = -0.619) strength measured by a one-repetition maximum hexagonal bar deadlift correlated with a faster 74.84-kg body drag (26). These findings are supported by Orr et al. (43) who found that absolute strength (deadlift, squat, bench press, and shoulder press) correlated with a repeated effort 85-kg body drag completed by specialist police to a greater extent than relative strength (*r* = 0.711-0.747 versus *r* = 0.465-0.586, respectively). Greater absolute and relative isometric strength measured by a leg/back and grip dynamometer related (*r* = -0.261 to -0.666) to a faster body drag in law enforcement recruits. In recruits prior to academy training, Moreno et al. (40) found that greater lower-body power, as measured by the vertical jump and standing broad jump, related to faster performance in the body drag (*r* = 0.209-609). At the end of the training academy, Lockie et al. (34) found that a faster 75-yard pursuit run significantly correlated (*r* = 0.11) with a faster body drag in recruits. The 75-yard pursuit run is a change-of-direction speed test that requires effective sprinting technique, change-of-direction ability, and lower-body strength and power (47). Clearly, qualities such as strength, power, and anaerobic capacity can influence body drag performance. As a starting point, however, the actual size of the recruit (i.e., height and body mass) could influence their ability to perform the drag.

According to POST standards (45), the body drag is to be performed with the same technique by all recruits. This is despite the range of body sizes present in law enforcement recruits (30), as law enforcement agencies generally cannot discriminate in their hiring practices according to height or body mass (49). Nonetheless, previous research has shown that height and body mass can influence the performance of tactical tasks that require lifting, carrying, and dragging (18, 48, 51, 54, 57). Specific to height, anecdotally taller officers may find performing the drag with the required technique easier, because if they are strong enough, they may be able to elevate the 1.73-cm tall dummy further off the ground (Figure 1). There is some basis to this concept in the literature. In an investigation of Aviation Rescue firefighters, Skinner et al. (51) found a significant relationship (r = -0.325) between height and time to complete a simulated emergency protocol. The protocol included tasks such as hose drags, 40-55 kg dummy drags, disc cutter and hose carries, and stair climbs while wearing a breathing apparatus. Although Skinner et al. (51) did not comment on reasons why, they did state that being taller was a favorable trait for firefighters. In occupational tasks where objects need to be lifted to a pre-determined height, being taller may be of benefit (48). To an extent this is the case in the 74.84-kg body drag, where the recruits must stand with the dummy before commencing the drag. Nonetheless, whether height correlates with the 74.84-kg body drag for law enforcement recruits is not known.

As for height, there has been no specific analysis of the relationships between body mass and the 74.84-kg body drag in law enforcement recruits. There has been some analysis of the relationships between body mass and the 123-kg casualty drag (32, 48), which is used by the US Army (7, 14, 48). Although the dummy is heavier and requires a different dragging technique, Lockie et al. (32) did find a significant relationship (r = 0.52) between body mass and the a 123-kg dummy drag performed by male and female civilians. Additionally, Lockie et al. (32) used a median split to divide their sample of 36 participants in heavier (mean body mass = ~94.88 kg) and lighter (mean body mass = ~70.11 kg) groups. The heavier group had a 43% faster casualty drag velocity compared to the lighter group. Redmond et al. (48) found that heavier female trainees and soldiers (the top quartile, which was the tallest 25% in their respective samples) performed the 123-kg casualty drag significantly ($p < 0.01$) faster than their counterparts in the bottom quartiles (the lightest 25% of the respective samples). As greater body mass could mean an individual has more muscle mass (28) and greater force generation during ground support (15, 32), this may help with performing a faster body drag especially noting the importance of absolute (as opposed to relative) strength when completing this task (43). Greater understanding of how factors such as height and body mass could influence the essential policing task of a body drag is important, given the diversity in body size present in law enforcement personnel (30). This research could take on more importance for law enforcement agencies looking to recruit more women (13, 55, 59), who will typically be shorter and weigh less than men (4, 16, 23).

The purpose of this study was to investigate the relationships between the height and body mass of law enforcement recruits with their performance of the 74.84-kg body drag. There is relatively limited research specifically on this body drag (26, 33, 40), despite its presence on exit examinations for law enforcement recruits in California (45). It was hypothesized that there would be significant relationships between height and body mass with body drag time, and that taller and heavier recruits would perform the drag faster than shorter and lighter recruits.

METHODS

Participants

Data were collected by staff from one law enforcement agency from southern California and released with consent from that organization. The sample of convenience consisted of 643 recruits from nine academy classes, including 542 males and 101 females. Participant details are provided in the results, but the characteristics of the recruits and the ratio between males and females was typical of law enforcement recruit populations from the literature (5, 8, 29, 30). Based on the retrospective nature of this study, the institutional ethics committee approved the use of pre-existing data (HSR-17-18-370). This research was conducted in accordance to the ethical standards of the International Journal of Exercise Science (42), and the recommendations of the Declaration of Helsinki (58).

Protocol

Data were collected by law enforcement agency staff through 2017-2018. Each recruit's age, height, and body mass were recorded at the start of academy. Height was measured barefoot using a portable stadiometer (Seca, Hamburg, Germany), while body mass was recorded by electronic digital scales (Health o Meter, Neosho, Missouri). The recruits completed the body drag in the final weeks of their 22-week academy (29, 34-36). This process was typical for this agency, and any variations in when the body drag was performed as part of exit examinations were due to timetable variations across the classes. Recruits were generally afforded opportunities to practice the body drag (and other job-specific tasks tested during exit examinations) at different time points during academy (27). The number of opportunities was not always consistent across classes, but recruits had some familiarity with the body drag task. The body drag was completed outdoors on a concrete surface (29, 34-36), and weather conditions were typical of the climate of southern California during a calendar year (6). Depending on the class schedule, testing occurred between 0500-1200. All recruits wore their physical training attire during testing, with no external equipment or load (29).

The body drag was conducted according to established procedures (29, 34-36, 45). Adhesive tape was positioned on the ground to indicate the start and finish lines for the dragging distance. The 74.84-kg dummy (Dummies Unlimited, Pomona, California), which was 1.73-m tall, was made of heavy duty Cordura® fabric which encased a siliconized pellet, sand, foam and rubber composite within the dummy to provide the weight (12). To complete the drag, the dummy was positioned face side up, with the head orientated towards the finish line. The feet were positioned 0.3 m behind the starting line. Recruits picked up the dummy by wrapping their arms underneath the arms of the dummy and lifted it to standing by extending their hips and knees (Figure 1) (29, 33-36, 40, 45). Once the recruit was standing with the dummy, they informed the staff member they were ready, and timing was initiated by the staff member via stopwatch (Accusplit, Pleasanton, California) when the feet of the dummy passed the start line. The recruit dragged the dummy as quickly as possible by walking backwards over the required distance. Timing stopped when the dummy's feet crossed the finish line, and was recorded to the nearest 0.10 s (45). Timing via stopwatches is standard practice in law enforcement testing, in addition to the use of multiple testers, which were used across all sessions due to the high volume of recruits (2, 25, 29, 34, 35, 50). Testers who are trained in the use of stopwatch timing, which the staff members were, can record reliable data (19, 39). Internal documentation from the law enforcement agency indicated that the body drag testing procedures had a trial-to-trial intra-class correlation coefficient (ICC) of 0.74 (17), which was acceptable (ICC > 0.70) (1, 22, 38). The graduated recruits completed 1-2 trials; the second trial was only completed if required (i.e. the recruit wanted to attempt to improve their time), and the fastest time was recorded (45). According to official procedures (45), recruits rested for a minimum of 2 minutes between attempts if they completed a second attempt. Regardless, the fastest trial was used for record and that trial was the only one considered in this study.

Statistical Analysis
Statistical analyses were processed using the Statistics Package for Social Sciences (SPSS) Version 28.0 (IBM Corporation, New York, USA), and Microsoft Excel (Microsoft Corporation™, Redmond, Washington, USA). SPSS was used for the statistical analysis, and Excel was utilized to produce the figures. Independent samples *t*-tests calculated any differences in age, height, body mass, and body drag time between the male and female recruits to confirm the need to control for sex in the later analyses. Levene's test for equality of variances ascertained the homogeneity of variance for the data, with significance set as $p < 0.05$. Effect sizes (Cohen's *d*; difference between the means divided by the pooled standard deviations) (9) were calculated for the between-sex comparisons. A *d* less than 0.2 was a trivial effect; 0.2 to 0.6 a small effect; 0.6 to 1.2 a moderate effect; 1.2 to 2.0 a large effect; 2.0 to 4.0 a very large effect; and 4.0 and above an extremely large effect (21). Partial correlations controlling for sex were used to investigate relationships between height and body mass with body drag time ($p < 0.05$). The strength of the relationships were defined as: an *r* between 0 to ± 0.3 was small; ± 0.31 to ± 0.49, moderate; ± 0.5 to ± 0.69, large; ± 0.7 to ± 0.89, very large; and ± 0.9 to ± 1 near perfect for relationship prediction (20).

The next part of the analysis was based on previous research (28, 37, 48). The recruits (both sexes combined, although the number of males and females per group was noted) were stratified into quartiles to create low-to-high height and body mass groups. The quartiles were based on the sample size of 643, and cut points were calculated according to the formula: 25 or 50 or 75/100 x (643 + 1). This resulted in four groups: Group 1 (lowest 25% of the sample for height or body mass); Group 2 (second lowest 25% of the sample for height or body mass); Group 3 (third lowest, or second highest, 25% of the sample for height or body mass); and Group 4 (highest 25% of the sample for height or body mass). When height or body mass values overlapped between quartiles, recruits that had the same value were placed in the higher quartile. This meant that each group did not have the same number of subjects, but also ensured a clear delineation between the groups. A one-way multivariate analysis of variance (MANOVA), with sex as a covariate and Bonferroni post hoc adjustment for multiple pairwise comparisons, was used to calculate any between-group differences. Statistical significance was set at $p < 0.05$. Effect sizes were also calculated for the height and body mass between-group comparisons, with *d* strength following ranges defined by Hopkins (21).

RESULTS

Demographic data for the male and female recruits, as well as the *p* values for the between-sex comparisons, are shown in Table 1. All recruits completed the body drag within the expected standard of 28 s. For the *t*-test analyses, equal variances were assumed for age ($F = 0.731$, $p = 0.393$) and height ($F = 0.925$, $p = 0.337$), and not assumed for body mass ($F = 8.009$, $p = 0.005$) and body drag time ($F = 90.686$, $p < 0.001$). There were no significant differences between the sexes in age. Male recruits were significantly taller and heavier than female recruits, and had a faster body drag time. All these comparisons had large effects. This confirmed the need to control for sex in the correlation and MANOVA analysis. Both height ($r = -0.255$, $p < 0.001$) and body mass ($r = -0.211$, $p < 0.001$) had significant, small correlations with body drag time. Regression scatter plots for the relationships between height and body mass with body drag time can be viewed in Figures 2 and 3. The relationships indicated that greater height and body mass related to a faster drag.

Table 1. Descriptive statistics (mean ± standard deviation) for age, height, body mass, and 74.84-kg body drag time for all, male, and female law enforcement recruits. Statistical significance (*p* value), and effect size (*d*) for the between-sex comparisons are also shown.

	All (*n* = 643)	Males (*n* = 542)	Females (*n* = 101)	*p* value	*d*
Age (years)	26.72 ± 5.05	26.72 ± 5.13	26.68 ± 4.65	0.472	0.01
Height (m)	1.74 ± 0.09	1.76 ± 0.07	1.63 ± 0.07*	< 0.001	1.86
Body Mass (kg)	80.09 ± 12.94	83.09 ± 12.47	65.87 ± 12.17*	< 0.001	1.40
Body Drag Time (s)	5.11 ± 1.33	4.76 ± 0.84	6.95 ± 1.89*	< 0.001	1.50

* Significantly ($p < 0.05$) different from the male recruits.

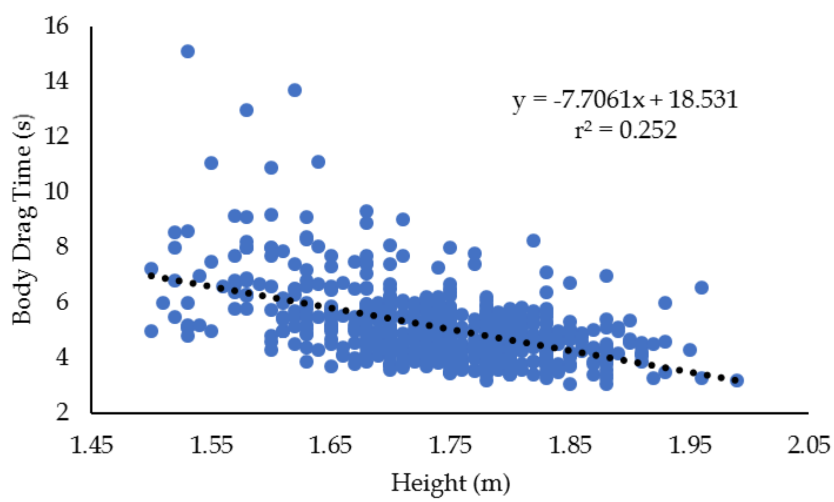

Figure 2. Regression scatter plot for law enforcement recruits (*n* = 643) between height and 74.84-kg body drag time.

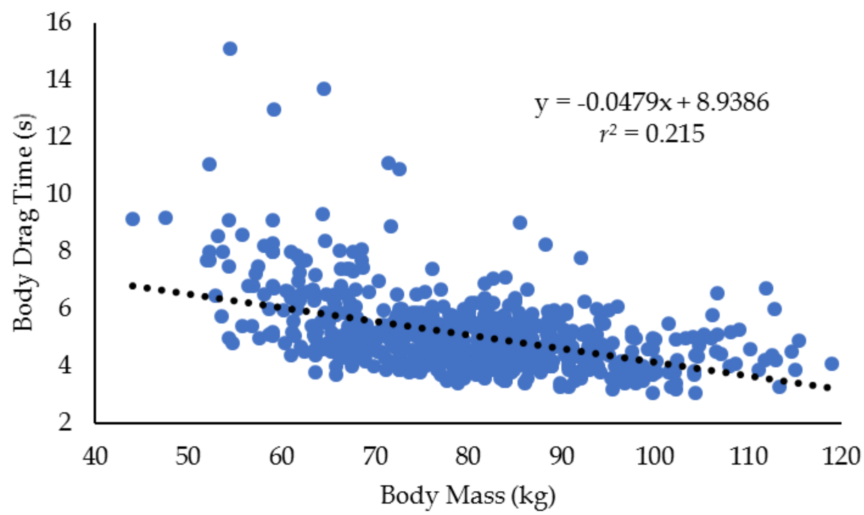

Figure 3. Regression scatter plot for law enforcement recruits (n = 643) between body mass and 74.84-kg body drag time.

The sex-adjusted descriptive data for the recruits stratified by height are shown in Table 2, with the pairwise effect size data shown in Table 3. There were no significant differences in age between the groups (p = 0.733). For height and body mass, Group 2 was significantly (p < 0.001) taller and heavier than Group 1; Group 3 was taller and heavier than Groups 1 and 2 (p < 0.001); Group 4 was taller and heavier than Groups 1-3 (p < 0.001). The effect sizes for the height comparisons ranged from very-to-extremely large; for the body mass comparisons, from small-to-very large. With regards to body drag time, all groups were faster than Group 1 (p ≤ 0.031; large-to-very large effects); Group 4 was faster than Group 2 (p = 0.007; large effect). There were no differences in body drag time between Groups 2 and 3 (p = 0.367; small effect), and Groups 3 and 4 (p = 1.000; small effect).

Table 2. Descriptive statistics (mean ± standard deviation) for age, height, body mass, and 74.84-kg body drag time for quartile groups stratified by height in law enforcement recruits.

	Group 1 Lowest 25% (n = 153; 71 males, 82 females)	Group 2 Second 25% (n = 148; 135 males, 13 females)	Group 3 Third 25% (n = 156; 151 males, 5 females)	Group 4 Highest 25% (n = 186; 185 males, 1 female)
Age (years)	27.02 ± 5.68	26.70 ± 5.10	26.58 ± 4.69	26.59 ± 4.78
Height (m)	1.62 ± 0.05	1.72 ± 0.02*	1.77 ± 0.02*§	1.84 ± 0.04*§ ϕ
Body Mass (kg)	67.56 ± 9.34	77.72 ± 8.49*	83.89 ± 10.89*§	89.13 ± 11.13*§ ϕ
Body Drag Time (s)	6.22 ± 1.86	5.06 ± 0.90*	4.73 ± 0.85*	4.54 ± 0.78*§ ϕ

* Significantly (p < 0.05) different from Group 1.
§ Significantly (p < 0.05) different from Group 2.
ϕ Significantly (p < 0.05) different from Group 3.

Table 3. Pairwise effect size data between quartile groups stratified by height for age, height, body mass, and 74.84-kg body drag time in law enforcement recruits.

Variables	Group 1-2	Group 1-3	Group 1-4	Group 2-3	Group 2-4	Group 3-4
Age	0.06	0.08	0.08	0.02	0.02	0.00
Height	2.63	3.94	4.86	2.50	3.79	2.21
Body Mass	1.14	1.61	2.10	0.63	1.15	0.48
Body Drag Time	0.79	1.03	1.18	0.38	0.62	0.23

The sex-adjusted descriptive data for the recruits stratified by body mass are shown in Table 4, and the pairwise effect size data is displayed in Table 5. Group 4 was significantly older than Group 1 (p = 0.010; small effect); there were no other between-group differences in age (p = 0.149-1.000). As for the height groups, in the body mass groups Group 2 was significantly ($p < 0.001$) taller and heavier than Group 1. Group 3 was taller and heavier than Groups 1 and 2 ($p < 0.001$); Group 4 was taller and heavier than Groups 1-3 ($p < 0.001$). The effect sizes for the height comparisons ranged from moderate-to-very large. Regarding the body mass comparisons, they ranged from very-to-extremely large. Group 1 was significantly ($p \leq 0.007$; all moderate effects) slower than all groups in the body drag. There were no other significant between-group differences in body drag time (p = 0.155-1.000; trivial-to-small effects).

Table 4. Descriptive statistics (mean ± standard deviation) for age, height, body mass, and body drag time for quartile groups stratified by body mass in law enforcement recruits.

	Group 1 Lowest 25% (*n* = 161; 88 males, 77 females)	Group 2 Second 25% (*n* = 161; 141 males, 20 females)	Group 3 Third 25% (*n* = 160; 157 males, 3 females)	Group 4 Highest 25% (*n* = 161; 160 males, 1 female)
Age (years)	26.03 ± 4.98	26.45 ± 4.98	26.76 ± 4.75	27.62 ± 5.38*
Height (m)	1.66 ± 0.08	1.73 ± 0.07*	1.77 ± 0.06*§	1.81 ± 0.06*§ϕ
Body Mass (kg)	63.73 ± 5.28	75.98 ± 2.69*	84.01 ± 2.10*§	96.70 ± 7.27*§ϕ
Body Drag Time (s)	6.10 ± 1.76	4.97 ± 1.07*	4.82 ± 0.90*	4.53 ± 0.81*

* Significantly ($p < 0.05$) different from Group 1.
§ Significantly ($p < 0.05$) different from Group 2.
ϕ Significantly ($p < 0.05$) different from Group 3.

Table 5. Pairwise effect size data between quartile groups stratified by body mass for age, height, body mass, and body drag time in law enforcement recruits.

Variables	Group 1-2	Group 1-3	Group 1-4	Group 2-3	Group 2-4	Group 3-4
Age	0.08	0.15	0.31	0.06	0.23	0.17
Height	0.93	1.56	2.12	0.61	1.23	0.67
Body Mass	2.92	5.05	5.19	3.33	3.78	2.37
Body Drag Time	0.78	0.92	1.15	0.15	0.46	0.34

DISCUSSION

This study analyzed the relationship between height and body mass with the 74.84-kg body drag in law enforcement recruits. The body drag is an essential policing job task, and is part of the exit physical ability examination (the Work Sample Test Battery) completed by recruits in

California (27, 29, 34-36, 45). Given the diversity in body size of law enforcement recruits (30), it was important to detail whether the height and body mass of recruits could influence their ability to complete the 74.84-kg body drag efficiently. Firstly, all recruits completed the drag within 28 s, so they achieved the standard in this task set by POST to pass the training academy (45). Regarding the correlation results, there were significant relationships between both height and body mass with body drag time, although the strength of the relationships was small. Taller and heavier recruits tended to perform the body drag faster, with the greatest detriments in drag performance seen in the shortest and lightest recruits. The results from this study could impact how law enforcement agencies train their recruits in the body drag.

Previous research in law enforcement recruits has shown that males tend to be taller than females (30), which was supported by the results from this study. The body drag times also supported previous studies which have shown males tend to perform this task faster than females (27, 33). Nonetheless, this study examined whether it was not just sex differences that could influence body drag performance. As noted, previous research in tactical populations has shown that body size can affect the performance of job tasks that require high force development (i.e., lifting, carrying, and dragging tasks) (18, 48, 51, 54, 57). As stated, the correlation results from this study indicated significant, albeit small, relationships between height and body mass with body drag time. These results likely occurred as other factors will contribute to an efficient body drag, such as strength (26, 33), power (40), anaerobic capacity (34), and lifting and dragging technique (26). Nevertheless, to further investigate the effects that height and body mass could have on the 74.84-kg body drag, a quartile analysis was conducted (28, 37, 48), which involved splitting the sample into groups according to their height or body mass.

The results showed that taller recruits performed the body drag faster than shorter recruits. The tallest group (top 25% of the sample; mean height of ~1.84 m) performed the drag 4-27% faster than all the other groups, although there were only significant differences with Groups 1 and 2. The shortest group (bottom 25%; mean height of ~1.62 m) was 23-37% significantly slower (with moderate effects) than all groups. There is context for these results. In their correlation analysis of Aviation Rescue firefighters, Skinner et al. (51) found a taller height related to faster performance of hose drags, 40-55 kg dummy drags, disc cutter and hose carries, and stair climbs. Taller female US Army soldiers performed the 123-kg casualty drag faster than their shorter counterparts (48). From a practical perspective with the 74.84-kg body drag, taller recruits may be able to reduce the friction they encounter during the drag. Considering the dummy is 1.73 m tall, if the recruit is strong enough, they could lift the dummy off the ground (26). This would essentially reduce most (if not all) of the friction that would be encountered during the drag. Although recruits obviously cannot change their height, it may influence the technique they should use during the body drag. Further investigation of optimal dragging techniques for recruits of different heights is warranted. However, what was also notable was that the mean height of the poorest performing group (Group 1) was shorter than the vertical height of the dummy (~1.62 m versus 1.73 m). The remaining groups (Groups 2-4) were either of a similar if not greater height (mean height = 1.72-1.84 m, respectively) than the dummy. The results from this study suggest that a law enforcement recruit's height, if smaller than the dummy, can influence how they perform the body drag.

Previous literature has documented that body mass can influence the performance of tactical tasks that incorporate dragging (18, 32, 48, 54, 57). The results from this study supported this research. Groups 2-4 (top 75% in the sample for body mass; Group 2 = ~75.98 kg; Group 3 = ~84.01 kg; Group 4 = ~96.70 kg) were 19-26% faster (with moderate effects) than Group 1 (bottom 25%; mean body mass of ~63.73 kg) in the 74.84-kg body drag. A contributing reason for this is that dragging often requires moving an absolute load, and heavier individual can often generate greater absolute force during movement (15, 32). Law enforcement recruits with greater body mass may also have more muscle mass (28), although this cannot be confirmed with the data from this study. What was interesting to note was that there were no differences in body drag times between Groups 2, 3, and 4. The results suggested it was only the lightest recruits from Group 1 that experienced negative impacts to their body drag time due to their body mass. As per the findings regarding recruit height, the lightest group (Group 1) was lighter than the mass of the dummy (~63.73 kg versus 74.84 kg). In contrast, the remaining groups were of similar if not heavier body mass (Groups 2-4, mean body mass of 75.98-96.70 kg, respectively). Although absolute strength is of importance for dragging tasks, relative strength has also been linked to dummy drag performance (26, 33, 43). As such, the relative load needing to be moved by the lighter recruits (which would have been in excess of 100% of their body mass) warrants consideration in the training of recruits. This is an important result, as it highlights that officers do not need to be at the higher end of their body mass spectrum to effectively perform body drags once past a potential law of diminishing returns (i.e., the same mass as the dummy). Given the range of occupational tasks that need to be completed by a law enforcement officer (e.g., foot pursuits, defensive tactics, obstacle climbs, discharging firearms) (2, 3, 10, 11, 24), it is important they strive to attain the right balance between their body mass and ability to perform all aspects of their job.

Another interesting finding for this group was the number of females present. Most of the females in this sample were placed in the bottom two groups (i.e., the lower 50%) of the sample for both height (95/101 females, or 94% of the sample) and body mass (97/101 females, or 96% of the sample). Females do tend to be smaller than males in both height and body mass (4, 16, 23), and the results from this study indicate the challenges they may encounter during tasks that require the movement of an absolute load such as during a body drag. This is an important consideration given that many police departments would like to increase the number of women officers hired (13, 55, 59). Specific to the US Army, Redmond et al. (48) recommended recruiting taller and heavier females, as they could perform physical demanding job tasks, such as lifting and dragging tasks, more effectively. However, law enforcement agencies and police departments may not have that luxury given potential legal ramifications (49) and the pragmatic need to address hiring shortages affecting many agencies (46). It is important to not just focus on any limitations experienced by females in a dragging task; smaller males will also experience the same challenges in attempting to move a heavy absolute load. Rather, law enforcement training academy should focus on training practices that could mitigate the negative effects associated with shorter heights and lighter body masses relative to tasks such as the body drag. This could involve specific strength (notably absolute strength) and power training, given the association of these qualities with this job task (26, 33, 34, 40, 43). The time frame for a law enforcement academy (e.g., 27 weeks) should allow for positive physiological adaptations to occur (31), especially if an appropriate training stimulus is applied. Consequently, it is essential for female recruits (and all law enforcement recruits in general) to complete specific strength and power training as this could positively influence their ability to performance physically demanding job tasks such as the body drag.

It should be strongly stated that these results do not suggest smaller individuals should not pursue a career in law enforcement, and indeed there are laws to ensure that they would not be discriminated against if they do (49). Rather, it is important to acknowledge the real-world challenges for smaller recruits, and what could be done in training to address these challenges. Strength training should always be a focus for smaller and lighter recruits. As noted by Lockie et al. (32), body mass could always be a limiting factor when performing a dragging task. This may be the case even if the recruit is completing strength training. As a result, lighter male and female recruits should make a concerted effort to reduce the chances their lighter mass could negatively affect their ability to perform a body drag. Indeed, ensuring a high level of strength and power could make the difference between an officer being able to rescue a colleague or civilian when performing their police duties. It is incumbent on law enforcement academy training staff to implement appropriately programmed and periodized strength and power training programs to optimize the physical development of their recruits.

There are study limitations that should be described. This study only analyzed one type of drag, and one dummy with a set mass of 74.84 kg and height of 1.73 m. Lockie et al. (26) investigated body drags where the initial manipulation of the dummy (i.e., picking it up from the ground) was included in the time. Investigating the relationship between this type of drag, or one where the officer may need to stay low to the ground to seek cover, could be analyzed with the procedures used in this study. Current population trends have shown that the average adult male and female is getting heavier (16). Accordingly, future research should also investigate the influence of height and body mass of law enforcement recruits when they perform drags with heavier masses. The data from this research only came from one agency. Given the variations in fitness that exist between personnel from different agencies (41), individual law enforcement agencies should specifically analyze their personnel as well in height and body mass relationships with the body drag. The body drag was performed in physical training attire (29), and not with the duty loads required by law enforcement officers. Load carriage can have a large impact on time to complete and the physiological demand of policing job tasks (44, 52, 53, 56). As an example, Thomas et al. (52) found that Special Weapons and Tactics police officers experienced a 15.6% increase in time to complete a 23-m drag with an 84-kg dummy when performed with duty loads (~14 kg of equipment). Future research could also investigate how body size in conjunction with load carriage could influence the performance of a job task such as the body drag.

In conclusion, height and body mass did have some impact on the 74.84-kg body drag when performed by law enforcement recruits. There were significant (albeit small) correlations found between height and body mass with body drag time. Further, when the recruits were split into quartiles based on their height and body mass, shorter and lighter recruits tended to be slower in the body drag, especially recruits who were shorter and lighter than the dummy being dragged. Additionally, most females in this sample tended to be placed in the shorter and lighter groups. Although recruits cannot change their height, future research should investigate whether there are more effective dragging techniques that could be performed for shorter and lighter personnel. Relative to body mass, lighter recruits (such as the average female and smaller males) should ensure they complete targeted strength and power training to mitigate the impacts of their stature when performing dragging tasks.

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