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Original Research

Are There Differences in Fitness between Recruits from Larger (Hosting) and Smaller (Participating) Law Enforcement Agencies?

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ABSTRACT

International Journal of Exercise Science 14(4): 885-901, 2021. Law enforcement agencies often conduct academy training classes that include recruits hired by both the larger hosting agency (HA), and by smaller participating agencies (PA). HAs that need to fill more positions may have recruits with a wide range of fitness levels. Smaller agencies may be more selective in their hiring as they do not have as many available positions. This study compared HA and PA recruit fitness prior to academy. Retrospective analysis was conducted on 11 academy classes, incorporating 742 HA recruits (602 males, 140 females) and 99 PA recruits (82 males, 17 females). The following fitness tests were administered prior to academy: push-ups and sit-ups completed in 60 seconds, vertical jump; 2-kg medicine ball throw, 75-yard pursuit run, and 20-m multistage fitness test. A univariate analysis of variance, with sex as a covariate, analyzed each fitness test to determine any differences between HA and PA recruits. Effect sizes were also calculated. There were significant differences in push-up ($p = 0.034$, $d = 0.22$) and sit-up ($p < 0.001$, $d = 0.47$) repetitions between HA and PA recruits. PA recruits completed ~8% and ~12% more repetitions, respectively. There were trivial differences between HA and PA recruits in the other fitness tests, although HA recruits tended to have a wider range of fitness levels. The push-up and sit-up differences may provide some indication that PA were more selective in their hiring. Nonetheless, staff should recognize that individual fitness differences may exist in recruits from different agencies prior to academy training.

KEY WORDS: Academy training, occupational testing, police, push-ups, sit-ups, tactical

INTRODUCTION

Between 1992 to 2008, state and local law enforcement increased their numbers of full-time sworn officers by 26%, totaling about 765,000 sworn personnel (53). In 2008, it was reported that there were 251 sworn personnel per 100,000 residents (one officer for every 400 residents), which was a slight increase over 2004 data (53). Approximately 64% of sworn personnel in the United States (U.S.) worked for agencies that employed 100 or more officers, while the rest worked for

agencies that employed fewer than 100 full-time officers (53). Clearly, larger and smaller agencies both exist, each with the same goal of protecting and serving civilians with enough officers to serve their respective city, state, or county (including areas of special jurisdiction). Law enforcement agencies typically attempt to recruit individuals with certain physical qualities that relate to the expected training and job demands, so there may be some crossover in the fitness tests used during the hiring process (3).

For some law enforcement agencies, specific fitness levels are required for designated tests prior to being accepted into the academy training process (5, 8). Awareness of an agency's standards could allow candidates the opportunity to prepare themselves for the required tests prior to application. Indeed, some agencies provide candidates with opportunities for pre-academy training to develop important fitness qualities (40, 41). A further benefit of better physical fitness is that it increases the potential for the recruit to successfully graduate from academy (13, 20, 24, 28, 57). Shusko et al. (57) found that recruits who completed more push-ups in 60 seconds and had a faster 2.4 km (1.5-mile) run time were more likely to graduate academy. Dawes et al. (13) found similar results for push-ups in their analysis of law enforcement recruits, as well as finding that male recruits that had a greater vertical jump height were also more likely to graduate. Lockie et al. (24) detailed that recruits that separated (i.e. did not graduate) due to physical training failures or injury were slower in a change-of-direction speed test called the 75 yard pursuit run (75PR), and completed fewer shuttles in the 20 m multistage fitness test (20MSFT) (24). In principle, a recruit who demonstrates greater muscular strength, endurance, power, and aerobic fitness would be better able to tolerate the physical rigors of a training academy.

From 2011 to 2013, a total of 664 state and local law enforcement academies provided basic training to entry-level police recruits in the U.S. (54). Due to the lack of space or resources, larger law enforcement agencies will often hold academy training classes, which include recruits hired from both the large hosting agency (HA) and smaller participating agencies (PA). However, the hiring requirements for fitness may dramatically vary across different agencies. For example, different agencies may incorporate a push-up test during initial entry fitness testing. Some agencies may have a set number of required repetitions, while others may not (2, 39, 47). A particular issue for larger agencies is they may have a high number of positions that need to be filled, likely due to higher staffing needs to adequately service the size of their respective jurisdictional area (30). The need for HA to fill more positions may lead to the acceptance of recruits with a wider range of fitness levels, especially when compared to those recruits from PA who may have a limited amount of training positions available. This could make programming for physical training difficult, especially considering the existing challenges associated with this process (e.g. large class sizes, limited equipment, and space) (22). More information is required on the fitness of law enforcement recruits prior to academy training, especially if there is variation between recruits due to which agency hired them in the first place.

Law enforcement physical training during academy can often follow a "one-size-fits-all" training model, whereby it is expected all recruits complete the same exercises with the same requirements (e.g., load weight, run speed, etc.) (7, 22, 24, 31, 42, 50). This approach is often

implemented, as all recruits will have the same job tasks should they graduate (31). However, "one-size-fits-all" training may not be optimal for enhancing fitness or preventing injury in recruits with lower fitness levels (50) or for discouraging voluntary separation (24). Furthermore, fitter recruits may be undertrained in "one-size-fits-all" training models, as they may not receive an adequate amount of training stress to improve certain physical qualities (44). Previous research has illustrated that there can be disparity in muscular strength, endurance, and aerobic fitness between individual recruits from the same academy class (31, 33, 38). These fitness differences could be exacerbated if recruits from both HA and PA are within the one academy class. Accordingly, it is important to document whether there are differences between HA and PA recruits in qualities such as muscular endurance, power, running speed, and aerobic fitness. If this can be clearly documented, the data could then influence how an agency implements their physical training to best develop fitness in their recruits.

Therefore, the purpose of this study was to compare the fitness of incoming law enforcement recruits from a HA and PA prior to academy. All recruits were assigned to complete academy training within the one large agency. It was hypothesized that PA recruits would perform more push-up and sit-up repetitions, would jump higher in the vertical jump (VJ), would be faster in the 75PR, and would complete more 20MSFT shuttles when compared to HA recruits.

METHODS

Participants

The sample totaled 841 recruits (age: 27.27 ± 6.22 years, height: 1.72 ± 0.09 m, body mass: 80.14 ± 14.01 kg), which included 684 males (age: 27.25 ± 6.14 years, height: 1.75 ± 0.08 m, body mass: 83.68 ± 12.56 kg) and 157 females (age: 27.34 ± 6.63 years, height: 1.62 ± 0.07 m, body mass: 64.70 ± 8.35 kg). 602 males (age: 27.34 ± 6.31 years, height: 1.74 ± 0.10 m, body mass: 84.09 ± 12.51 kg) and 140 females (age: 27.16 ± 6.76 years, height: 1.62 ± 0.06 m, body mass: 64.96 ± 8.35 kg) were from the HA group, while 82 males (age: 26.57 ± 4.60 years, height: 1.77 ± 0.08 m, body mass: 80.72 ± 12.67 kg) and 17 females (age: 28.82 ± 5.42 years, height: 1.61 ± 0.08 m, body mass: 62.53 ± 8.28 kg) were from the PA group. The PA were drawn from a range of smaller agencies and the researchers had no control on the selection of this sample. The characteristics of the participants in this study and the male-to-female ratio were similar to those reported in previous law enforcement research (5, 6, 8, 28-32, 34, 37, 38, 43). Based on the archival nature of this investigation, 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 (46) and the recommendations of the Declaration of Helsinki (58).

Protocol

Retrospective analyses were conducted on eleven academy classes across 2017-2019 from the one law enforcement agency. The data in this study were collected by staff working on behalf of the agency in the week preceding academy training for all classes. The staff were all trained by a certified tactical strength and conditioning facilitator (TSAC-F), who verified the proficiency of the staff. Prior to testing, each recruit's age, height, and body mass were recorded. Height was measured using a portable stadiometer (Seca, Hamburg, Germany), while body mass was

recorded by electronic digital scales (Omron Healthcare, Kyoto, Japan). All tests were conducted outdoors on concrete or asphalt surfaces at the agency's training facility. Testing occurred between 0900-1400 (9:00am - 2:00pm), depending on recruit availability. Recruits generally did not eat in the two to three hours prior to their testing session, as they were completing employee-specific documentation which was required by the agency. The weather conditions for testing was generally typical for the climate of southern California across the years from which the data were derived (6). Although conducting testing outdoors is not ideal, these procedures were standard practice for this agency (6, 28-30, 32, 34, 37, 43). As described by Lockie et al. (30), recruits rotated through the fitness tests in small groups of three or four, except for the 20MSFT which was completed last in groups of 14 - 16. Recruits were allocated to a testing station before rotating to the next station once all groups were complete. All recruits completed the 20MSFT last (30). During testing, recruits were permitted to consume water as needed.

Upper-body muscular endurance was assessed via a push-up test where recruits completed as many repetitions as possible in 60 seconds. This protocol followed established methods (6, 27, 28, 31, 36-38). Tests of maximal push-up have high trial-to-trial reliability (intra-class correlation coefficient [ICC] = 0.95) (56). Recruits began in the "up" position, with the body taut and straight, the hands positioned approximately shoulder-width apart, and the fingers pointed forwards (31). A tester placed a fist on the floor directly under the recruit's chest to ensure they descended to an appropriate depth. Although there are some limitations with this approach, this ensured recruits descended to the required depth (36). All female recruits were partnered with a female tester. On the start command, the recruit flexed their elbows and lowered themselves until their chests contacted the tester's fist before they extended their elbows to return to the start position. Recruits performed as many correct push-ups as possible using this technique in 60 seconds. The final score was recorded as the total number of completed push-ups achieved.

Abdominal muscular endurance was assessed via the sit-up test, where recruits completed as many repetitions as possible in 60 seconds via established methods (6, 21, 28, 38). Maximal sit-up tests have high trial-to-trial reliability (ICC = 0.92) (56). The recruits laid on their backs with their knees flexed to 90°, heels flat on the ground, and arms crossed over the chest. The feet were held to the ground by a tester who also counted the repetitions. On the start command, recruits raised their shoulders from the ground while keeping their arms crossed over the chest and touched their elbows to their knees. The recruit then descended back down until their shoulder blades contacted the ground. Recruits completed as many correct repetitions as possible using this technique in 60 seconds. The final score was recorded as the total number of completed sit-ups achieved.

VJ performance was measured by a Vertec apparatus (Perform Better, Rhode Island, USA). Jump height provided an indirect measure of lower-body power (32). Established protocols were used to measure jump height (4, 6, 28, 32, 37, 43), as these have very high test-retest reliability (r > 0.99) (4). The recruit initially stood side-on to the Vertec on their dominant side. While keeping their heels on the ground, the recruit reached upward and fully elevated the shoulder to displace as many vanes as possible. The last vane moved was the zero reference. With no preparatory step or countermovement restrictions, the recruit then jumped as high as possible and jump

height was recorded from highest vane moved. VJ height was calculated in inches by subtracting standing reach height from the jump height, and then converted to cm. Each subject completed two trials, with a between-trial recovery time of approximately 60 seconds. The best trial was used for analysis.

The MBT was used to indirectly measure upper-body power (32). Established procedures adopted (28, 32, 37), as these have high test-retest reliability ($r > 0.95$) (18). Recruits sat on the ground with their head, shoulders, and lower back against a wall and used a two-handed chest pass to throw a 2-kg medicine ball (Champion Barbell, Texas, USA) as far as possible. The ball was lightly dusted with chalk to assist with grip and to mark the ball's landing spot (32). The throw distance measured (via a standard tape measure) was determined as the perpendicular distance from the wall to the chalk-marking closest to the wall made by the ball. Two trials were completed, with a between-trial recovery time of approximately 60 seconds. The best trial was analyzed.

The 75PR was designed to simulate a foot pursuit for a law enforcement officer and provided a measure of change-of-direction speed (5, 8, 23, 28, 30, 38, 52). The structure for the 75PR, which was also presented by Cesario et al. (8), is shown in Figure 1. The recruit completed five sprints about a square grid (each side was 12.1 m), while also completing four direction changes to zig-zag across the grid. Recruits also stepped over three barriers (2.44-m long and 0.15-m high) that simulated curbs during three of the sprints. Time was recorded via a stopwatch from the initiation of movement until the recruit crossed the finish line. Stopwatch timing was the standard measurement technique used for this test (5, 8, 23, 28, 30, 38). These testing procedures have been shown to have high trial-to-trial reliability (intra-class correlation coefficient [ICC] = 0.85) (23). Two trials were completed with at least two minutes rest between the trials. The fastest trial was examined.

The 20MSFT was used to measure aerobic capacity and was conducted outdoors on an asphalt surface. Although this was not the best conditions for this test, it was the only available space at the agencies' training facility to do this test. The procedures followed established literature (6, 12, 13, 28-30, 34, 37) and have very high reliability (ICC = 0.96) (1). Recruits ran back and forth between two lines (indicated by markers) spaced 20 m apart. The running speed was standardized by pre-recorded auditory cues (i.e., beeps) played from an iPad handheld device (Apple Inc., Cupertino, California) connected via Bluetooth to a portable speaker (ION Block Rocker, Cumberland, Rhode Island). The speaker was positioned in the center of the running area, such that it did not interfere with the recruits while they were running. The test was terminated when the recruit was unable to reach the lines twice in a row in accordance with the auditory cues (or by voluntary fatigue and withdrawal). 20MSFT performance was scored according to the final level and stage the recruit was able to achieve. The level and stage results were used to derive the total number of shuttles completed.

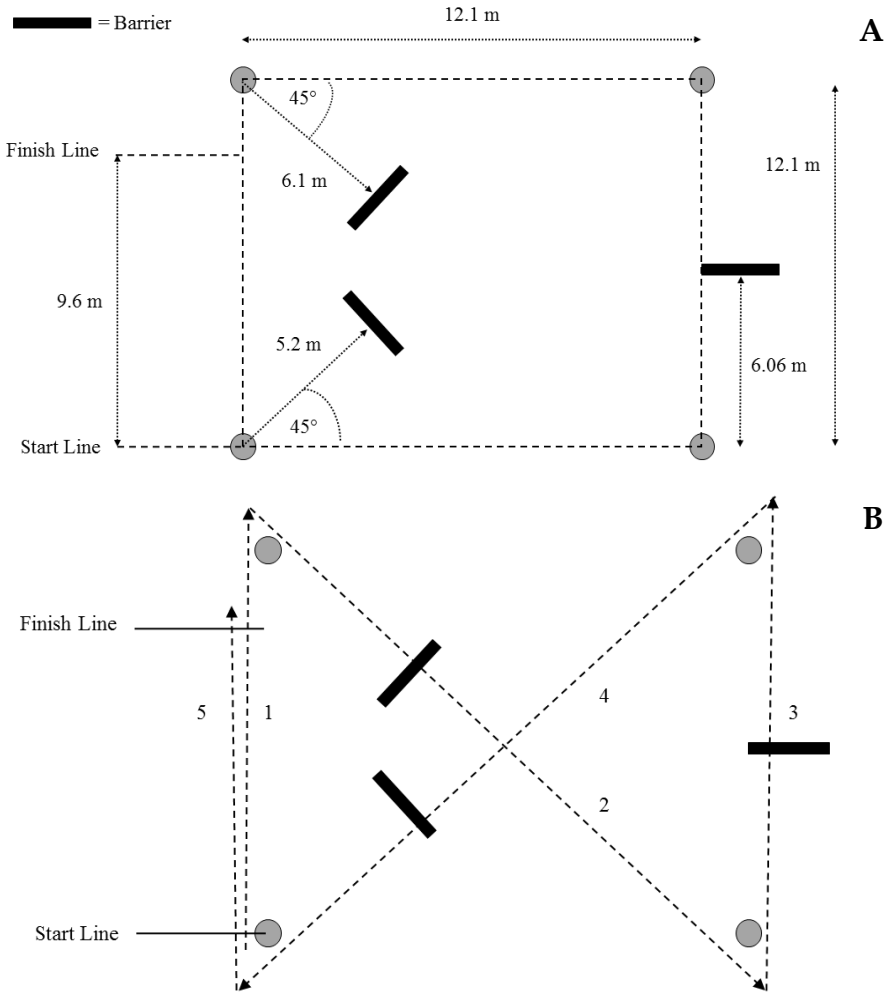

Figure 1. (A) The 75-yard pursuit run dimensions in meters (m) and (B) the running direction (numbered in order).

Statistical Analysis

The data for all the tests were entered into Microsoft Excel (Microsoft Corporation™, Redmond, Washington, USA) and exported into Statistics Package for Social Sciences (SPSS) Version 27.0 (IBM Corporation, New York, USA) for further analysis. Descriptive data (mean ± standard deviation [SD]) were produced for each variable. A univariate analysis of variance ($p < 0.05$), with sex as the covariate, was conducted to determine the differences between the HA and PA recruits. The sexes were combined within each group, which is an approach used in previous law enforcement research (5, 6, 8, 27, 32, 37, 38). However, sex was included as a covariate as numerous studies have documented differences between males and females in law enforcement-specific fitness tests (5, 8, 26, 28, 29, 31, 32, 34). Effect sizes (d) were also calculated for the between-group comparisons, where the difference between the means was divided by the pooled SD (10). A d less than 0.2 was considered 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 (19). Microsoft Excel was used to produce scatter plots for each fitness assessment in order to analyze the fitness of individual recruits by agency.

RESULTS

The use of descriptive data (mean ± standard deviation) for the HA and PA recruits are shown in Table 1. There were no significant differences in age (with a trivial effect) between the HA and PA recruits. The PA recruits were significantly taller and heavier than the HA recruits, with the effects sizes for these differences both being small. There were significant differences in the number of push-ups and sit-ups completed by the HA and PA recruits. PA recruits completed ~8% more repetitions in the push-up test and ~12% more repetitions in the sit-up test. However, both differences had small effects. There were no significant differences between HA and PA recruits in any of the other fitness tests, all of which had trivial effects.

Table 1. Descriptive statistics (mean ± SD) for comparisons between hosting agency (HA) and participating agency (PA) law enforcement recruits prior to academy training.

	HA Recruits (n = 742)	PA Recruits (n = 99)	p	d	d Strength
Age (years)	27.31 ± 6.40	26.96 ± 4.80	0.605	0.06	Trivial
Height (m)	1.72 ± 0.09	1.74 ± 0.10*	0.025	0.21	Small
Body Mass (kg)	80.48 ± 14.00	77.59 ± 13.84*	0.011	0.21	Small
Push-Ups (no.)	42.18 ± 15.33	45.40 ± 13.22*	0.034	0.22	Small
Sit-Ups (no.)	35.57 ± 9.12	39.92 ± 8.04*	<0.001	0.51	Small
VJ (cm)	58.19 ± 16.91	60.26 ± 18.08	0.288	0.12	Trivial
MBT (m)	5.93 ± 1.33	5.97 ± 1.25	0.987	0.03	Trivial
75PR (s)	17.18 ± 1.20	16.96 ± 1.14	0.085	0.19	Trivial
20MSFT (shuttles)	51.09 ± 18.22	54.33 ± 17.77	0.105	0.18	Trivial

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

Scatter plots were produced for each of the fitness tests and are shown from Figures 2-7. For push-ups, HA recruits had a minimum number of 0 repetitions and a maximal number of 96 repetitions (Figure 2). PA recruits had a minimum of 15 repetitions and a maximum of 76 repetitions. In the sit-up test, HA recruits had a minimum of 3 repetitions and a maximum of 80 repetitions (Figure 3). PA recruits had a minimum of 22 repetitions and a maximum of 62 repetitions. For the VJ, HA recruits had a minimum jump height of 12.70 cm and a maximum jump height of 99.06 cm (Figure 4). PA recruits had a minimum jump height of 29.21 cm and a maximum jump height of 97.00 cm. In the MBT, HA recruits had a minimum throw distance of 2.52 m and maximum of 10.05 m (Figure 5). PA recruits had a minimum throw distance of 2.88 m and maximum of 8.81 m. The slowest 75PR time for the HA recruits was 25.20 seconds, while the fastest time was 13.50 seconds (Figure 6). For PA recruits, the slowest time was 20.96 seconds, while the fastest time was 15.06 seconds. The lowest number of completed 20MSFT shuttles for the HA recruits was 2, while the highest was 116 (Figure 7). For the PA recruits, the lowest number of 20MSFT shuttles completed was 7 and the highest number was 118.

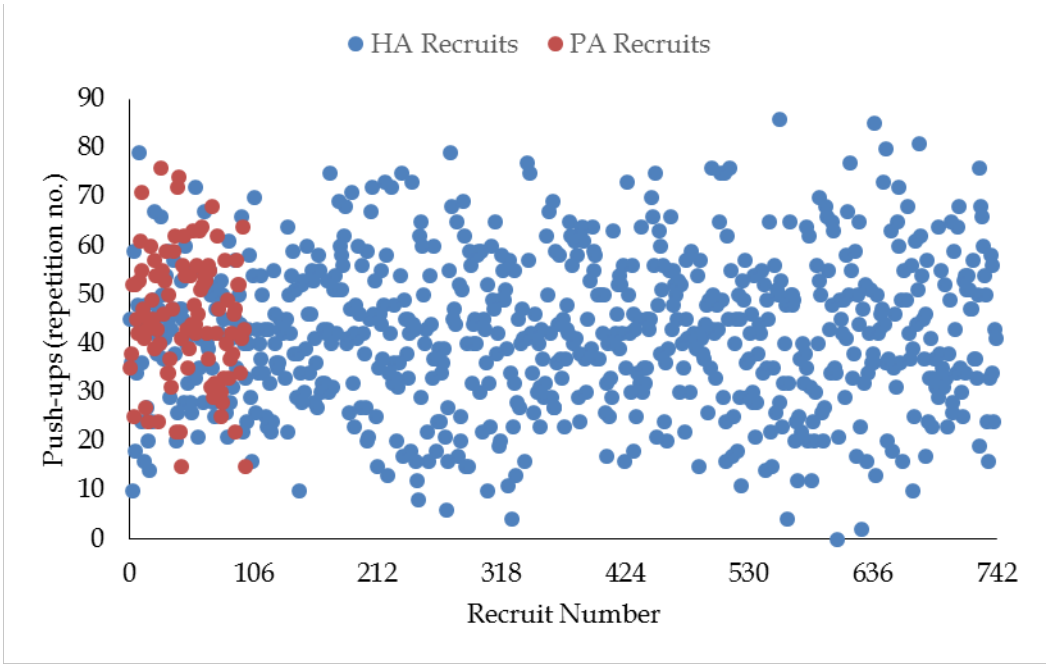

Figure 2. Individual scores for the push-up test in hosting agency (HA; n = 742) and participating agency (PA; n = 99) law enforcement recruits prior to academy training.

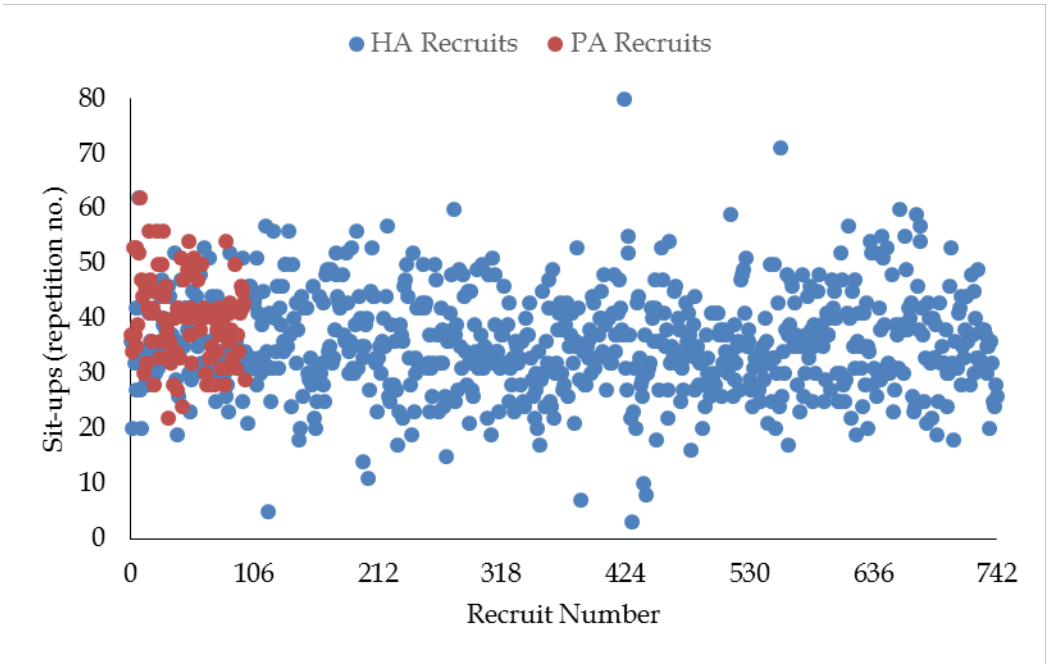

Figure 3. Individual scores for the sit-up test in hosting agency (HA; n = 742) and participating agency (PA; n = 99) law enforcement recruits prior to academy training.

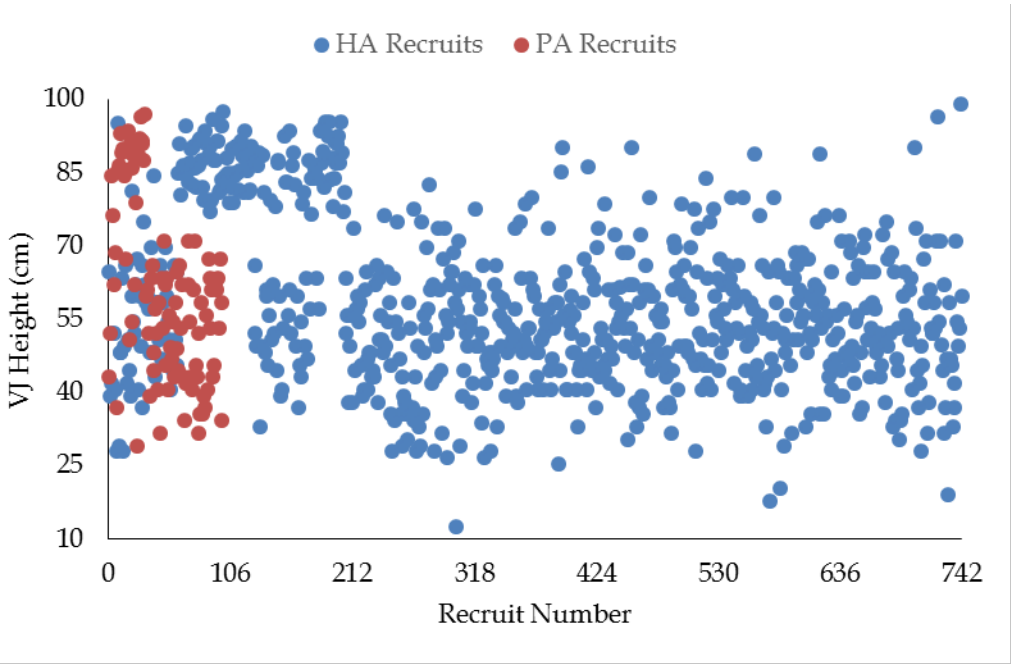

Figure 4. Individual scores for the vertical jump (VJ) test in hosting agency (HA; n = 742) and participating agency (PA; n = 99) law enforcement recruits prior to academy training.

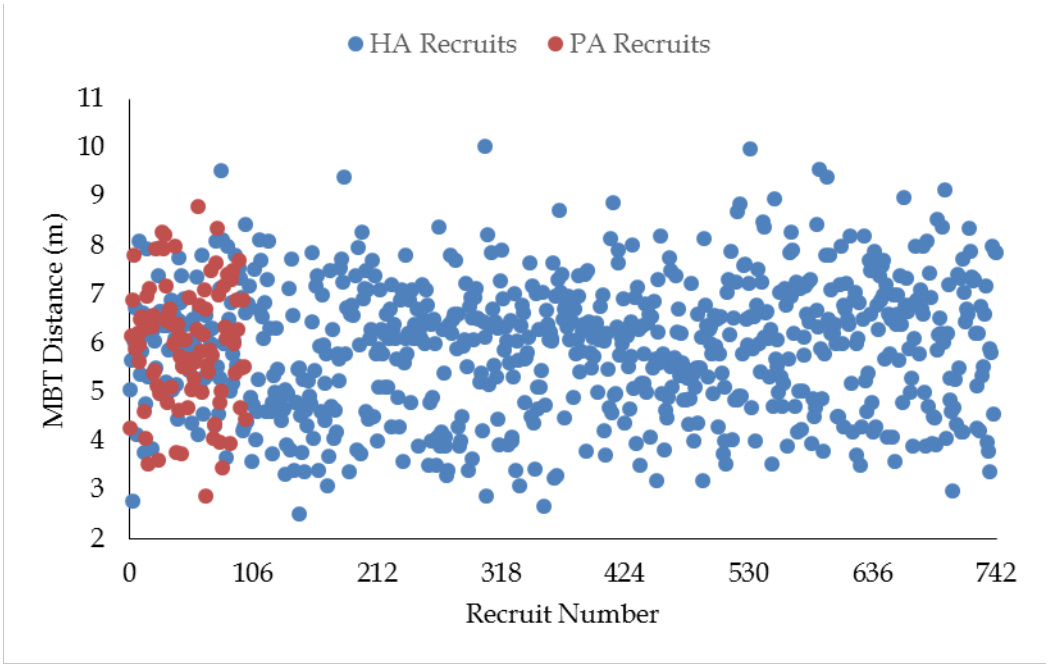

Figure 5. Individual scores for the 2-kg medicine ball throw (MBT) in hosting agency (HA; n = 742) and participating agency (PA; n = 99) law enforcement recruits prior to academy training.

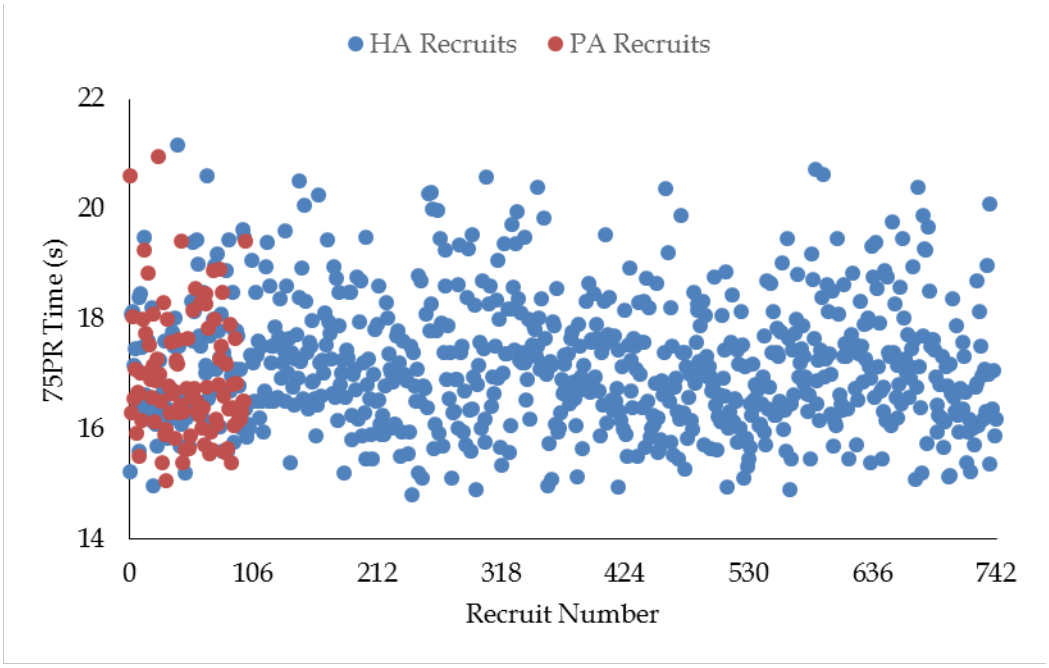

Figure 6. Individual scores for the 75-yard pursuit run (75PR) in hosting agency (HA; n = 742) and participating agency (PA; n = 99) law enforcement recruits prior to academy training.

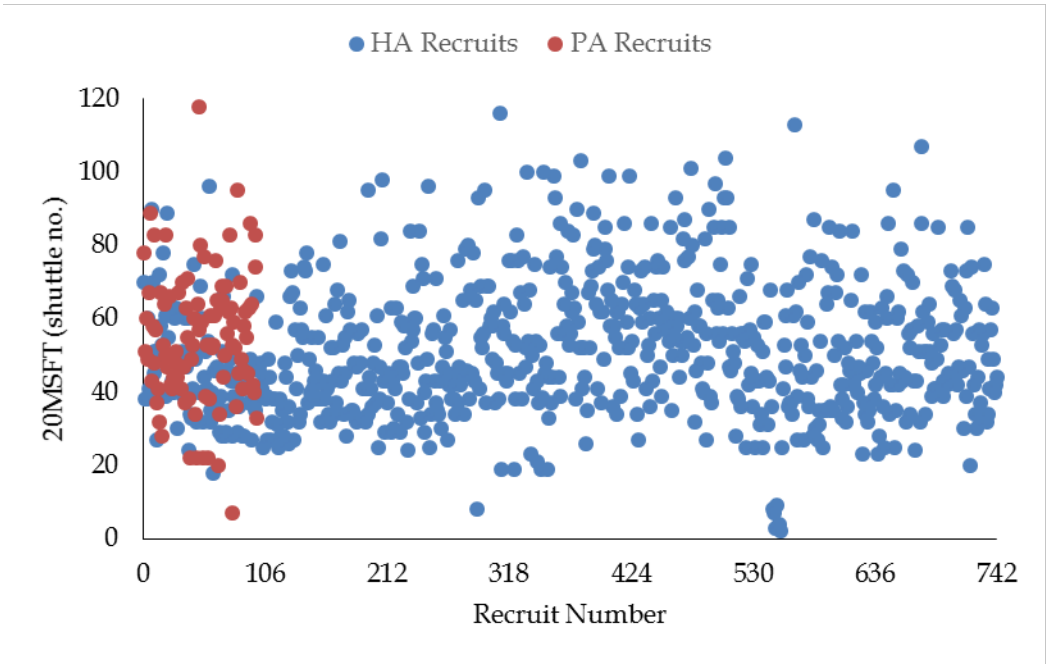

Figure 7. Individual scores for the 20-m multistage fitness test (20MSFT) in hosting agency (HA; n = 742) and participating agency (PA; n = 99) law enforcement recruits prior to academy training.

DISCUSSION

This study investigated the differences in fitness between incoming law enforcement recruits from either a HA or PA to provide some determination as to how an agency's hiring practices could affect the overall fitness of an academy class. Counter to the study's hypothesis, the results

indicated that there were predominantly trivial differences between HA and PA recruits. However, the PA recruits did complete significantly more push-up and sit-up repetitions than the HA recruits. Furthermore, analysis of individual recruit data indicated those from the HA tended to demonstrate greater extremes (minimum and maximum values) in the fitness tests. The current data have important implications for law enforcement academy staff, and reinforce the need to consider individualized, ability-based approaches for physical training regardless of agency.

There were no significant differences in age between the HA and PA recruits. The PA recruits were taller and heavier, though these differences both had small effects. Even though sex was controlled for within the univariate analysis, these data could have been influenced by the number of male recruits (n = 82) relative to females (n = 17) in this group. Males tend to be taller and heavier than females when considering general population data (16). It should be noted that this disparity between the sexes is very typical in law enforcement (5, 6, 8, 28-32, 34, 37, 38, 43). Nonetheless, both the HA and PA recruits demonstrated age, height, and body mass characteristics similar to other law enforcement recruits in the literature (5, 6, 8, 28-32, 34, 37, 38, 43). This highlights some generalizability of the results found in this study.

In this study, PA recruits completed approximately 8% more push-up repetitions than HA recruits, which equated to about 3 more repetitions in the 60 seconds time period. This result may provide some indication of how a PA could be more selective in hiring recruits with better fitness characteristics amongst their applicants, especially if they have a smaller number of positions to fill relative to the HA. This is important, as previous research has shown that recruits who can complete more push-ups are more likely to graduate from academy (13, 57). Relative to job performance, Dawes et al. (12) found that in patrol officers, a greater number of push-ups correlated (r = - 0.52, p < 0.001) with faster physical ability test performance, which incorporated tasks such as running, pushing, pulling, barrier climbs, and obstacle clearances. Lockie et al. (24) found that in recruits push-ups were involved in predictive relationships for law enforcement specific tasks, such as a 99-yard obstacle course and six-foot chain link fence climb. Evidently, push-up performance provides an indicator of upper-body muscular endurance for law enforcement populations. Nevertheless, there was also a notable variation between individual recruits in the number of push-ups completed, whether for the HA or PA recruits, although the range was greater (96 repetitions) for the HA recruits. These results also highlight the potential value of an ability-based focus within academy training (9, 22, 42, 44, 50). Providing the same exercises and training dose (e.g., a specific number of repetitions) for all recruits would not be as beneficial, especially if there are recruits that arrive at academy with better muscular endurance.

With regards to sit-ups, the PA recruits completed approximately 12% more repetitions than the HA recruits (approximately four more repetitions), demonstrating better abdominal muscular endurance. As for the push-up results, these data may provide some indication of hiring practices for PA. Although only one piece of hiring procedures required by a law enforcement agency (30, 31), in this study PA may have been able to hire recruits that had better fitness in certain qualities, such as muscular endurance. This is notable, as Lockie et al. (27) found that in

recruits greater sit-up repetitions correlated with faster times in tasks including a 99-yard obstacle course (r = -0.208, p = 0.001), six-foot chain link fence climb (r = -0.175, p = 0.006), and 500-yard run (r = -0.344, p < 0.001). Nonetheless, individual data for the HA and PA recruits indicated a wide range of abilities. The extremes were notable for the HA recruits, with a difference of 77 repetitions between the best and worst performers. This also highlights the need for ability-based training in law enforcement recruits. If there are some recruits that arrive at academy training with better muscular endurance, it is important to make exercises more challenging to encourage greater adaptation. Examples of this for exercises such as push-up and assorted abdominal exercises have been provided in the literature (17, 42).

There were no significant differences between HA and PA recruits in the MBT and VJ. These results suggest that when considering overall means, the HA and PA recruits entered training academy with similar upper and lower-body power. These results are potentially impactful, as power is important for law enforcement populations. Lockie et al. (28) found that the MBT was involved in predictive equations for academy graduation in law enforcement recruits. The VJ has been linked to reduced injury risk in recruits (13, 48). Moreno et al. (43) found that VJ height significantly correlated with body drag velocity (r = 0.209, p < 0.05) when law enforcement recruits dragged a 75-kg dummy 9.75 m. Nonetheless, individual recruit data indicated a wide range of power capacities for the HA and PA recruits. There was a greater range for the HA recruits in both power tests, which may provide an indication of the hiring needs of a large agency due to the number of positions needed to be filled (30). Given the importance of power for policing job tasks, academy training staff should ensure their programming caters towards those with greater and lesser physical abilities (11, 12, 14, 43).

There were also no significant differences in the 75PR times between HA and PA recruits. This specific change-of-direction speed test is used for the agency in this study as a foot pursuit simulation (5, 8, 23, 28, 30, 38, 52). Lockie et al. (24) found that recruits who did not graduate from academy due to physical training failures or injury were slower in the 75PR. Lockie and Hernandez (23) have detailed percentile rank data for the 75PR which was drawn from 949 law enforcement recruits. The mean for the HA recruits in this study fell within the 40-49th percentile rank. The mean for PA recruits was slightly superior, falling in the 50-59th percentile rank. The individual recruit data for the 75PR spanned the spectrum of the percentile ranks detailed by Lockie and Hernandez (23). While the range was greater for the HA recruits (~12 s), the PA recruits still had an approximate six-second difference between high and low performers. Contributing factors to a faster 75PR include lower-body isometric strength, multidirectional power (measured by jump tests), and faster running speeds (52). HA and PA recruits will likely enter academy with a range of abilities in lower-body strength, power, and maximal running. Training staff should take this into account when attempting to enhance foot pursuit ability in their recruits.

There were no significant differences (with trivial effects) in the 20MSFT between the HA and PA recruits. As for the other fitness tests, it should be recognized that there was a wide range of aerobic capacities demonstrated by individual HA and PA recruits. The range was wider for the HA recruits, with a difference of 114 completed 20MSFT shuttles between high and low

performers. There was also a large difference between high and low performers for the PA recruits (111 completed 20MSFT shuttles). Again, these results highlight the wide range of fitness capabilities that can exist between individual HA and PA recruits. Given the need for aerobic fitness in law enforcement, these individual differences should be recognized (4, 12, 27, 51, 55). Ability-based aerobic conditioning programs should be adopted during law enforcement academy training. Examples of how to do this have been presented in the literature (7, 22, 50). This approach has the added benefit of not only improving performance, but also reducing injury risks in recruits (50).

There are certain study limitations that should be noted. There were more recruits from the HA compared to PA, although this was expected. As the fitness characteristics of law enforcement populations can vary between agencies, it is recommended that agencies' investigate their own recruits to ascertain whether they are representative of the data in this research (45). The PA recruits were from a range of different smaller agencies. Compared to other agencies, an individual agency could have a different hiring practices (2, 30, 39, 47) or provide different access to pre-academy training (40, 41). This was not considered in this study, as splitting the PA recruits into individual agencies would result in some very small data subsets. Furthermore, pre-academy training is not mandatory for recruits, so the number of individuals from the PA and HA groups who may have completed any pre-academy training was not provided to the researchers. Future analysis is needed to determine whether any fitness differences that may exist between recruits hired by different agencies is influenced by hiring practices or training advice provided by the agency. This study did not feature a maximal strength test, even though maximal strength should contribute to important policing job tasks (14, 25, 35, 49). Future research should investigate any strength differences between HA and PA recruits, via assessments such as a bench press (15), hexagonal bar deadlift (25), and leg/back dynamometer (35). As for previous research, body composition analyses could also have been included in this study (21). Nevertheless, within the context of these limitations, the results from this study still provide insight on characteristics of HA and PA recruits across multiple academy classes.

In conclusion, this analysis revealed that the PA recruits in this study performed significantly more push-ups and sit-ups compared to HA recruits. This could provide some indication that PA could be more selective in their hiring process, as they would have less positions to fill than the HA and could have hired recruits with better muscular endurance. What was also notable was that there were no other between-group differences in the fitness tests. Furthermore, analysis of individual recruit data included a wide spread of results for both the HA and PA groups (although the differences between high and low performers tended to be greater for the HA). Due to the differences in muscular endurance between HA and PA recruits and the spread of fitness between individual recruits, the results from this study provide further support for ability-based practices in law enforcement academy training. Ability-based training should allow for greater performance improvements in more recruits during academy, as well as reduction in potential injuries.

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