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Original Research

The Health and Fitness Characteristics of Civilian Jailer Recruits Prior to Academy Training

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ABSTRACT

International Journal of Exercise Science 15(4): 58-78, 2022. Civilian jailer (CJ) recruits may not complete fitness testing within their hiring process. As certain job tasks in custody/jail facilities can be physically demanding (e.g., inmate restraint), better health and fitness should help a recruit graduate from a CJ academy and be prepared for the occupation. This study investigated the health and fitness characteristics of CJ recruits entering academy training, detailed between-sex differences, and categorized recruits relative to population norms. Retrospective analysis was conducted on data from 89 CJ recruits (48 males, 41 females) across three academy classes from one law enforcement agency. The following were measured before academy: resting heart rate (RHR); blood pressure (BP); height, body mass, and body mass index (BMI); waist circumference; sit-and-reach; grip strength; 60-s push-ups; and YMCA step test recovery heart rate (HR). Independent samples *t*-tests derived any between-sex differences. Recruit data were compared to categorical population norms. The results indicated that male recruits were taller, heavier, had greater grip strength, and completed more push-ups than female recruits ($p < 0.001$). Approximately 53% of recruits were overweight or obese according to BMI, ~63% had an RHR below average-to-very poor, and ~75% had elevated BP or hypertension. Most recruits had good-to-excellent flexibility (sit-and-reach; ~66%) and muscular endurance (push-ups; ~85%). However, ~70% of recruits had fair-to-poor grip strength, and ~79% had poor-to-very poor aerobic fitness measured by step test recovery HR. Aerobic conditioning and strength training should be a focus of CJ recruits during academy. Furthermore, better aerobic fitness should benefit job performance and lessen cardiovascular disease risk.

KEY WORDS: Aerobic fitness, custody assistant, correctional, tactical, YMCA step test

INTRODUCTION

An important law enforcement job position is a custody assistant, correctional services assistant trainee, detention officer, or civilian jailer (CJ) (46, 54). A CJ is typically responsible for assisting law enforcement officers with maintaining security in custody detention, station jails, or court

lockup facilities (41, 42, 46, 54). Most job tasks for CJs are relatively sedentary, including office work and supervision of inmates (27, 28). However, there are certain tasks that could be very physically demanding for the CJ. These could include cell searches, responding to alarms, and physical confrontations with inmates (27, 28). To provide a specific example, Lockie et al. (32) analyzed a defensive tactics training scenario completed by custody assistant/CJ recruits. They reported that recruits achieved a heart rate (HR) in excess of 90% of their age-predicted maximum. Within this defensive tactics scenario, training instructors in protective equipment verbally initiated a physical confrontation with the CJ recruit (32). This ultimately resulted in a scenario that lasted for approximately 40 seconds (s), with 15-20 s of talking and 15-20 s of fighting between the training staff and recruit (32). The physical demands of the controlled fight within the training scenario contributed to the high HR experienced by recruits. Given the intensity of tasks such as inmate restraint, and the importance of being able to complete these tasks to ensure safety within the custody facility (27, 28), it could be surmised that CJs require some level of physical fitness.

During the hiring process for law enforcement officers, many agencies require candidates to complete fitness testing. Fitness testing is generally designed to provide data that distinguishes between candidates that have the physical ability to learn how to safely and effectively perform critical or essential job tasks, resulting in academy or training program graduation (7, 10). Indeed, achieving an adequate level of fitness should benefit a candidate's ability to tolerate the demands of a training academy (16, 30, 34). For example, previous research has shown that law enforcement officer recruits who had poorer muscular endurance (measured by push-ups completed in 60 s) (16, 30), or aerobic fitness (measured by the 2.4-km run or multistage fitness test) (16, 30, 34), were more likely to fail a training academy. However, candidates for custody positions may not need to complete any fitness testing during the hiring process. Some agencies may only use height and body mass in their selection requirements (50, 51). However, due to Federal Equal Employment Opportunity laws, height and body mass standards often cannot be strictly enforced as standards for job readiness based on the assumption that they are not related to the occupation (66). This is partly related to the differences in job demands for correctional versus patrol positions, and the type of training academy completed. A law enforcement officer recruit may complete an academy that lasts for 27 weeks (43). In contrast, in California (and depending on the agency), a custody assistant, correctional services assistant trainee, or CJ recruit may only need to complete an 8- or 9-week training academy (12, 54). With regards to physical training for CJs, this is typically up to the discretion of the training staff for the particular academy. Nevertheless, it could be expected that a CJ recruit with better health and fitness may better tolerate the physical rigors of a training academy and the job itself.

In the USA there are generally no fitness tests used during the hiring process for correctional populations, with limited consistency across different agencies (1). As stated, some CJ candidates may only have their height and body mass used as physical entry standards prior to being hired (50, 51), although this cannot often be strictly enforced as a hiring standard as these measures are not job-related. Some agencies in California will include some general fitness (e.g., push-ups, sit-ups) and physical ability (e.g., body drags, obstacle courses) tests in the hiring process for CJs (12), but these are not standard across the state. Therefore, in practice this

population essentially has no hiring standards as it pertains to physical fitness. This could indicate there is a wider selection pool from the general population for agencies when recruiting (39), as there are limited restrictions on the health and fitness of potential applicants. Indeed, there is a relatively higher number of females in custody assistant/CJ academy classes (~36%) (42), compared to law enforcement officer classes (~16%) (40). This is important as many agencies are facing challenges with recruitment and retention (73). However, if there are limited to no fitness standards for CJ recruits, this may result in agencies hiring individuals whose health and fitness could be less than optimal. It would be important for agency staff to know whether this is the case, as this could influence the type of training used for their recruits.

The health and fitness of a CJ recruit prior to academy could influence whether they are capable of successfully completing academy, in addition to their future job performance or longevity. There has been some analysis of the general fitness of custody assistant/CJ recruits (42, 46); however, there has been limited investigation of the health of this population. This is notable given the propensity for law enforcement personnel to be at risk of conditions such as cardiovascular disease (78). Some practical health assessments that could be used for CJ recruits, which have been previously recommended by Rodas and Lockie (65), include: resting heart rate (RHR) (9), resting blood pressure (BP) (22), body mass index (BMI) (14), and measures of body composition (14, 18). These assessments could be used to supplement select fitness tests to provide a more detailed picture of the health and fitness of a CJ recruit. This is important because if a recruit enters a training academy with relatively poor health and fitness, it may be problematic for training academy completion and indeed career longevity. Anecdotally, training staff noted that the rate of CJ recruits tends to be lower than law enforcement officer recruits, which can equate to approximately 14-18% of a recruit sample (34, 37). This is understandable given the differences in training academy length (i.e., 8 weeks vs. 27 weeks) (43, 54) and job demands (i.e., custody vs. patrol tasks) (45). Although any physical ability tests that need to be completed prior to graduation may be of a lesser intensity than that for patrol officers due to the different job demands (12), health and fitness could impact a CJ recruits performance in these tests (in addition to performance in other aspects of academy). Training staff also anecdotally noted that those recruits with lesser health and fitness tend to encounter the greatest challenges during a CJ training academy.

Therefore, the purpose of this study was to detail the health and fitness characteristics of CJ recruits entering academy training. This research involved the analysis of de-identified archival data provided to the researchers. Law enforcement agency staff conducted health and fitness testing on the CJ recruits prior to academy training. Between-sex comparisons were made (46), and individual recruits were categorized relative to population norms (63, 64, 67). It was hypothesized that male CJ recruits would outperform female recruits in the fitness tests (46), although there would be no differences in the health assessments. As the agency from this study did not use fitness testing during the hiring process for CJ candidates (51), it was further

hypothesized that most recruits would demonstrate lesser health and fitness characteristics relative to the general population.

METHODS

Participants

Retrospective analysis of a convenience sample of CJ recruit data from three academy classes belonging to one law enforcement agency was conducted. This sample comprised 89 recruits, including 48 males and 41 females, and descriptive data is shown in Table 1. For recruit data to be included, full data sets had to be available. As secondary data was utilized in this study, G*Power software (v3.1.9.2, Universität Kiel, Germany) was used to confirm post hoc that the sample size of 89 (with groups of 48 and 41 participants) was sufficient for an independent *t*-test analysis such that data could be interpreted with a small effect level of 0.55 (26), and a power level of 0.82 when significance was set at 0.05 (19). The characteristics of the CJ recruits in this study, in addition to the between-sex ratio, was similar to that from previous research (42, 46, 54). The three cohorts completed their academy within a calendar year in southern California. Based on the archival nature of this analysis, the institutional ethics committee approved the use of pre-existing data (HSR-17-18-370). Even though this study utilized existing data, the research was still conducted in agreement with the ethical standards of the International Journal of Exercise Science (57). Additionally, the study followed the recommendations of the Declaration of Helsinki (75).

Protocol

The data were collected by staff working for one law enforcement agency in the week preceding academy. The staff involved were all trained by a certified Tactical Strength and Conditioning Facilitator who verified the proficiency of the staff members. Recruits wore their physical training attire (cotton t-shirt, shorts, and athletic shoes). Testing occurred between 9:00am-2:00pm depending on recruit availability. Recruits typically did not eat in the 2-3 hours prior to their testing session as they were completing employee-specific documentation. Testing was conducted indoors on a basketball court at the agency's training facility in groups of 10-12 recruits. RHR and BP were recorded first, followed by age, height, and body mass. The recruits then completed a testing circuit that included waist measurement, sit-and-reach, and grip strength. The recruits completed push-ups as a group, before concluding with the YMCA step test. The fitness tests were not used as a barrier for graduation for the recruits (e.g., a recruit needed to attain a certain standard in each fitness test in order to graduate). Rather, they were used as a way to monitor any changes in health and fitness that resulted from the training academy process. Rodas and Lockie (65) have provided explanations as to the validity of these tests relative to law enforcement populations; some of this information will be included here.

RHR and BP were recorded after the recruits were seated quietly for approximately 5-10 minutes. Both of these variables provide a measure of cardiovascular health (20, 74). Electronic BP monitors (Omron Healthcare, Kyoto, Japan) were used by staff due to ease of use, consistency, and need for time management. Electronic BP monitors have been recommended by Rodas and Lockie (65) for use in law enforcement, as well as the Centers for Disease Control

and Prevention (5). Recruits were seated with their feet flat on the floor and their arm in a supported, relaxed position at heart level. Clothing was removed or repositioned so that the cuff was placed on bare skin without any compression above the cuff. The cuff position was above the crease of the elbow and encircled approximately 75-100% of the arm (55). Staff then followed the directions on the automated device. RHR (measured in beats per minute; bpm), systolic BP, and diastolic BP were recorded.

Recruits self-reported their age to staff. Height was measured using a portable stadiometer (Seca 217, Hamburg, Germany), while body mass was recorded by electronic digital scales (Model HBF-510, Omron Healthcare, Kyoto, Japan). BMI was derived via the calculation: *body mass in kilograms (kg) ÷ (height in m)*^{2}.

Waist circumference provides an indication of body fat distribution (14, 18). A greater waist circumference has been related to cardiovascular disease risk (18), and poorer fitness test performance in law enforcement recruits (47). The datasets indicated that some recruits also had hip measurements taken to calculate hip-to-waist ratios. However, as the hip circumference measure was not available for all recruits in the dataset, only waist circumference was included in this study. Waist circumference was measured in cm at the narrowest part of the waist just superior to the naval with a thin-line metric tape measure (Lufkin, Apex Tool Group, Maryland) (47).

The sit-and-reach provided a measure of low back and hamstring flexibility (32), and used established procedures (38, 48, 49). Reduced hamstring flexibility could influence spine loading during manual handling tasks (4), which can be part of the job description for CJs (50). To complete the sit-and-reach, the recruit removed their shoes and sat with both feet flat against the sit-and-reach box with their hands positioned one on top of the other (tips of the middle fingers aligned), with the palms down. The recruit then reached forward slowly and touched as far along the scale as possible and, ensuring that their knees remained extended, held this position for 5 s. Three trials were performed, with the furthest reach distance (measured in cm) used for analysis.

Grip strength provided a measure of upper-body strength (71) and was measured by a hand grip dynamometer (Takei Scientific Instruments, Japan). This quality is important for CJ recruits as grip strength can positively influence grappling during defensive tactics scenarios (60), and body or victim drags (44). Recruits kept their testing arm by their side when standing throughout the assessment and squeezed the handle as hard as possible for approximately 2 s (17, 46, 47). Two attempts were completed for each hand and results were recorded to the nearest kg, with the left hand tested first (47). The best score for each hand was summed together to provide the combined grip strength score.

Upper-body muscular endurance was assessed via a 60-s push-up test. This is a standard test in law enforcement, and previous research has linked muscular endurance as measured by the push-up test to the ability to graduate from academy in law enforcement recruits (16, 68). This would also have application for CJ recruits, and established procedures were used (36, 46, 47).

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 push-up depth (46). All female recruits were partnered with a female tester. On the start command, the tester began the stopwatch and 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 push-ups as possible in 60 s. They could rest in the up position with elbows locked; however, only full repetitions were recorded (13, 38). The recorded result was the number of correctly completed repetitions.

The YMCA step test was administered as a fitness assessment to measure aerobic capacity (31, 76). This test has been previously used to assess aerobic fitness in custody assistant/CJ recruits, with the procedures described by Moreno et al. (54). The test was performed on an indoor basketball court, with approximately 12 inch (~31 cm) high bleacher seats used for the step. Although it could have been beneficial to customize step heights to all recruits, this was not realistic within the training and testing environment for CJ recruits (54). Recruits completed the step test in groups of 6-8, such that they could be paired up with a tester to measure their recovery HR. To complete the YMCA step test, recruits continuously stepped in time to a 96-bpm metronome for 3 minutes. The beat was played from an iPad handheld device (Apple Inc., Cupertino, California) connected to a portable speaker (ION Block Rocker, Cumberland, Rhode Island) positioned on a higher bleacher seat in front of the recruits. Recruits were required to complete the steps continuously through the 3 minutes without pausing for rest. Verbal encouragement was provided to recruits to ensure this was the case. The researchers were not informed as to whether certain recruits from this dataset were using any medication that could have affected their HR following the YMCA step test. Nonetheless, training staff informed the researchers that all recruits analyzed in this study were able to complete the full 3 minutes in the step test. Following the 3 minutes, recruits immediately sat on the step while recovery HR was manually taken by a staff member via the carotid or radial artery for 60 s (31, 54). Although HR may continue to decline after this 60-s time period, this followed the established procedures for the YMCA step test (76). Furthermore, 60-s recovery HR has been shown to be a valid measure of cardiovascular fitness (2, 25, 31). Beutner et al. (2) stated that the 60-s recovery HR following the YMCA step test predicted peak oxygen uptake in adult men and women with an R value of 0.83. Accordingly, the use of 60-s recovery HR as deemed appropriate by the researchers within the confines of this study. This was also especially true considering the face validity of the YMCA step test (i.e., climbing stairs in custody facilities is a daily job task for CJs) (65).

Statistical Analysis

Statistical analyses were processed using the Statistics Package for Social Sciences (Version 27; IBM Corporation, New York, USA). Descriptive statistics (mean ± standard deviation [SD]) were calculated for each variable. Any differences between the sexes were investigated by independent samples *t*-tests, with significance set at $p < 0.05$. Levene's test for equality of variances were checked to determine whether equal variances were to be assumed or not assumed. Effect sizes (*d*) were also calculated for the between-sex comparisons, where the

difference between the means was divided by the pooled SD (8). 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 (26).

Individual data were then compared to categorical normative data, relative to sex and age. BP classifications were drawn from standards presented by Pescatello et al. (63). BMI, waist circumference, sit-and-reach, grip strength, and push-ups were compared to normative data shown by Riebe et al. (64). RHR and recovery HR from the YMCA step test were compared to normative data presented by Ryan and Cramer (67). The variables were then profiled using Microsoft Excel (Microsoft Corporation™, Redmond, Washington, USA). Male and female recruits were grouped together according to the respective categories for the different health and fitness measures, as sex-specific standards were provided (63, 64, 67). Nevertheless, the number of male and female recruits per category was also noted.

RESULTS

Descriptive data for the full data sample, in addition to the male and female recruits, is shown in Table 1. Equal variances were assumed for all variables except grip strength. The male recruits were taller, heavier, had a greater grip strength, and completed more push-ups (all large effects) than the female recruits. The female recruits had a lower systolic BP (small effect) and smaller waist circumference (moderate effect). There were no other between-sex differences in the health and fitness assessments.

Health and fitness assessments for the CJ recruits relative to normative data is shown in Figures 1-8. Approximately 46% of the sample (41 recruits) were classified as normal weight relative to their BMI (Figure 1); 43% were overweight (8 recruits), and 10% were Obesity Class I or II (9 recruits). About 63% of the sample (69 recruits) had an RHR that was below average-to-very poor (Figure 2). Approximately 25% of the sample (22 recruits) had a BP that was categorized as normal (Figure 3); just over half the CJ recruits were categorized as having Class 1 or 2 hypertension (46 recruits). Almost half the CJ recruits (42 in total) had no additional risk of cardiovascular disease based on their waist circumference relative to their BMI (Figure 4). Nonetheless, approximately 52% did have increased risk, with 3 recruits having very high risk. Most of the CJ recruits had good-to-excellent flexibility as measured by the sit-and-reach (~66% or 59 recruits; Figure 5), and the same was true for push-ups (~85% or 76 recruits; Figure 7). However, for combined grip strength most CJ recruits were fair-to-poor (~70% or 62 recruits; Figure 6). Relative to aerobic fitness measured by recovery HR following the YMCA step test (Figure 8), approximately 79% of the sample (70 recruits) were categorized as poor-to-very poor.

Table 1. Descriptive data (mean ± SD) for age, height, body mass, body mass index (BMI), resting heart rate (RHR), systolic and diastolic blood pressure (BP), waist circumference (WC), sit-and-reach, grip strength, push-ups, and YMCA step test recovery heart rate (HR) in male and female civilian jailer recruits.

	All (n = 89)	Males (n = 48)	Females (n = 41)	p	d
Age (years)	28.67 ± 9.10	27.94 ± 9.56	29.54 ± 8.56	0.411	0.18
Height (m)	1.69 ± 0.09	1.74 ± 0.06	1.62 ± 0.06*	< 0.001	2.00
Body Mass (kg)	73.48 ± 13.35	80.39 ± 12.16	65.38 ± 9.70*	< 0.001	1.36
BMI (kg m^{-2})	25.71 ± 3.38	26.45 ± 3.42	24.86 ± 3.16	0.260	0.48
RHR (bpm)	75.65 ± 12.83	74.35 ± 12.09	77.17 ± 13.63	0.304	0.22
Systolic BP (mmHg)	132.17 ± 18.90	136.27 ± 18.64	127.37 ± 18.28*	0.026	0.48
Diastolic BP (mmHg)	82.31 ± 11.10	81.44 ± 12.38	83.34 ± 9.44	0.423	0.17
WC (cm)	83.98 ± 9.20	88.14 ± 7.65	79.12 ± 8.52*	< 0.001	1.11
Sit-and-Reach (cm)	32.98 ± 8.75	31.47 ± 9.15	34.74 ± 8.01	0.079	0.38
Grip Strength (kg)	71.05 ± 21.26	84.83 ± 19.14	54.92 ± 9.41*	< 0.001	1.98
Push-ups (reps)	32.35 ± 16.63	43.13 ± 12.70	19.73 ± 10.79*	< 0.001	1.99
Recovery HR (bpm)	134.93 ± 18.15	136.50 ± 18.84	133.10 ± 17.36	0.381	0.19

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

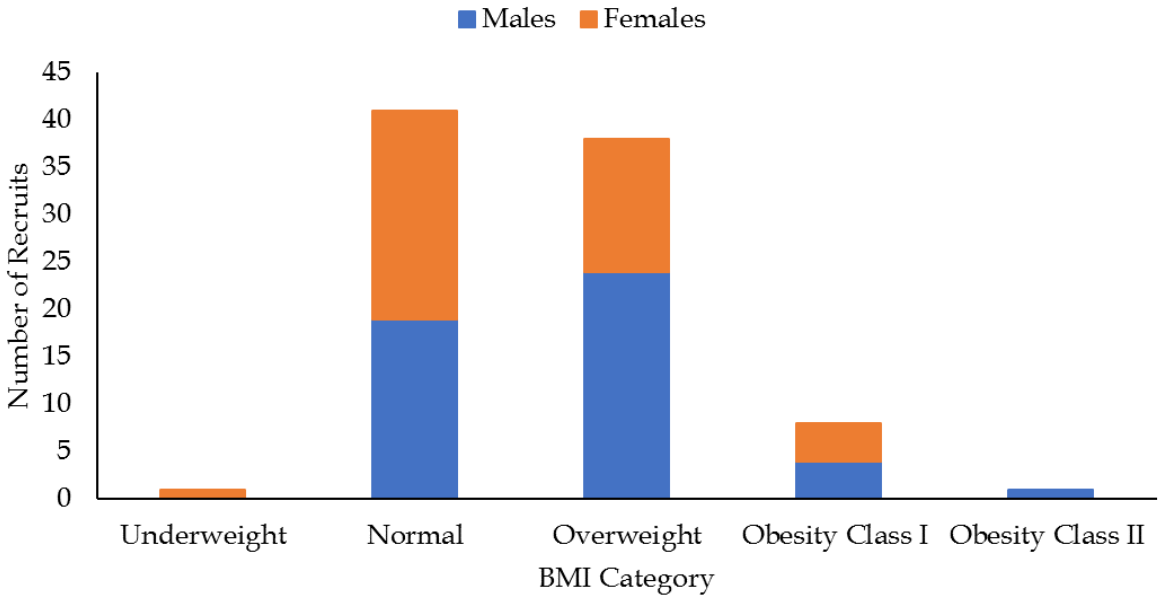

Figure 1. Number of civilian jailer recruits classified according to the body mass index (BMI) categories.

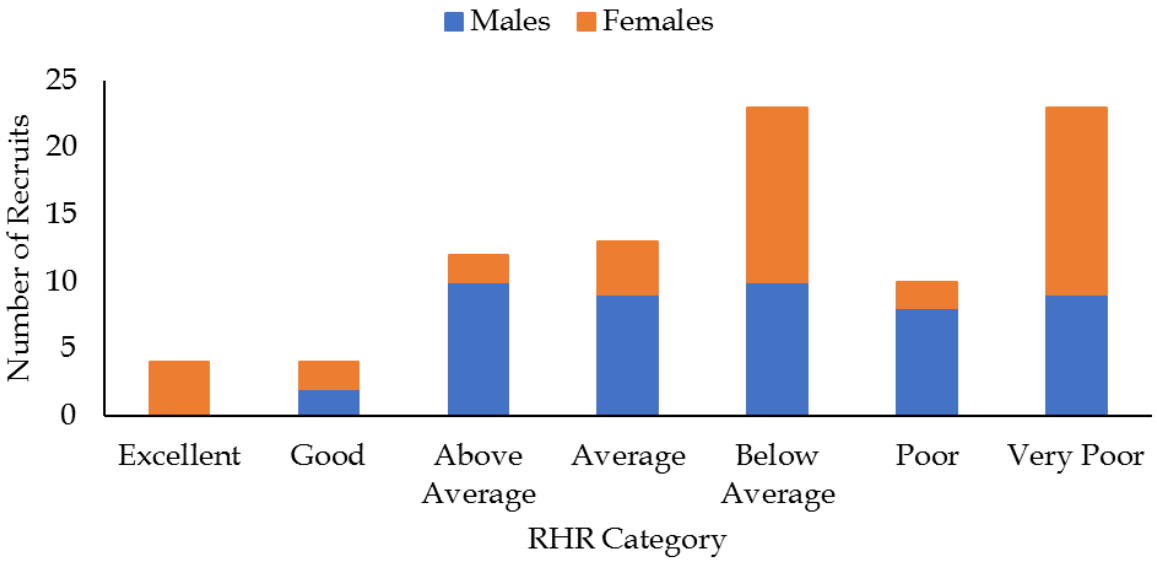

Figure 2. Number of civilian jailer recruits classified according to the resting heart rate (RHR) categories.

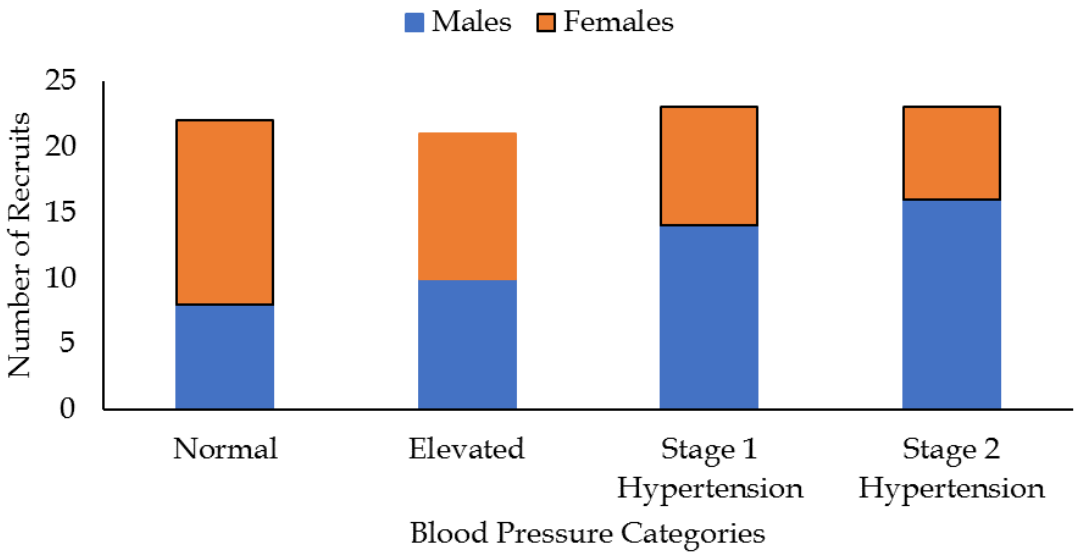

Figure 3. Number of civilian jailer recruits classified according to the blood pressure categories.

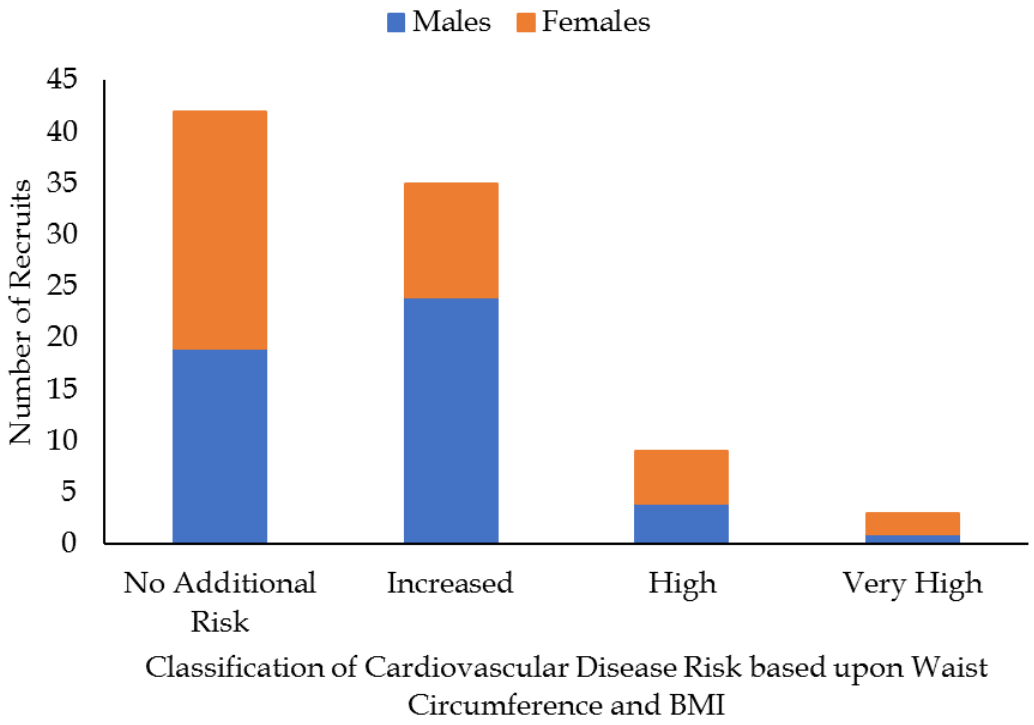

Figure 4. Number of civilian jailer recruits classified according to the cardiovascular disease risk based upon waist circumference and body mass index (BMI) categories.

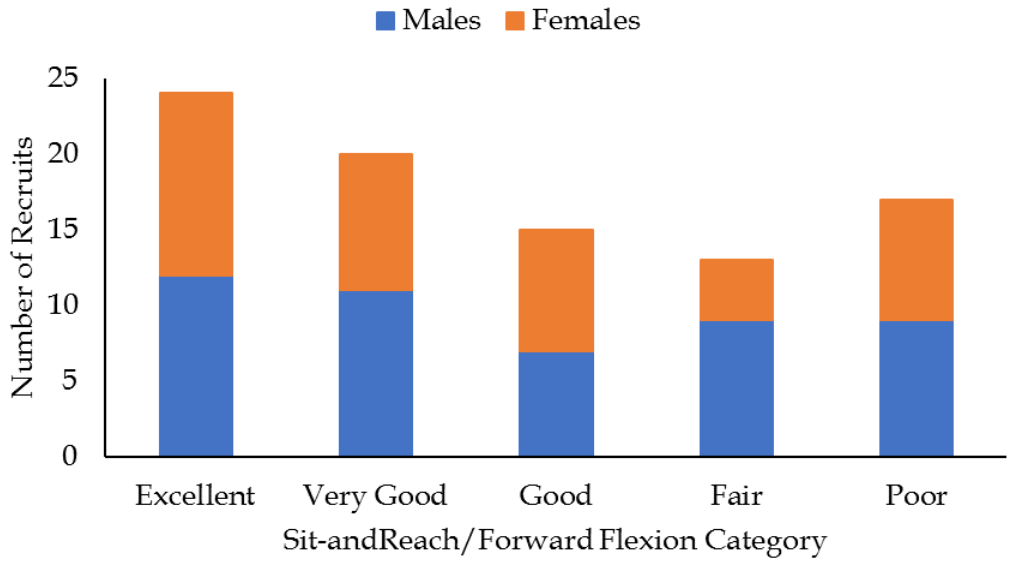

Figure 5. Number of civilian jailer recruits classified according to the sit-and-reach/forward flexion categories.

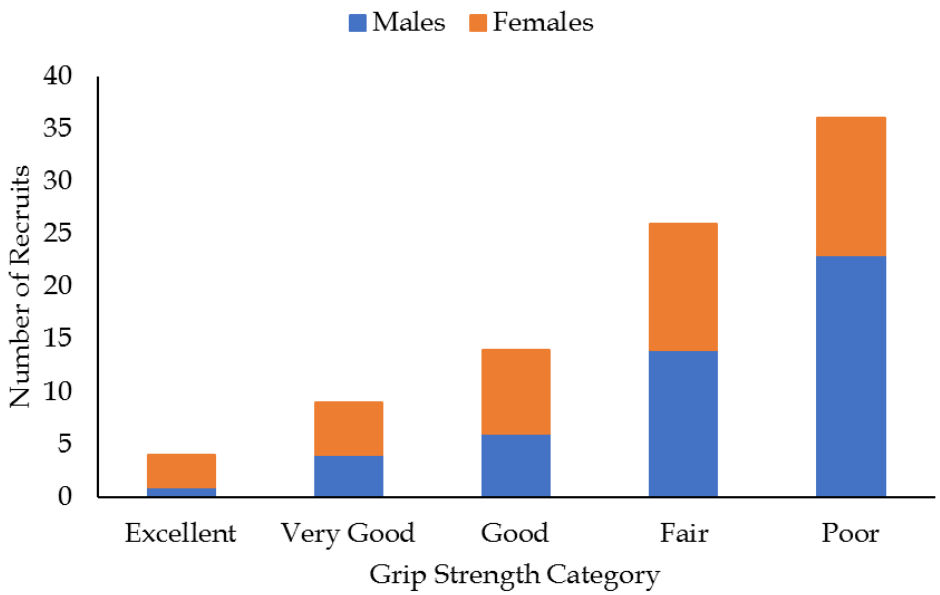

Figure 6. Number of civilian jailer recruits classified according to the combined grip strength categories.

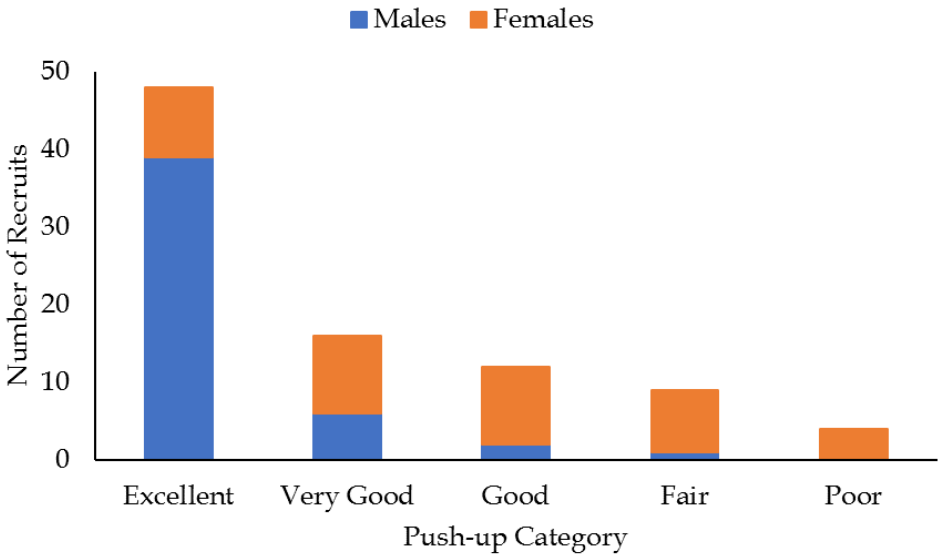

Figure 7. Number of civilian jailer recruits classified according to the push-up categories.

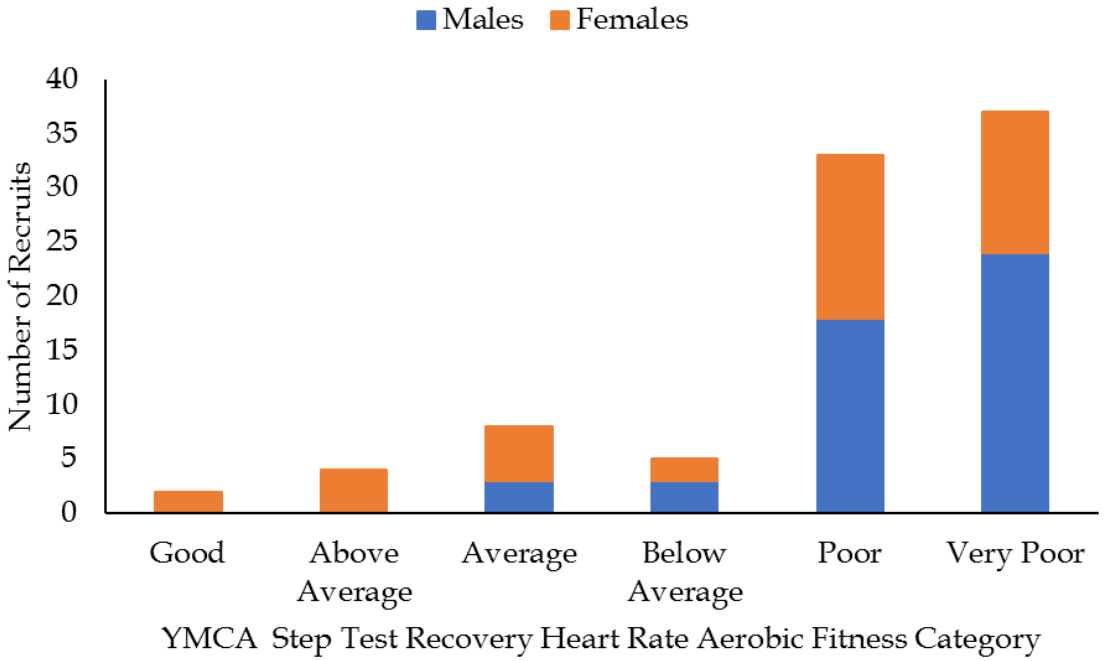

Figure 8. Number of civilian jailer recruits classified according to the YMCA step test recovery heart rate categories.

DISCUSSION

This study investigated the health and fitness of CJ recruits prior to their training academy. It was firstly hypothesized that the male CJ recruits would outperform female recruits in the fitness tests. Additionally, as the law enforcement agency did not incorporate fitness testing for custody assistant/CJ candidates as part of the hiring process, it was further hypothesized that the recruits would demonstrate lesser health and fitness relative to population forms. These hypotheses were proven partially true. The male recruits did perform significantly better than the female recruits in some fitness tests (e.g., grip strength, push-ups); however, there were no differences in other assessments (e.g., YMCA step test recovery HR). Furthermore, while the recruits generally displayed superior fitness relative to general population data in some tests (e.g., push-ups, sit-and-reach), there were concerning results in other assessments (e.g., RHR, BP, grip strength, YMCA step test recovery HR). Notably, the training staff informed the researchers that the data analyzed in this study were all from recruits who graduated from academy. For that reason, the data is representative individuals who were able to successfully navigate the CJ training academy process. The results from this study have important implications for law enforcement training staff regarding how they develop and ideally monitor the health and fitness of their custody personnel.

Males typically have a larger body size (21), greater waist circumference (64), and tend to outperform females in strength- and aerobic-based fitness tests (52, 62). The data from this study somewhat reflected this. The male CJ recruits were taller, heavier, and had a greater waist circumference. The female recruits had a lower systolic BP, but there were no differences in diastolic BP. Both male and female recruits did have a mean BP that would place them in the

elevated BP category (63). With regards to the fitness tests, previous research in custody assistant recruits detailed that males were significantly ($p \leq 0.024$) stronger in grip strength, and completed more push-ups than females (46). The results from Lockie et al. (46) were supported by the current research. Interestingly, there was no significant between-sex difference in the sit-and-reach, despite females tending to display greater flexibility compared to males (64, 77). Further, there were no significant between-sex differences in aerobic fitness measured by the recovery HR following the YMCA step test. This was in contrast to Lockie et al. (46), who found male custody assistant recruits had an 18% greater estimated maximal aerobic capacity compared to female recruits as measured by the 2.4-km run. Differences in the dynamics of the tests likely would have contributed to these results. The YMCA step test is completed within 3 minutes; the 2.4-km run can take anywhere between about 10-30 minutes to complete, depending on the recruit (42). As will be discussed, what could have also influenced the YMCA step test recovery HR data is the relative fitness of both the male and female recruits, which was generally poor relative to general population norms (67). Indeed, categorizing the health and fitness of CJ recruits relative to population norms is important to provide context for the sample in this study.

Law enforcement personnel are at high risk of cardiovascular disease (78). Stress, shift work, lack of sleep, and poor dietary choices are all contributing factors to this risk (23, 78). Given these occupational factors occur over the course of a career, recruits should ideally be in good health prior to academy to minimize any detrimental effects of the job. Elevated RHR (9) and BP (22) are both indicators of increased risk of cardiovascular disease. In the CJ recruits from this study, 36% of the sample (33 out of 89) had a below average-to-poor RHR. Twenty-three recruits had elevated blood pressure, while just over half the sample (46 out of 89 recruits) had Stage 1 or 2 hypertension. It should be acknowledged that these measurements were not taken first thing in the morning which is generally recommended (55). A CA training academy can be a stressful process (demonstrated by elevated HR responses in training scenarios) (35), so the recruits may have had a physiological response to the environment they were in. Nonetheless, these data indicate that the CJ recruits may need to improve their RHR and BP profile. Appropriate aerobic conditioning programs could decrease the RHR and BP of the CJ recruits (11). This would be especially important for recruits that report to a training academy with a cardiovascular profile requiring improvement.

BMI has some limitations in that it does not provide a direct measure of body composition, nor does it take into account the volume of lean mass an individual has (58). Nevertheless, BMI has featured in other law enforcement research (15, 30), and does provide some context to the health of an individual (64). Almost half the sample (41 out of 89 recruits) had a BMI categorized as normal (64). However, 38 recruits were overweight, with 9 obesity class I or II. When combined with waist circumference data to assess cardiovascular disease risk (64), 42 recruits had no additional risk, while 47 had increased-to-very high risk. It would have been beneficial to have hip circumference for the recruits such that waist-to-hip ratio could be calculated, as this measurement can also indicate cardiovascular disease risk (18). Unfortunately, this measurement was not available in the dataset for all recruits, and thus was omitted. Nonetheless, the data indicates almost half the sample of CJ recruits had a BMI and waist

circumference that could increase their risk of cardiovascular disease, even before they embark on a custody career. Taken together with the RHR and BP results, this further emphasizes the importance of aerobic conditioning for CJ recruits. Appropriate aerobic training in CJ recruits could not only improve RHR and BP (11), but could also induce a more favorable BMI and waist circumference (3).

Approximately 67% of the sample (59 out of 89 recruits) had a sit-and-reach that was categorized as good or above (64), with 27% of the recruits (24 out of 89) rated as excellent. Although the sit-and-reach is limited to measuring low back and hamstring flexibility (32), these results are still important within the context of this study. Flexibility is needed for correctional staff when conducting searches (27, 28) and for manual handling (4). Greater hamstring flexibility has also been found to decrease overuse injuries in military trainees (24), so this could have some impact for CJ recruits during the academy training period. The data from this study detailed that most recruits demonstrated good low back and hamstring flexibility relative to population norms. Nonetheless, there were still 13 recruits rated as fair, and 17 recruits rated as poor. CJ academy training staff should recognize that there could be recruits with limitations in low back and hamstring flexibility. These recruits (and generally all recruits) could benefit from specific flexibility training, which can be effective when implemented correctly (59). Flexibility exercises could be seamlessly integrated into the warm-up or cool-down, and Jeffreys (29) has presented numerous exercises that could be used.

In contrast to the sit-and-reach, the grip strength profiles of the CJ recruits were less-than-optimal. Only 4 recruits were categorized as excellent (64). Twenty-six out of 89 recruits (~29% of the sample) were categorized as fair for grip strength, while 36 recruits (~41% of the sample) were considered poor. Grip strength has great practical application for CJ recruits, as it is needed during inmate restraint (27, 28) and body or casualty drags (44). Further, Jamnik et al. (27) has detailed that for an inmate arm retraction, a minimum grip force of 26 kg would be required. Within this sample there would be recruits who did not have a unilateral grip strength equivalent to this value, especially for female CJ recruits who were categorized as fair or poor. Given the importance of grip strength, and upper-body strength in general, within custody job tasks (27, 28, 44), training staff should attempt to develop this quality in their CJ recruits. This is especially important if recruits are deficient in strength prior to their respective training academy. Specific resistance training should be completed CJ recruits as part of the academy process, and it would be best if this was facilitated by a strength and conditioning coach (33). Previous research has detailed that males and females can improve their upper- and lower-body strength over 6-8 weeks with appropriate and well-designed resistance training programs (72), which fits the window used for a CJ recruit training academy (54). Furthermore, Moreno et al. (53) has provided example resistance training exercises that could be adopted in the law enforcement academy training setting, and these could be very useful for CJ recruits.

Push-ups are commonly used a means to measure upper-body muscular endurance in law enforcement populations (36, 46, 47). Although comparisons were made between the CJ recruits to categorical norms, there were differences between the push-up test methodology detailed by Riebe et al. (64) and the current research. The data from Riebe et al. (64) was for the maximal

number of push-ups that could be completed with no time limit; the push-ups completed by the CJ recruits in this study had a time limit of 60 s. Anecdotally, however, feedback provided by training staff indicated that many recruits reached their maximal number of successfully completed push-ups within 60 s. Furthermore, even with the time restrictions, many CJ recruits exceeded the standard expected for excellent (64). As a result, comparisons were made to the categorical data from Riebe et al. (64) to provide some context to the current results. More than half the recruits (48 out of 89) were categorized as excellent; 37 were categorized as fair to very good, while only 4 were considered poor (64). Training for muscular endurance is a common focus of law enforcement physical training programs (40), which was also the case for the law enforcement agency in this study. Further, performance in muscular endurance tests such as push-ups and sit-ups was used by this agency to present fitness awards to recruits during physical training (36, 40). Accordingly, it is plausible that the recruits were expecting this so attempted to develop these qualities prior to academy. As muscular endurance is important for custody job tasks that holding, pushing, and wrestling (i.e., inmate restraint and defensive tactics) (28), it is a positive that the CJ recruits are arriving at academy with some degree of muscular endurance. Training staff should ideally ensure that muscular endurance is, at the least, maintained and is translated to CJ-specific job tasks thereby ensuring the safety of the CJ, their colleagues, and inmates.

Although the CJ recruits exhibited better muscular endurance relative to population norms, this was not the case for aerobic fitness. Previous research has shown a wide spread of aerobic fitness capacities, as measured by the 2.4-km run, in custody assistant/CJ recruits (42). This was also demonstrated in this research. Only 14 out of 89 recruits were categorized as having average-to-good aerobic fitness as measured by their YMCA step test recovery HR (67). Thirty-three recruits (~37% of the sample) were categorized as having poor aerobic fitness, while 37 recruits (~42% of the sample) were very poor. Aerobic capacity is essential for many job tasks required in custody, including responding to alarms, extended cell searches, and inmate pursuit and restraint (28). The data in this study highlight the need for aerobic fitness development of CJ recruits, especially if many recruits report to academy with suboptimal cardiorespiratory fitness. Following a meta-analysis of interval training research, Sloth et al. (69) detailed that aerobic fitness could be improved over a time period of 2-8 weeks with 2-3 sessions completed per week. This would fall within the typical 8-week range of a CJ training academy (54). Further, sample circuit training (53) and running-based training sessions (6) that target aerobic conditioning have been presented in the literature. Academy training staff could use programs such as these to improve aerobic fitness in their recruits. Further, given the range of aerobic fitness (from very poor to good) and the increased risk of injury during academy for less aerobically fit recruits (70), ability-based training (i.e., group training that accounts for the fitness of individuals), as opposed to one-size-fits-all training is warranted (33, 61). In addition to developing aerobic fitness to benefit job task performance, this type of training could also improve factors such as RHR and BP to reduce the future risk of cardiovascular disease.

There are limitations to the current study that should be acknowledged. The CJ recruits in this study were from the one agency. The health and fitness profile of custody recruits and personnel from other agencies may be different (56). Specific measures of body composition (i.e., lean body

and fat mass) were not included in this study. The use of specific body composition equipment (e.g., bioelectrical impedance analyses) may provide a more detailed analyses of lean body and fat mass in CJ recruits. Grip strength was the only measure of maximal strength in this study. As maximal strength could be important for job tasks required when working in custody facilities, such as victim rescues or body drags (44), future research could incorporate different maximal strength assessments. Some examples include the hexagonal bar deadlift or leg/back chain dynamometer (17, 44). Some recruits may have been using medication that affected their HR measured during the YMCA step test. However, the researchers were not provided with this information by the agency. This study was cross-sectional in nature, and future studies should detail whether academy training can improve the health and fitness of CJ recruits.

In conclusion, this study demonstrated that although male CJ recruits outperformed female CJ recruits in some fitness tests (e.g., grip strength, push-ups), there were limited between-sex differences in other health and fitness measures (e.g., BMI, RHR, sit-and-reach, YMCA step test recovery HR). When compared to categorical populations norms, the CJ recruits demonstrated acceptable flexibility standards as measured by the sit-and-reach, and good muscular endurance as measured by push-ups completed in 60 s. However, many recruits had a BMI, RHR, and BP that placed them at risk of cardiovascular disease. For some recruits, this was compounded by their waist circumference. Many recruits also had fair-to-poor grip strength, so academy training staff should attempt to enhance the strength of recruits to potentially improve their ability to perform important job tasks (e.g., inmate restraint). Furthermore, approximately 79% of the CJ recruit sample had poor-to-very poor aerobic fitness as measured by YMCA step test recovery HR. These data emphasize the need for grip strength and aerobic fitness development in CJ recruits during the academy training period. Staff should utilize training programs that improve the strength and aerobic fitness of CJ recruits. Improving aerobic fitness may not only benefit future job performance of the CJ recruits, but also lessen their risk of cardiovascular disease.

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