Relationships Between Lean Body Mass and Fat Mass with Physical Fitness Performance in Deputy Sheriff Recruits

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Law enforcement can be a physically demanding profession, where officers may be required to complete low- and high-intensity efforts at various times while on duty. The purpose of academy training is to prepare recruits for these demands. It could be expected that a greater amount of lean body mass (LBM), and less fat mass (FM), would be beneficial to fitness and job-specific performance in law enforcement recruits. Several studies have analyzed these associations in law enforcement and in deputy sheriff recruits at the start of academy. The purpose of this study was to measure the relationships between body composition (LBM and FM) and fitness test performance in deputy sheriff recruits prior to academy. A retrospective analysis was conducted on 284 (230 males, 54 females) recruits from three academy classes. Health and fitness tests included: LBM and FM as a percentage of body mass derived using bioelectrical impedance analysis; grip strength for both left (L) and right (R) hands; arm ergometer revolutions in 60 s; push-ups and sit-ups completed in 60 s; a 75-yard pursuit run (75PR); seated medicine ball throw (MBT) with a 2 kg medicine ball; vertical jump (VJ); and number of shuttles in the multistage fitness test (MSFT). Partial correlations controlling for sex were used to derive relationships between LBM, FM, and the fitness tests (p < 0.05). Fat mass had small, but significant, negative correlations with: grip strength (L, V), push-ups, sit-ups, and MSFT shuttles (r = 0.19 to 0.27). A small, but significant, positive correlation was found between FM and the 75PR (r = 0.23). LBM also demonstrated small, but significant, positive correlations with: grip strength (L, V), push-ups, sit-ups, and MSFT shuttles (r = 0.15-0.25). A negative relationship between LBM and the 75PR was also found (r = -0.22). Although correlation strength was generally small, recruits with lower FM and higher LBM tended to perform better on the aerobic and anaerobic fitness tests, while recruits with higher FM and lower LBM tended to perform worse on these measures. Although these relationships may be expected, they have not been documented in a deputy sheriff recruitment population. This is important given that the academy training period of 22 weeks, in conjunction with less-than-optimal training methods (high running volumes with restricted recovery), could lead to reductions in LBM. Law enforcement agencies should monitor changes in FM and LBM over the course of the academy.

METHODS

- Physical Fitness Tests
  - Grip Strength R
  - Grip Strength L
  - Arm Ergometer
  - Push-ups (L, R)
  - Sit-ups (L, R)
  - MBT (L, R)
  - VJ (L, R)
  - MSFT shuttles (L, R)

- Physical Fitness Performance
  - Grip Strength R
  - Grip Strength L
  - Arm Ergometer

- Correlations
  - LBM with FM
  - LBM with Grip Strength R
  - LBM with Grip Strength L
  - FM with Grip Strength R
  - FM with Grip Strength L

RESULTS

- The test performance data for the three recruit classes is shown in Table 1.

<table>
<thead>
<tr>
<th>LBM &amp; FM Correlation</th>
<th>Grip Strength R</th>
<th>Grip Strength L</th>
<th>Arm Ergometer</th>
<th>Push-ups (L, R)</th>
<th>Sit-ups (L, R)</th>
<th>MBT (L, R)</th>
<th>VJ (L, R)</th>
<th>MSFT shuttles (L, R)</th>
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</table>

- The regression equation for the 75-yard pursuit run is shown in Figure 1.

- The correlation coefficients for the 75-yard pursuit run were: r = 0.44 and p < 0.05.

CONCLUSIONS

- Although correlation strength was generally small, recruits with higher LBM and lower FM tended to perform better on the aerobic and anaerobic fitness tests, while recruits with lower LBM and higher FM tended to perform worse on these measures.
- Although these relationships between anthropometric measures (body mass, LBM, and FM) and fitness test performance may be expected, they have not been documented in a deputy sheriff recruitment population.
- Dawes et al.2 recommends that decreasing FM and increasing LBM could lead to positive changes in physical fitness performance in law enforcement populations. This is important given that the academy training period of 22 weeks, in conjunction with less-than-optimal training methods (high running volumes with restricted recovery), could lead to reductions in LBM.
- Law enforcement agency staff should monitor changes in recruits LBM and FM over the course of the 22-week academy period.