

AGE-RELATED DIFFERENCES IN FITNESS IN FIREFIGHTER ACADEMY RECRUITS

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BACKGROUND

- Firefighter (FF) recruit academies often include applicants from fire cadet programs and/or from the general population.
- Those matriculating from cadet programs often represent the youngest age group, usually 19-21 years old, in a class of mixed recruits that oftentimes consists of a wide range of ages.
- Longitudinal work has demonstrated age-related decreases in cardiorespiratory fitness in active-duty firefighters.¹
- However, age-related fitness differences have not been explored within incoming recruits across a variety of fitness measures.

PURPOSE

- The **purpose** of this study was to explore initial fitness differences between six separate age groups of incoming FF academy recruits.

METHODS

- Fitness data were collected from five separate FF academy recruit cohorts (2018-2019, 2021-2023) of the same urban fire department resulting in 242 total recruits (203 males, 39 females).
- Recruits were separated into six age groups (See Table 2 for descriptives):
 - A1: 19-21 yrs (cadets)
 - A2: 22-25 yrs
 - A3: 26-30 yrs
 - A4: 31-35 yrs
 - A5: 36-40 yrs
 - A6: ≥ 41 yrs
- Upon the first week of entry into each recruit academy, recruits completed a battery of assessments in combine format. (Table 1).⁴

Measures	Method
Body mass (BM, kg)	Digital scale
Percent body fat (PBF, %)	Skinfold calipers
Movement Efficiency Screen (MES, 0-100)	Fusionetics™ MES
Sum handgrip (SHG, kg/BM _{kg})	Handgrip dynamometry
Push-ups (PU, #)	Paced, 2-minute test
Aerobic capacity (VO _{2peak} , mL•kg ⁻¹ •min ⁻¹)	5-minute Forestry step test
1-minute Heart Rate Recovery (HRR _{1min} , %MHR)	5-minute Forestry step test

Table 1. Data collection measures

Statistical Analysis

- SHG was normalized to BM and HRR_{1min} was normalized to estimated maximum heart rate (MHR = 220 – Age).
- The data were evaluated for normalcy.
- Comparisons were made to examine the influence of age:
 - One-way analyses of variance (ANOVA) were used in normally distributed data (MES, SHG, PU, HRR_{1min}).
 - Kruskal-Wallis tests were used in non-normally distributed data (BM, PBF, and VO_{2peak}).
- Pairwise comparisons determined differences between age groups.
- An alpha of 0.05 determined statistical significance.

RESULTS

- A1 had lower BM than A5 ($H_5 = 31.05, P < 0.001$) and PBF than A4, A5, and A6 ($H_5 = 26.70, P < 0.001$) (Figure 1).
- A1 had higher VO_{2peak} than all other age groups ($H_5 = 80.58, P < 0.001$) and higher HRR_{1min} than A3 and A4 ($F_{5,54} = 8.95, P < 0.001$) (Figure 2).
- Non-significant age differences were found for MES ($F_{5,56} = 1.80, P = 0.13$), SHG ($F_{5,56} = 1.49, P = 0.21$), and PU ($F_{5,57} = 2.40, P = 0.05$) (see Table 2 for descriptives).

Measure	A1 N = 105	A2 N = 14	A3 N = 45	A4 N = 39	A5 N = 25	A6 N = 14
Age (yrs)	20.4 ± 0.6	24.2 ± 1.1	28.0 ± 1.4	32.9 ± 1.3	38.2 ± 1.5	45.5 ± 4.4
Height (cm)	175.8 ± 9.2	177.4 ± 9.6	179.1 ± 7.7	177.7 ± 7.9	177.1 ± 10.1	179.6 ± 7.1
MES (0-100)	64.9 ± 1.3	58.9 ± 3.9	65.0 ± 2.1	59.7 ± 1.8	58.8 ± 3.3	61.4 ± 3.6
SHG (kg/BM _{kg})	1.2 ± 0.0	1.2 ± 0.1	1.1 ± 0.0	1.1 ± 0.0	1.1 ± 0.1	1.1 ± 0.1
PU (repetitions)	32.8 ± 1.2	23.9 ± 3.5	28.1 ± 1.7	29.2 ± 1.7	25.9 ± 2.5	30.6 ± 2.7

Table 2. Group descriptives for non-significant comparisons

CONCLUSIONS

- The youngest age group, composed of only cadets (A1), had better body composition and greater aerobic fitness than the older age groups.
- The lack of age group differences in movement efficiency, relative muscular strength and endurance may suggest a limit to the physical preparation benefits from the cadet experience (A1).
- Absence of differences between the five older age groups may suggest that age alone poorly differentiates the physical readiness in incoming recruits.
- Through an improved understanding of the potential age-related fitness differences of those entering the recruit academy, more tailored programming may be generated prior to and during the recruit academy to maximize development and success of the recruits.

PRACTICAL APPLICATIONS

- Training emphasizing aerobic fitness may be needed for recruits **not** entering from a cadet program.
- All recruits, regardless of age, would benefit from increased movement efficiency, muscular strength, and muscular endurance programming during the recruit academy.
- As the age of the incoming recruit increases, greater relative training focus may be needed for weight management and aerobic capacity.
- It has been demonstrated that each of these factors have been successfully improved with physical training programming and are related to successfully graduating from the recruit academy.^{2,3}

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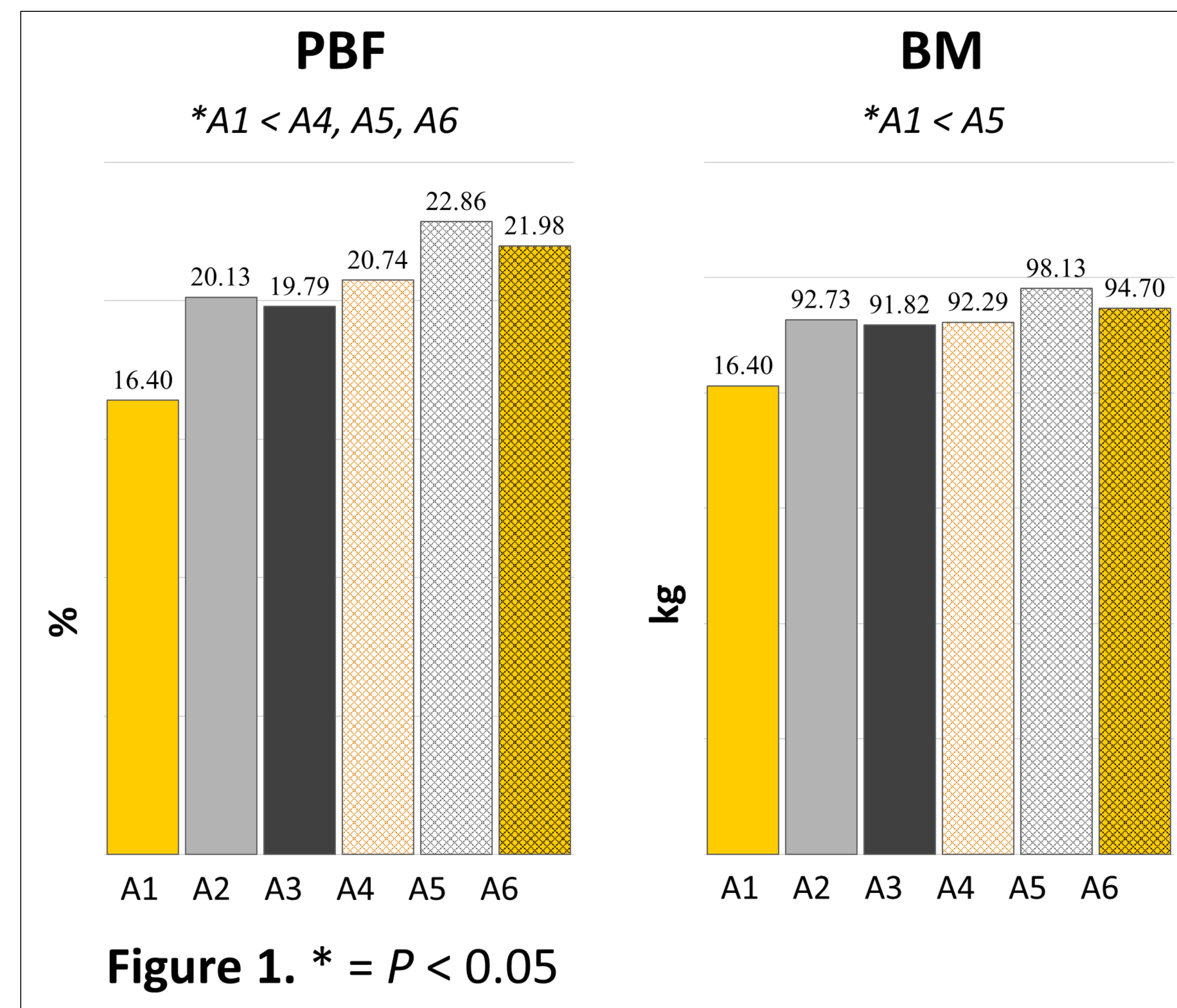


Figure 1. * = P < 0.05

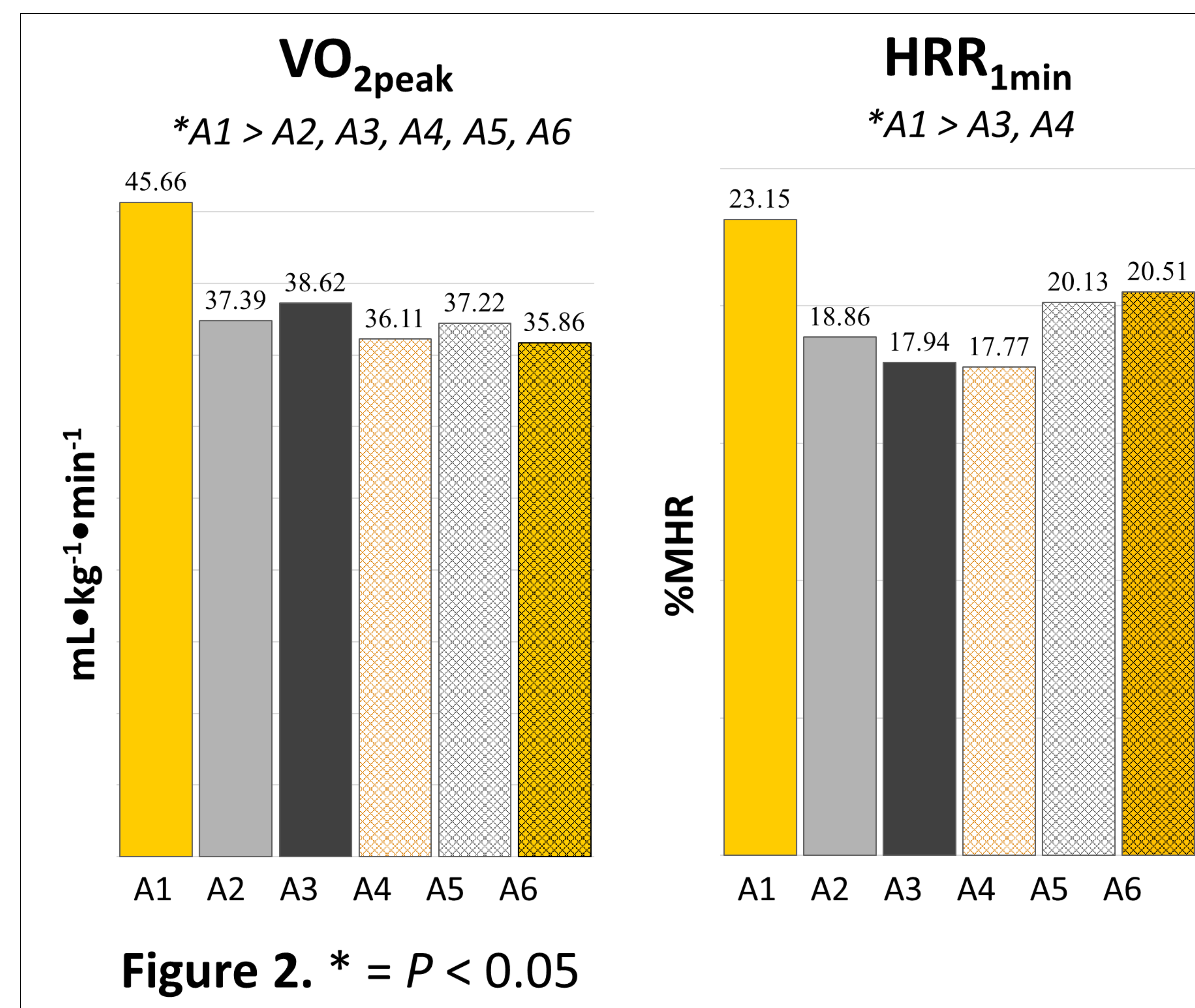


Figure 2. * = P < 0.05

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