



Exercise Motivation Mediates Parenting Effects on Physical Fitness Among Aviation Cadets: A PLS-SEM Study

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Abstract. Physical fitness is essential for aviation cadets because operational readiness requires sustained physical and psychological capacity. This study examined whether institutional parenting, exercise motivation, and the educational environment explain physical fitness among cadets at the Indonesian Aviation Academy Banyuwangi. An explanatory quantitative design was applied to 94 respondents using census sampling. Parenting, motivation, and educational environment were measured with five-point Likert instruments, while fitness was represented by objective performance indicators. Data were analyzed using partial least squares structural equation modeling and bootstrapping. The educational environment significantly predicted physical fitness ($\beta = 0.411$, $p = .001$) and exercise motivation ($\beta = 0.370$, $p = .003$). Exercise motivation predicted physical fitness ($\beta = 0.353$, $p = .004$), while institutional parenting strongly predicted motivation ($\beta = 0.501$, $p < .001$) but had no significant direct effect on fitness ($\beta = 0.193$, $p = .051$). The indirect parenting-motivation-fitness effect was significant ($\beta = 0.177$, $p = .013$). The model explained 75.0% of fitness variance. The findings indicate that supportive but structured parenting is most effective when it builds internal motivation, while a conducive educational environment provides the context needed to sustain cadets' fitness.

Keywords: Aviation Cadets; Educational Environment; Exercise Motivation; Institutional Parenting; Physical Fitness

1. INTRODUCTION

Aviation education combines academic learning, discipline, character formation, and physical conditioning. At the Indonesian Aviation Academy Banyuwangi, physical fitness is directly relevant to operational readiness because cadets must tolerate sustained workload, follow safety-critical procedures, and maintain performance under pressure. The source study reports a decline in physical-fitness scores during 2024-2026, with average achievement below the institutional minimum. This pattern makes the social and educational mechanisms surrounding training an important object of evaluation, not merely the physiological training program itself.

The academy applies a structured form of institutional parenting in which control and support operate simultaneously. Control concerns rules, monitoring, schedules, and behavioral standards; support concerns constructive communication, emotional attention, mentoring, and guided autonomy. The control-support distinction originates from parenting research (Baumrind, 1991), yet its logic is relevant to residential and highly regulated education. During the 2024-2025 reform period, the source study describes a movement toward a more humanistic and participatory educational approach while retaining discipline requirements (Kementerian Perhubungan Republik Indonesia, 2024, 2025). This transition creates a practical question: can reduced dependence on external control be compensated by stronger internal motivation?

Self-Determination Theory proposes that durable behavior is more likely when autonomy, competence, and relatedness are supported and external regulation becomes internalized (Deci & Ryan, 2000; Ryan & Deci, 2017). Evidence in physical education likewise shows that autonomy-supportive climates are associated with stronger need satisfaction, intrinsic motivation, participation, and adaptive outcomes (Kruse et al., 2024; Langoy et al., 2024; Leisterer & Paschold, 2022; White et al., 2021). Exercise research also shows that autonomous motivation is important for sustained physical activity and fitness-related outcomes (Liu et al., 2023; Manninen et al., 2022; Ntoumanis & Moller, 2025; Teixeira et al., 2012).

However, evidence integrating institutional parenting, exercise motivation, educational environment, and objectively oriented fitness outcomes in Indonesian aviation education remains limited. Prior research generally examines family parenting, conventional schooling, or sport settings. The present study therefore tests whether institutional parenting affects physical fitness directly and indirectly through exercise motivation, while also examining the contribution of the educational environment. Its main contribution is to connect a control-support approach with motivational and fitness outcomes in a safety-sensitive vocational context.

2. LITERATURE REVIEW

Institutional parenting is conceptualized as a balance between demandingness and responsiveness. A control-dominant system can secure short-term compliance, but excessive control may weaken self-directed regulation; conversely, support without adequate structure may reduce consistency. The theoretically preferable pattern is structured support: clear standards are maintained while participants receive rationale, feedback, respect, and guided autonomy. Contemporary educational evidence supports this balance. Parental autonomy support is linked to motivation through psychological needs and self-control (Celik, 2024), while autonomy support from teachers and instructors is associated with intrinsic motivation and adaptive learning outcomes (Mammadov & Schroeder, 2023; Ortiz-Rodriguez et al., 2024).

Exercise motivation is therefore positioned as the psychological mechanism translating external regulation into consistent training behavior. Within Self-Determination Theory, intrinsic and internalized forms of motivation are expected to sustain effort more effectively than behavior maintained only by reward, punishment, or surveillance. In physical education, offering meaningful choices and autonomy-supportive instruction has been associated with better affective and activity outcomes (Lagestad et al., 2024; Oldervik & Lagestad, 2021).

Motivation also mediates relationships between contextual or body-related factors and participation (Haug et al., 2023), reinforcing its relevance as an intervening mechanism.

The educational environment represents the broader context in which parenting and motivation operate. From an ecological perspective, development reflects interaction between individuals and nested institutional systems (Bronfenbrenner, 1979). In aviation education, this environment includes institutional values, regulations, training facilities, instructor relationships, and peer climate. Accordingly, the model expects institutional parenting and the educational environment to strengthen exercise motivation, exercise motivation to improve physical fitness, and motivation to transmit part of the parenting effect to fitness.

3. RESEARCH METHOD

This study used an explanatory quantitative design with PLS-SEM as the main analytical approach. The population consisted of participants at the Indonesian Aviation Academy Banyuwangi, and census sampling yielded 94 respondents. Primary data were collected through an online five-point Likert questionnaire, while fitness performance was represented by the objective indicators used in the source study. Secondary information was drawn from institutional documents and relevant scientific literature.

Institutional parenting was measured through control and support indicators, including rule compliance, monitoring, rule clarity, emotional support, relationship quality, and guided autonomy. Exercise motivation covered intrinsic interest, training satisfaction, reward, and punishment. Physical fitness included endurance/VO2 max, push-up and sit-up performance, sprint, and shuttle run, while the educational environment reflected institutional values, regulations, policies, and training facilities.

The measurement model was evaluated through outer loading, average variance extracted (AVE), Cronbach's alpha, composite reliability, Fornell-Larcker criteria, and HTMT. The structural model used R-square, effect-size diagnostics, predictive relevance, path coefficients, and bootstrapping. These procedures follow established guidance for PLS-SEM in educational research (Hair & Alamer, 2022). Statistical interpretation in this condensed article is restricted to the direct and indirect effects reported in the source output.

4. RESULTS AND DISCUSSION

Measurement Model

All indicators met convergent-validity requirements. Outer loadings ranged from 0.814 to 0.886 for institutional parenting, 0.909 to 0.924 for exercise motivation, 0.927 to 0.970 for physical fitness, and 0.861 to 0.937 for educational environment. AVE values ranged from 0.737 to 0.910, while Cronbach's alpha and composite reliability exceeded 0.70 for all constructs. The highest reported HTMT value was 0.841, below the 0.90 criterion. These results indicate adequate convergent validity, discriminant validity, and internal consistency.

Table 1. Measurement Model Summary.

Construct	Loading range	Alpha	CR	AVE
Institutional parenting	0.814-0.886	0.929	0.944	0.737
Exercise motivation	0.909-0.924	0.916	0.947	0.857
Physical fitness	0.927-0.970	0.967	0.976	0.910
Educational environment	0.861-0.937	0.885	0.928	0.812

Structural Model and Hypothesis Testing

The model showed satisfactory explanatory and predictive performance. Physical fitness had $R^2 = 0.750$ (adjusted $R^2 = 0.743$), indicating that 75.0% of its variance was explained by the modeled predictors. Exercise motivation had $R^2 = 0.650$ (adjusted $R^2 = 0.643$). Model-fit diagnostics reported SRMR = 0.067, NFI = 0.822, and Q2 Predict = 0.352. The direct-effect results are summarized in Table 2.

Table 2. Direct Effects

Path	Beta	t	p	Decision
Environment -> Fitness	0.411	3.175	.001	Significant
Environment -> Motivation	0.370	2.791	.003	Significant
Motivation -> Fitness	0.353	2.688	.004	Significant
Parenting -> Fitness	0.193	1.633	.051	Not significant
Parenting -> Motivation	0.501	3.963	<.001	Significant

The strongest direct relationship was institutional parenting -> exercise motivation (beta = 0.501), showing that the parenting system primarily operates through a psychological pathway rather than by producing an immediate fitness response. The direct parenting -> fitness path was positive but narrowly missed the conventional significance level ($p = .051$). In contrast, both the educational environment and exercise motivation significantly predicted fitness. This pattern is consistent with evidence that autonomy-supportive contexts foster stronger motivation and engagement (Celik, 2024; Langoy et al., 2024; Rodriguez et al., 2024)

and with research showing that exercise motivation is associated with better physical-fitness outcomes (Liu et al., 2023).

Table 3. Indirect Effects Through Exercise Motivation.

Indirect path	Beta	p	Decision
Parenting -> Motivation -> Fitness	0.177	.013	Significant
Environment -> Motivation -> Fitness	0.133	.041	Significant

The significant parenting -> motivation -> fitness effect ($\beta = 0.177$, $p = .013$) confirms that exercise motivation mediates the relationship between institutional parenting and physical fitness. Thus, discipline and support appear to influence fitness when they are internalized as willingness to train consistently. This interpretation is compatible with Self-Determination Theory and meta-analytic evidence that need-supportive interventions improve autonomous forms of motivation in organized physical activity (Manninen et al., 2022; Ntoumanis & Moller, 2025). It also clarifies why strict control alone may be insufficient: physical adaptation depends on repeated behavior, and repeated behavior is more sustainable when regulation becomes personally endorsed.

The educational environment also had both direct and motivation-mediated relationships with fitness. In practical terms, motivation may be strong but difficult to convert into performance when facilities, rules, peer climate, or instructional support are weak. Conversely, a conducive environment can reinforce motivated behavior. The findings therefore support a combined institutional strategy: maintain clear performance standards, provide autonomy-supportive mentoring, explain the purpose of physical training, monitor progress constructively, and ensure adequate training resources. Such an approach retains the safety-oriented discipline of aviation education while reducing unnecessary dependence on external pressure.

5. CONCLUSION AND SUGGESTIONS

The study demonstrates that exercise motivation is the key mechanism linking institutional parenting to physical fitness among aviation cadets. Institutional parenting significantly predicted motivation but did not have a statistically significant direct effect on fitness, whereas exercise motivation and the educational environment significantly predicted fitness. The significant indirect parenting-motivation-fitness path indicates that control and support are most useful when they foster internal commitment to training. With $R^2 = 0.750$ for physical fitness and $Q^2 \text{ Predict} = 0.352$, the model has strong explanatory and meaningful predictive capacity within the studied sample.

For practice, the academy should preserve clear discipline while strengthening mentoring, rationale-giving, guided autonomy, feedback, and access to training facilities so that cadets develop sustained exercise motivation. The study is limited by its cross-sectional design, single-institution setting, and relatively small census sample, so causal and broad institutional generalization should be cautious. Future studies should use longitudinal or experimental designs, involve multiple aviation or vocational academies, and explicitly test interaction effects of educational-environment conditions.

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