

The occupational divide in health behavior: A non-linear threshold analysis of exercise motivation and physical activity among 45,551 Chinese adults

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Abstract

Background

Physical inactivity drives global health inequalities, yet the translation from psychological motivation to actual behavior is heavily constrained by occupational structures. This study aimed to unravel the occupational divide in health behavior by investigating the non-linear threshold effects of exercise motivation on moderate-to-vigorous physical activity (MVPA).

Methods

Utilizing cross-sectional data from 45,551 Chinese adults from the 2020 China National Fitness Activity Status Survey, we assessed motivation and physical activity using standardized scales. Restricted cubic splines (RCS) were applied to quantify non-linear dose-response relationships.

Results

Analyses revealed a significant nonlinear association between exercise motivation and MVPA ($P_{\text{overall}} < 0.01$, $P_{\text{nonlinear}} < 0.01$). A distinct "behavioral activation threshold" was identified: MVPA surged only after the exercise motivation score (EMS) exceeded 47.3, peaking at an EMS of 67.7 (corresponding to 288.9 min/week). Crucially, a stark occupational divide emerged. Manual laborers exhibited a steady, linear conversion of motivation into activity ($P_{\text{nonlinear}} = 0.312$). In contrast, mental workers demonstrated a pronounced threshold effect ($P_{\text{nonlinear}} = 0.004$), revealing a profound sedentary inertia that required the EMS to surpass 45.2 to trigger an exponential increase in MVPA. Furthermore, intrinsic enjoyment ($\beta = 0.022$, $P < 0.01$) and competence ($\beta = 0.019$, $P < 0.01$) emerged as the dominant catalysts for crossing this threshold, whereas health-centric motives ($\beta = -0.012$, $P = 0.08$) lacked significant efficacy.

Conclusions

Translating motivation into health behavior is not universally linear but deeply shaped by occupational strata. Desk-based mental workers face structurally embedded sedentary barriers that demand exceptionally high activation thresholds. Addressing these occupational health inequalities requires a paradigm shift from universal health education to structurally targeted workplace environmental interventions that lower behavioral barriers for mental workers, while prioritizing the cultivation of intrinsic enjoyment.

Background

Physical inactivity is linked to cardiovascular disease, metabolic disorders, and all-cause mortality and therefore represents an important public health challenge globally [1, 2]. The World Health Organization explicitly recommends engagement in moderate-to-vigorous physical activity (MVPA) for 150–300 min per week among adults [3]. However, despite continuous government promotion and improved fitness infrastructure, the prevalence of physical inactivity persists to be high [4, 5]. Such phenomenon of high health awareness coexisting with low physical activity suggests that reliance on knowledge dissemination and environmental improvements appears insufficient to overcome behavioral inertia among adults. Consequently, investigations into exercise motivation and analyses of mechanisms underlying the translation of exercise motivation into actual physical activity have emerged as crucial entry points for addressing current bottlenecks in health promotion.

Exercise motivation is a primary psychological driver of sports participation and constitutes a core variable that may elucidate variance in physical activity behavior. Grounded in the Self-Determination Theory (SDT) [6], this construct encompasses (i) intrinsic motivation stemming from interest and enjoyment and (ii) extrinsic motivation driven by external pressures or health benefits; between these two forms, intrinsic motivation is widely considered to be pivotal for sustaining long-term adherence [7]. Existing studies in the literature have consistently reported a positive association between stronger motivation and higher physical activity engagement; nevertheless, most studies have predominantly used linear regression models to quantify this relationship [7–9]. This methodological approach assumes that increments in motivation translate into physical activity gains at a constant fixed ratio;

however, such linear assumptions may oversimplify complex psychological dynamics and obscure potential nonlinear patterns [10]. This creates a knowledge gap in understanding the precise levels of motivation required to effectively trigger a transition from intention to actual behavior. Given these theoretical considerations, whether such a critical motivational threshold exists empirically remains unclear owing to the lack of precise evidence derived from large-scale datasets.

In addition to the magnitude of motivation, the specific quality of motivation and the surrounding social context are pivotal correlates of behavioral translation [11–13]. Health-centric motives dominate current public health discourse [14, 15]; however, it remains debatable whether abstract long-term health goals can effectively counterbalance the immediate physiological demands and execution costs of MVPA [16, 17]. Such an uncertainty prompts a critical examination of the actual contributions of distinct motivational dimensions to sustaining high-intensity activity.

Crucially, the translation of these motivational drivers into action is not universal but remains contingent upon the individual's occupational context[18]. For mental workers, physical activity is typically a discretionary leisure choice governed by lifestyle preferences; in contrast, for manual laborers, physical activity is often inextricably interwoven with occupational duties [19–21]. These environmental disparities suggest divergent barriers faced by distinct groups when translating intention into action [22]. Nonetheless, only few studies have systematically integrated the efficacy of motivational dimensions with the structural perspective of occupational stratification within a single analytical framework.

Existing studies have largely failed to uncover the dose–response characteristics inherent to the translation of motivation into MVPA and to conduct mechanistic analyses on occupational disparities. To the best of our knowledge, this study is among the first to integrate the SDT framework with nonlinear dose–response modeling to precisely identify behavioral activation thresholds across diverse occupational strata in China. The present study aimed (i) to precisely characterize the dose–response relationship between exercise motivation and MVPA and identify behavioral activation thresholds via nonlinear modeling, (ii) to evaluate the relative efficacy of distinct motivational contents in driving high-intensity activity, and (iii) to investigate the heterogeneity of motivational translation pathways across different occupations. Under the Self-Determination Theory (SDT) framework[23], we hypothesize that the translation from psychological intent to physical action is inherently non-linear[24]. Specifically, low motivation levels may be insufficient to overcome behavioral inertia, as MVPA entails considerable perceived costs, including time constraints, physical fatigue, and psychological stress. Instead, individuals may not engage in substantial MVPA until their intrinsic motivation reaches a critical “activation threshold” that outweighs these execution costs [25]. This study broadened the analysis to include health, enjoyment, competence, appearance, and social factors. Ultimately, this study sought to elucidate the mechanisms underlying the translation from psychological intent to MVPA and to provide an empirical basis for the development of stratified and targeted intervention strategies.

Methods

Participants

This study analyzed data derived from the 2020 China National Fitness Activity Status Survey, which was conducted with adults aged 20–59 years from September 1 to November 30, 2020, across 31 provinces (autonomous regions and municipalities) in China [26]. A three-stage probability proportional to the size sampling technique was applied. In the first stage, 10–20 county-level units were randomly selected from each provincial administrative unit. In the second stage, 13 village or neighborhood committees were randomly selected from each county-level unit. In the third stage, four adults aged 20–59 years were randomly sampled from each village or neighborhood committee. Data were collected through household visits. The questionnaires were administered by trained investigators using paper-based forms to ensure data entry accuracy. After rigorous data cleaning and the exclusion of participants with incomplete questionnaires or outliers in MVPA data, 45,551 adults were included in the final sample.

Variables

Exercise motivation

Exercise motivation was assessed using the validated Chinese version of the Motives for Physical Activity Measure–Revised (MPAM-R), a 15-item instrument that evaluates five motivational dimensions (namely, enjoyment, competence, appearance, health, and social engagement) using a 5-point Likert scale (1–5). The total exercise motivation score (EMS) ranges from 15 to 75, with

higher scores indicating greater motivation. The MPAM-R had been previously validated among Chinese adults (Cronbach's α of 0.737 overall and 0.725–0.899 across subscales) [27]. In this study, internal consistency was re-examined, yielding Cronbach's α of 0.790 overall and 0.756–0.826 across subscales, confirming high reliability for the present sample.

MVPA

Physical activity was assessed using the International Physical Activity Questionnaire–Short Form (IPAQ-SF) [28], which has been validated to show high test-retest reliability in Chinese adults (intraclass correlation coefficients: 0.79 [0.66–0.88] for total physical activity, 0.85 [0.75–0.91] for moderate physical activity, and 0.75 [0.60–0.85] for vigorous physical activity [29]. Data were collected through participants' self-reported recall of their physical activity in the preceding week.

Control variables

Key demographic covariates were controlled for in the analysis, consistent with previous studies [30, 31]. Sex was dichotomized into male or female, and age was treated as a continuous variable. Residence was categorized into urban or rural.

Occupation was classified into five categories: Occupation 1, unemployed/students; Occupation 2, agricultural workers; Occupation 3, service/transport workers; Occupation 4, clerical personnel; and Occupation 5, managers. For occupational stratification analysis, the sample was restructured to allow for a clear comparison between manual laborers and mental workers. The manual laborer group exclusively comprised agricultural workers, a category characterized by high physical intensity and occupational homogeneity, whereas the mental worker group included clerical personnel and managers. Unemployed/students and service/transport workers were excluded from this specific stratified analysis because the “unemployed/students” category represented occupational inactivity and the “service/transport workers” category showed extreme internal heterogeneity in occupational physical activity (e.g., active delivery vs. sedentary driving). Excluding them enabled a clear comparison between two theoretical extremes—namely, manual laborers and mental workers.

Educational attainment was coded into four levels: primary school or below, junior high school, senior high school, and undergraduate or above. Annual household income was categorized into “ $\leq$ CNY 100,000,” “CNY 100,000–199,999,” and “ $\geq$ CNY 200,000.”

Survey procedures

Survey coordinators underwent training sessions prior to data collection and subsequently organized secondary training for field investigators to ensure consistency in the understanding of survey objectives, procedures, and operational standards. During the survey, basic information on the sampling frame was obtained from local statistical departments and used for random sampling.

Face-to-face household interviews were conducted to collect data. During interviews, the investigators explained the purpose and significance of the survey, and written informed consent was obtained from all participants before administering the questionnaire. Upon survey completion, personal identifiers were processed using a three-level coding system to protect the participants' confidentiality.

This study was conducted in accordance with the principles embodied in the Declaration of Helsinki, and the study protocol was approved by the Ethics Committee of the China Institute of Sport Science (approval nos. CISSLA-20191029 and CISSLA-20220629).

Statistical analysis

Statistical analyses were performed using SPSS version 30.0 (IBM Corp., Armonk, NY, USA) and R version 4.2.2 (R Foundation for Statistical Computing, Vienna, Austria). Normality of continuous variables was assessed using the Kolmogorov–Smirnov test, skewness and kurtosis statistics, and Q–Q plots. Social, appearance, competence, health, and enjoyment motivation subscales, as well as total EMS, were normally distributed and are expressed as mean $\pm$ standard deviation. MVPA data were non-normally distributed and are presented as median (25th percentile, 75th percentile). Categorical variables are reported as n (%).

For univariate analysis, between-group comparisons of two independent samples were performed using the independent samples t -test for normally distributed data and the Mann–Whitney U test for non-normally distributed data. Comparisons among more than two groups were conducted using one-way analysis of variance for parametric data and the Kruskal–Wallis H test for nonparametric

data. When significant differences were identified in multi-group comparisons, post-hoc pairwise comparisons were conducted with Bonferroni adjustment to control for multiple testing.

To test the hypothesis of a nonlinear relationship between EMS and MVPA, the dose–response relationship was explored using restricted cubic splines (RCSs) within the generalized additive model framework. Five knots were placed in the 5th, 25th, 50th, 75th, and 95th percentiles of EMS distribution. Sensitivity analyses indicated that varying the knot number (3 or 4) did not alter the primary findings. All models were adjusted for age, sex, residence, occupation, educational attainment, and income. The statistical significance of both overall association (P_{overall}) and nonlinear component ($P_{\text{nonlinear}}$) was examined; the association was considered nonlinear if both $P_{\text{overall}} < 0.05$ and $P_{\text{nonlinear}} < 0.05$ and was regarded as linear if $P_{\text{overall}} < 0.05$ but $P_{\text{nonlinear}} > 0.05$. Thresholds for MVPA were identified according to inflection points and curvature of fitted RCS plots. The relative strength of association between each motivational dimension and MVPA was quantified using standardized β coefficients, which were estimated via multiple linear regression. All statistical tests were two-sided, with statistical significance set at $P < 0.05$. Analyses were performed in R version 4.2.2 using the “rms” and “ggplot2” packages for RCS modeling and visualization, respectively.

Results

A total of 45,551 adults with a mean EMS of 57.84 ± 8.51 and median MVPA of 195 (85, 365) min/week were included in the final analysis (Table 1). Except for sex, significant heterogeneity was detected across all demographic variables. Specifically, no statistical disparity in the EMS was observed between sexes; men had markedly higher MVPA levels than women. Regarding socioeconomic status, a clear socioeconomic gradient was observed, with higher EMS and MVPA levels consistently clustered among urban residents, individuals with tertiary education, and those in higher income brackets. Notably, occupational categories highlighted a complex relationship between intention and action. Agricultural workers (Occupation 2) exhibited the lowest EMS despite maintaining substantial physical activity levels, indicating a functional decoupling of motivation and behavior. Conversely, managers (Occupation 5) displayed a coherent alignment characterized by high EMS coupled with a peak MVPA volume of 720.0 min/week.

The adjusted nonlinear dose–response relationship between the total EMS and MVPA is depicted in Figure. 1. A distinct nonlinear pattern was evident. At EMS levels <47.3 , MVPA only modestly increased in response to rising scores; however, surpassing this threshold was accompanied by a sharp acceleration in activity levels. The trajectory peaked at an EMS of 67.7, corresponding to a maximum MVPA volume of 288.9 min/week. Beyond this apex, the positive association between the EMS and MVPA gradually declined.

Adjusted dose–response curves were mapped to dissect the specific contributions of distinct motivational components to MVPA (Figure. 2), and standardized coefficients were analyzed using multivariate linear regression (Figure. 3). The dose–response profiles showed marked heterogeneity across dimensions. Enjoyment and competence, which represented intrinsic motivation, exhibited a steep positive gradient with MVPA. Specifically, beyond a score threshold of 7.5, the MVPA volume surged exponentially with increasing EMS, and regression outcomes statistically reinforced this pattern (Figure. 2). After adjusting for confounders, enjoyment ($\beta = 0.022$, 95% CI: 0.008–0.036, $P < 0.01$) and competence ($\beta = 0.019$, 95% CI: 0.007–0.031, $P < 0.01$) yielded the most substantial positive coefficients, establishing them as the dominant predictors of MVPA. Conversely, despite higher mean scores for extrinsic dimensions (e.g., health, appearance), their dose–response trajectories appeared notably flatter (Figure. 3). Regression analyses indicated that the coefficients for these dimensions were not statistically significant ($P > 0.05$), with the health dimension showing a marginal inverse association ($\beta = -0.012$, 95% CI: -0.026–0.002, $P = 0.08$).

Stratified dose–response curves were constructed to clarify the interaction between occupational classification and EMS–MVPA relationship (Figure. 4). Manual laborers exhibited a strictly monotonic linear increase, in which MVPA increased steadily from 77.9 to 230.1 min/week as the EMS increased from 27 to 75, devoid of any saturation or plateau effects. In stark contrast, mental workers exhibited a complex nonlinear J-shaped trajectory, in which baseline MVPA increased to 176.8 min/week at an EMS of 16.0 and paradoxically receded in the low-motivation band to reach a nadir of 140.9 min/week at an EMS of 34.3. Beyond the critical threshold of 45.2, the curve initiated a precipitous exponential ascent, culminating at 293.6 min/week at an EMS of 75. The two trajectories converged at EMS of 46.1 and 58.6; after the initial intersection, the acceleration rate of mental workers significantly surpassed that of manual laborers.

Discussion

Drawing upon a comprehensive nationwide dataset, the present study systematically clarified the nuanced mechanisms governing the relationship between the EMS and MVPA among Chinese adults. The results revealed a nonlinear association between the EMS and MVPA, with enjoyment exhibiting the strongest behavioral driving force. Furthermore, the patterns of translating motivation into action varied significantly across occupational types. Crucially, the identification of a non-linear trajectory with a distinct activation threshold represents a novel contribution to the field, offering a more granular understanding of behavioral initiation than traditional linear models.

Latent motivational thresholds in the association between the EMS and MVPA

This study delineated a nonlinear trajectory in translating the EMS into MVPA, which was distinguished by a pronounced activation threshold. Empirical evidence indicates a disproportionate escalation in activity volume only upon reaching increased motivational states, although MVPA yields negligible increments within the lower EMS spectrum. This pattern suggests a high behavioral activation threshold for MVPA, the theoretical underpinnings of which may be elucidated through a tripartite framework. First, the evolutionary perspective of energy parsimony provides a foundational explanation [32]. The “least effort” principle implies an innate predisposition to conserve metabolic resources [33], suggesting that the substantial energy expenditure required for MVPA necessitates a potent psychological override to conquer this inherent biological inertia [34]. Second, affective response theory posits that the somatic discomfort inherent to high-intensity exertion, manifested as dyspnea and diaphoresis, constitutes a substantial physiological barrier [35, 36]. Insufficient motivation may fail to buffer against these immediate aversive sensations, thereby impeding behavioral initiation. Third, from a cognitive–behavioral standpoint, MVPA entails considerable executive costs for planning and implementation [37]. Low motivation plausibly remains confined to the intention level, whereas successful mobilization of superior motivational resources is a requisite for bridging the chasm between volition and enactment.

Dichotomy of motivational efficacy: intrinsic potency versus health-oriented constraints

With respect to motivational architecture, the present study delineated a stark dichotomy: intrinsic dimensions anchored in enjoyment and competence showed a robust positive coupling with MVPA, whereas the linkage to health motivation was markedly attenuated. This divergence likely reflects a mechanistic disparity in the capacity of distinct drivers to sustain high-intensity engagement.

Intrinsic motivation is inherently tethered to positive affective states and immediate gratification mechanisms [38, 39]. The experiential acquisition of enjoyment and perceived competence during physical exertion establishes a positive feedback loop capable of buffering against somatic fatigue and reinforcing behavioral perseverance [36, 40]. Conversely, the diminished potency of health motivation operates within the theoretical framework of temporal discounting. Individuals frequently amplify the immediate physical and cognitive disutility of exertion while discounting delayed health dividends, precipitating a pronounced intention–behavior discrepancy in which high cognitive prioritization of health fails to materialize into sustained adherence [41, 42].

Furthermore, amidst compounding stressors inherent to adult life, relying exclusively on volitional control to uphold MVPA may prove cognitively exhaustive and unsustainable [43, 44]. Thus, future health promotion strategies should mandate a paradigm shift, moving beyond mere health education to prioritize the cultivation of exercise-induced enjoyment as a primary lever for behavioral change [17].

This stark dichotomy between intrinsic and health-oriented motives aligns with the core tenets of SDT but extends current knowledge by quantifying the specific point at which enjoyment becomes the dominant driver in a large-scale Chinese population.

Occupational heterogeneity in motivational translation patterns

The present study highlighted clear differences in how motivation translates into physical activity between different occupational groups. Manual laborers exhibited a steady linear increase in activity, whereas mental workers showed a significant threshold effect (J-shaped association). This difference is likely attributable to the distinct work environments of these two groups. The jobs of mental workers often involve long periods of sitting and mental fatigue [45, 46]; such an environment creates a high behavioral activation threshold because prolonged sitting can suppress the natural desire to move [47]. Notably, the paradoxical dip in MVPA at lower EMS (16.0–34.3) may reflect a psychological burden. During this stage, emerging motivation may manifest merely as external

pressure or obligation, which, in the absence of sufficient intrinsic drive, could increase stress and inadvertently suppress even spontaneous baseline activity [48]. Alternatively, this minor fluctuation may partially stem from statistical noise at the lower extremes of scoring distribution [49]. When motivation is low, overcoming the physical inertia and time constraints caused by work is often insufficient [50], resulting in low or stagnant MVPA levels. Only when motivation surpasses a critical threshold can it break through these environmental barriers and trigger a sharp rise in activity [10, 51]. This explains why mental workers require much stronger psychological stimulation to start exercising.

In contrast, manual laborers showed a direct linear relationship, in which MVPA increased steadily with motivation. This finding suggests that manual laborers do not need to build up a high motivation level before they start increasing their activity [52]. Notably, their substantial baseline MVPA is largely an artifact of their occupational requirements rather than intrinsic exercise motivation. However, because the IPAQ-SF captures unavoidable occupational physical activity, the high baseline MVPA among manual laborers largely reflects mandatory work requirements rather than volitional exercise [53]. Given that daily work inherently drives physical movements, their linear trajectory may partially result from this occupational physical activity bias [54]. This finding suggests that interventions for mental workers must go beyond merely improving willingness. Practical workplace environmental modifications, such as introducing standing desks, mandating short activity breaks, and adopting active meeting formats, are important not only to aid mental workers in surmounting this high activation threshold but also to disrupt sedentary inertia and reduce behavioral barriers to movements. These findings underscore the significance of moving beyond individual-level motivation to address the structural environmental barriers that reinforce the high activation threshold observed in mental workers.

Limitations

This study has some limitations. First, the cross-sectional design precluded the establishment of causality, leaving bidirectional relationships (e.g., reverse causality) unresolved. Second, the IPAQ-SF conflated occupational and leisure-time physical activity. Although this was mitigated by occupational stratification in this study, high MVPA in manual laborers likely reflects job demands rather than intrinsic motivation. Third, self-reported measures might have introduced recall and social desirability biases, necessitating future objective assessments such as accelerometry. Finally, these findings may not be generalizable beyond Chinese adults aged 20–59 years to other age groups (e.g., children, adolescents) or diverse cultural and geographical settings.

Conclusions

This study revealed that the association between exercise motivation and MVPA depended on intensity thresholds, motivation types, and occupation. Enjoyment was identified as the primary driving force, and health motivation alone might be insufficient for sustaining activity. Furthermore, the results of analysis revealed distinct patterns across occupations: manual laborers followed a linear translation path, whereas mental workers showed a clear threshold effect, implying that mental workers require a stronger psychological drive to initiate action. Thus, future public health policies should prioritize cultivating exercise enjoyment alongside health awareness and adopt tailored strategies for different occupational groups.

Abbreviations

EMS Exercise motivation score

IPAQ-SF International Physical Activity Questionnaire–Short Form

MPAM-R Motives for Physical Activity Measure–Revised

MVPA Moderate-to-vigorous physical activity

RCS Restricted cubic splines

SDT Self-Determination Theory

Declarations

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Authors' contributions

YG and ML were involved in study design and conceptualization. YZ contributed to data acquisition. YG, ML and YT analyzed the data. XP and LJ were involved in data interpretation. YG and ML drafted the manuscript, and XC, HZ, and KS were involved in manuscript revision. All authors read and approved the final manuscript.

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Data Availability

The data used in this study are derived from the 2020 China National Fitness Activity Status Survey. Access to these data is restricted and requires formal application to the General Administration of Sport of China (<https://www.sport.gov.cn/n315/n329/>), the data owner. Owing to the data's sensitive nature and potential for participant identification, the authors are unable to directly share the dataset with other researchers. However, inquiries regarding the data or potential collaborative research projects involving overlapping data are welcome and can be directed to Yibo Gao (gaoyibo1019@163.com).

Use of artificial intelligence

During the preparation of this work the authors used Gemini in order to improve language and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Ethics Approval and Consent to Participate

All investigators written informed consent was obtained from each participant before the questionnaire was administered. This study protocol was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Ethics Committee of the China Institute of Sport Science (approval nos. CISSLA-20191029 and CISSLA-20220629).

Consent for publication

Not Applicable

Conflict of Interest

All authors declare no conflict of interest.

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Table

Table 1 Demographic characteristics, exercise motivation, and baseline MVPA levels

	Categories	<i>n</i> (%)	Social	Appearance	Competence	Health	Enjoyment	EMS	MVPA
	Total	45,551 (100.0)	10.44 ± 2.02	12.85 ± 1.80	10.02 ± 2.26	12.76 ± 2.06	11.77 ± 2.00	57.84 ± 8.51	195 (85,365)
Age group (years)	20–29	9,526 (20.9)	10.38 ± 2.03a	12.87 ± 1.79a	10.03 ± 2.24a	12.72 ± 2.08a	11.76 ± 2.00a	57.76 ± 8.53a	190 (90,345) a
	30–39	12,399 (27.2)	10.46 ± 1.99b	12.87 ± 1.78b	10.01 ± 2.25b	12.79 ± 2.04b	11.77 ± 1.99a	57.90 ± 8.45a	185 (90,340) a
	40–49	12,214 (26.8)	10.48 ± 2.02c	12.88 ± 1.79c	10.06 ± 2.26c	12.81 ± 2.04c	11.80 ± 1.99b	58.03 ± 8.52b	200 (90,375) b
	50–59	11,412 (25.1)	10.41 ± 2.04d	12.79 ± 1.83d	10.00 ± 2.27d	12.72 ± 2.07d	11.72 ± 2.01b	57.65 ± 8.54c	195 (68,405) a
Statistic			6.06	7.66	1.96	5.32	3.31	4.71	10.46
<i>P</i>			<0.01	<0.01	0.12	<0.01	0.02	<0.01	0.02
Sex	Male	23,689 (52.0)	10.43 ± 2.04	12.85 ± 1.81	10.01 ± 2.28	12.76 ± 2.08	11.76 ± 2.01	57.81 ± 8.60	210 (90,375)
	Female	21,862 (48.0)	10.44 ± 1.99	12.85 ± 1.78	10.04 ± 2.23	12.77 ± 2.03	11.77 ± 1.98	57.87 ± 8.41	180 (75,355)
Statistic			-0.57	-0.03	-1.67	-0.69	-0.38	-0.78	-11.75
<i>P</i>			0.57	0.98	0.11	0.49	0.70	0.44	<0.01
Residence	Urban	29,619 (65.0)	10.45 ± 2.00	12.87 ± 1.79	10.03 ± 2.24	12.78 ± 2.04	11.78 ± 1.98	57.91 ± 8.44	205 (90,380)
	Rural	15,932 (35.0)	10.41 ± 2.05	12.82 ± 1.81	10.01 ± 2.29	12.74 ± 2.08	11.73 ± 2.02	57.71 ± 8.64	175 (75,330)
Statistic			2.18	2.78	0.73	1.96	2.23	2.46	-14.33
<i>P</i>			0.03	0.01	0.47	0.05	0.03	0.01	<0.01
Occupations	1	25,756 (56.5)	10.42 ± 2.02a	12.82 ± 1.81a	9.97 ± 2.25a	12.76 ± 2.07a	11.75 ± 2.01a	57.72 ± 8.53a	180 (75,360) a
	2	4,199 (9.2)	10.37 ± 2.03b	12.77 ± 1.83b	9.88 ± 2.31b	12.67 ± 2.08b	11.66 ± 2.04b	57.34 ± 8.65b	175 (65,340) a
	3	9,349 (20.5)	10.46 ± 2.01c	12.91 ± 1.78c	10.15 ± 2.24c	12.79 ± 2.04c	11.83 ± 1.97c	58.15 ± 8.44c	210 (100,380) a
	4	3,489 (7.7)	10.51 ± 2.01d	12.88 ± 1.79d	10.09 ± 2.25d	12.82 ± 2.05d	11.80 ± 1.97d	58.09 ± 8.45d	225 (110,390) b
	5	2,758 (6.1)	10.44 ± 2.03e	12.85 ± 1.82e	10.17 ± 2.26e	12.78 ± 2.06e	11.79 ± 2.02e	58.02 ± 8.56e	240 (110,425) a
Statistic			2.83	7.01	14.63	1.86	4.68	8.20	333.02
<i>P</i>			0.02	<0.01	<0.01	0.11	<0.01	<0.01	<0.01

Educational attainment	Primary school and below	5,817 (12.8)	10.37 ± 2.06a	12.80 ± 1.83a	9.91 ± 2.30a	12.66 ± 2.09a	11.67 ± 2.03a	57.41 ± 8.67a	165 (50,345) a
	Junior high school	15,233 (33.4)	10.44 ± 2.01b	12.86 ± 1.79b	9.99 ± 2.25b	12.75 ± 2.06b	11.78 ± 2.00b	57.82 ± 8.47b	175 (75,340) b
	Senior high school	10,384 (22.8)	10.44 ± 2.02c	12.84 ± 1.80c	10.02 ± 2.26c	12.77 ± 2.05c	11.76 ± 2.00c	57.84 ± 8.53c	205 (90,375) c
	Undergraduate or above	14,117 (31.0)	10.46 ± 2.01d	12.87 ± 1.79d	10.10 ± 2.25d	12.81 ± 2.05d	11.80 ± 1.98d	58.05 ± 8.47d	225 (110,390) d
Statistic			2.40	2.15	9.45	7.18	5.17	6.88	520.50
<i>P</i>			0.07	0.09	<0.01	<0.01	<0.01	<0.01	<0.01
Average annual household income	≤CNY 100,000	28,965 (63.6)	10.43 ± 2.01a	12.85 ± 1.79a	9.99 ± 2.25a	12.76 ± 2.05a	11.77 ± 2.00a	57.80 ± 8.48a	180 (75,350) a
	CNY 100,000–199,999	15,278 (33.5)	10.44 ± 2.02a	12.84 ± 1.81a	10.06 ± 2.28a	12.76 ± 2.06a	11.77 ± 2.00a	57.88 ± 8.55a	225 (105,390) b
	≥CNY 200,000	1,308 (2.9)	10.53 ± 2.06b	13.00 ± 1.84b	10.22 ± 2.31b	12.92 ± 2.09b	11.85 ± 2.03b	58.53 ± 8.64b	255 (120,450) c
Statistic			1.48	3.22	4.86	2.23	0.57	2.77	355.02
<i>P</i>			0.23	0.04	0.01	0.11	0.56	0.06	<0.01

Notes: Social, appearance, competence, health, enjoyment, and EMS were compared among multiple groups (e.g., age, occupation, educational attainment, income) using one-way analysis of variance (ANOVA), with the *F*-value as the statistical measure. Comparisons between two groups (e.g., sex residence) were conducted using the independent samples *t*-test, with the *t*-value as the statistical measure. MVPA was compared among multiple groups using the Kruskal–Wallis *H* test, with the *H* statistic. Comparisons between two groups were performed using the Mann–Whitney *U* test, with the *Z* statistic. For pairwise comparisons within multiple groups, Bonferroni correction was applied. Differences between categories sharing different superscript letters within the same column were statistically significant ($P < 0.05$), whereas those sharing the same letter showed no significant difference

Figures

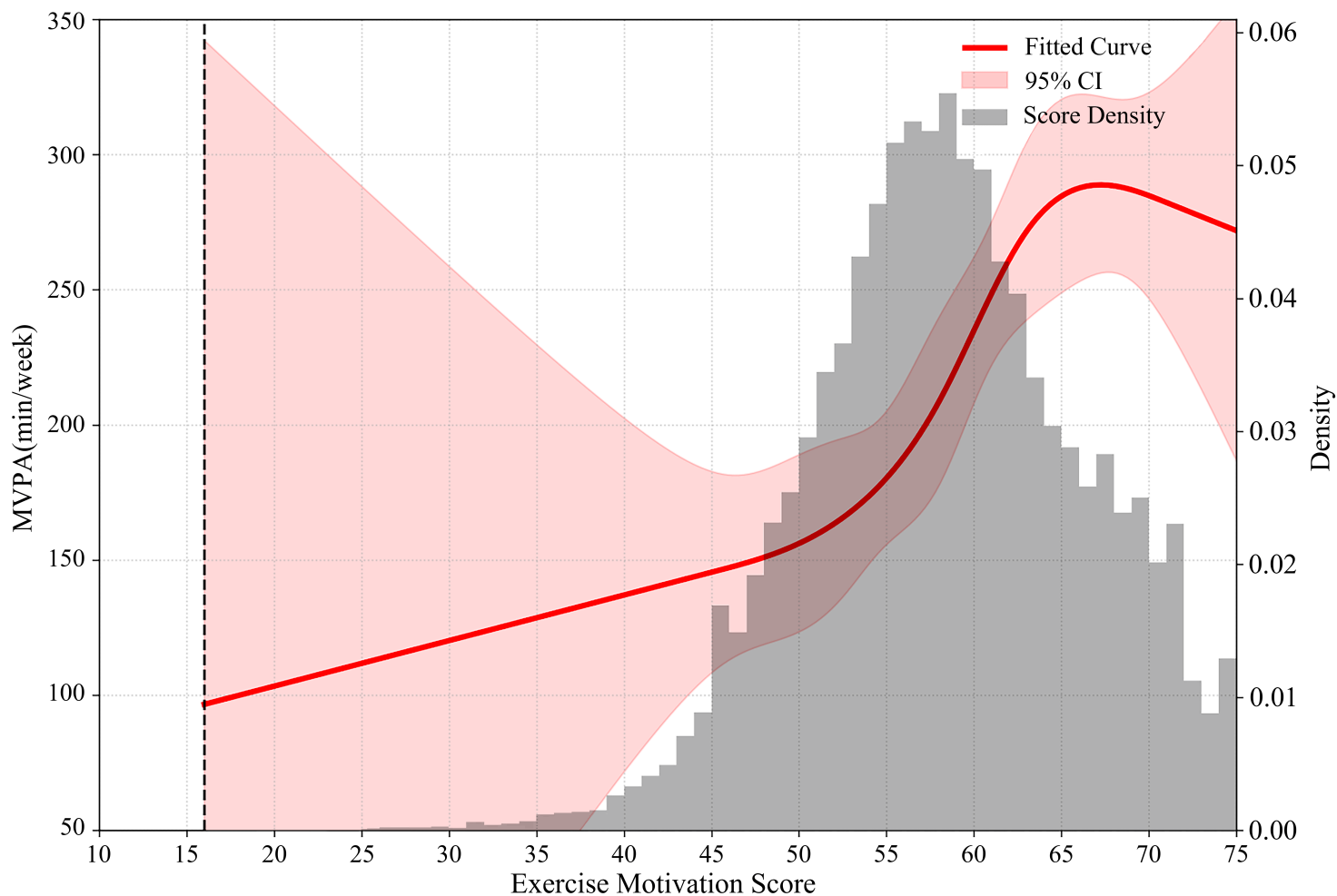


Figure 1

Dose-response relationship between the total EMS and MVPA. Notes: Models were adjusted for age, sex, residence, educational attainment, and income. Shaded areas indicate 95% confidence intervals. Statistical results: $P_{\text{overall}} < 0.01$, $P_{\text{nonlinear}} < 0.01$

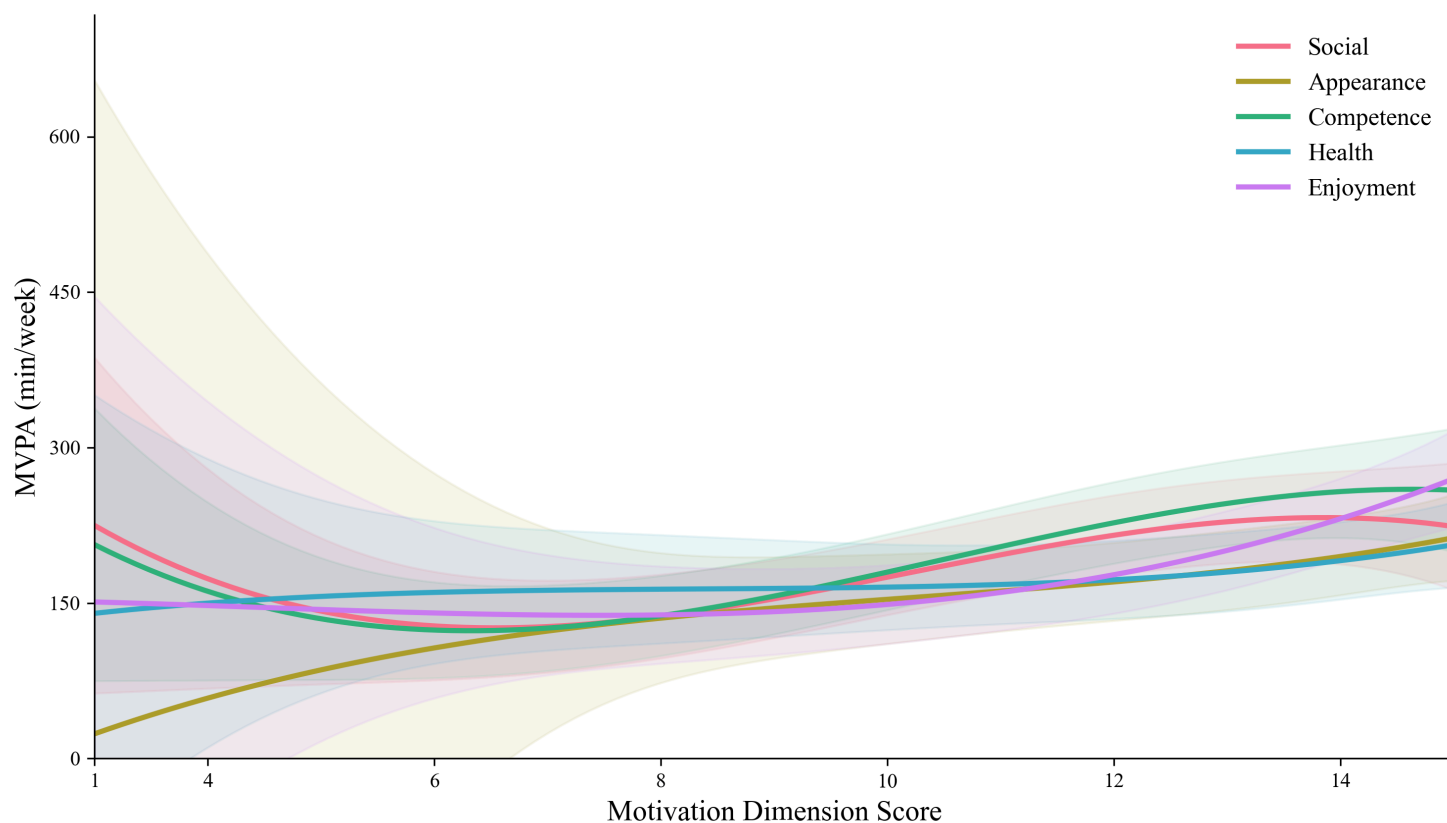


Figure 2

Adjusted dose-response relationships between five motivation sub-dimensions and MVPA. Notes: Adjusted for age, sex, residence, educational attainment, and income. Shaded areas indicate 95% confidence intervals. Enjoyment, competence: $P_{\text{overall}} < 0.01$, $P_{\text{nonlinear}} < 0.05$. Social, appearance, health: $P_{\text{overall}} > 0.05$

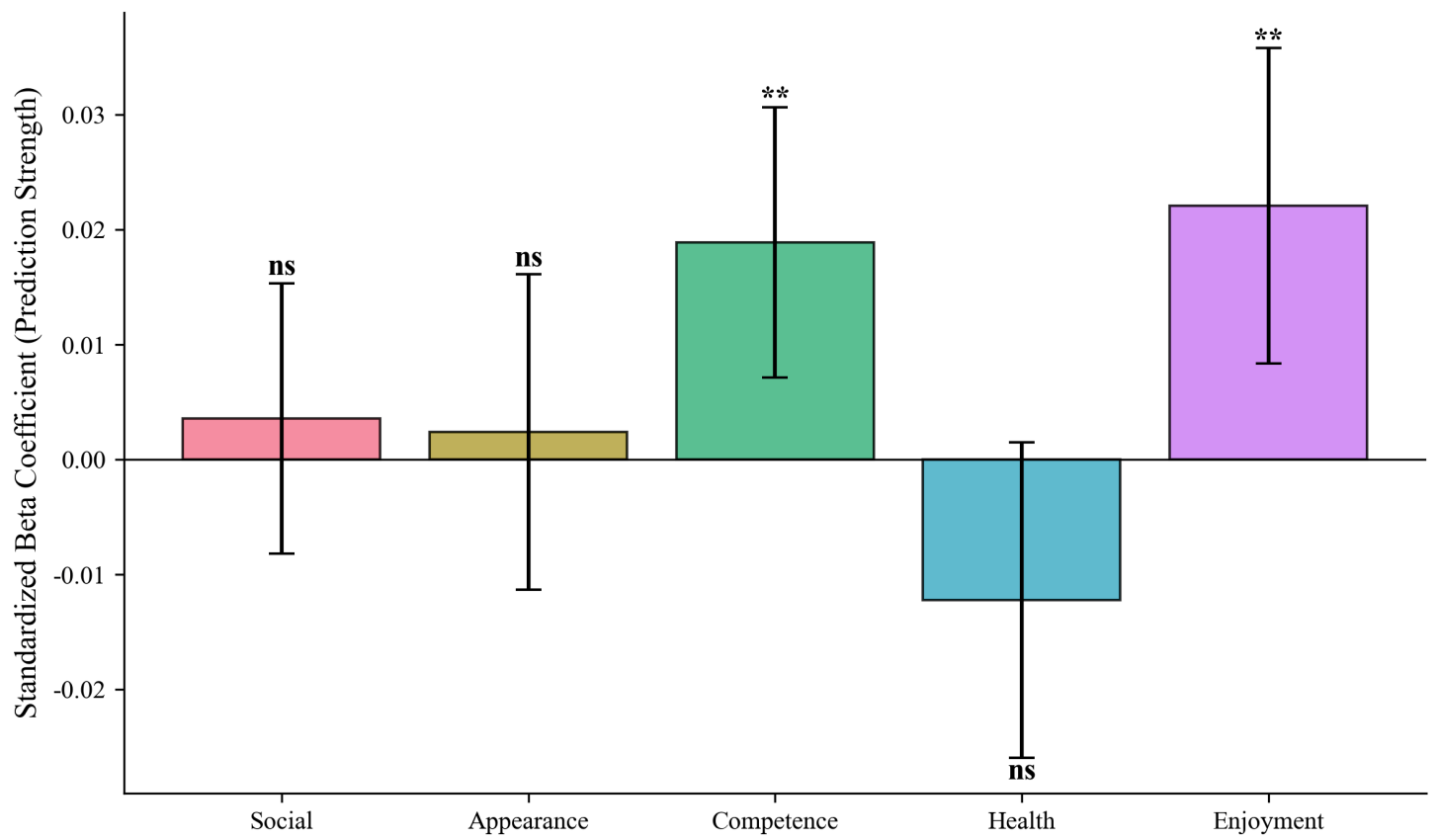


Figure 3
Standardized regression coefficients of secondary dimensions of exercise motivation associated with MVPA. Note: $**P < 0.01$

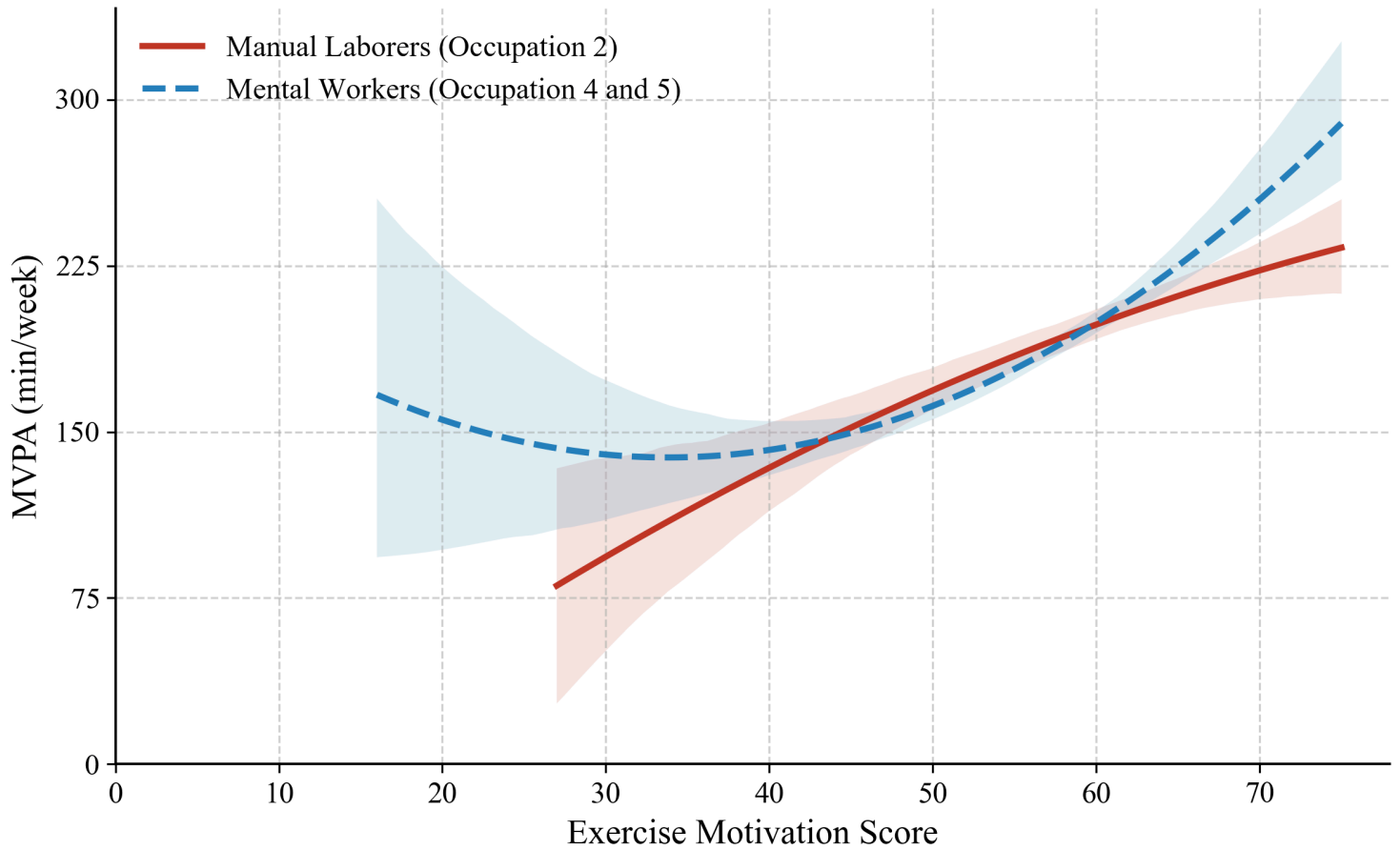


Figure 4

Dose-response relationship between the EMS and MVPA stratified by occupation type. Notes: Models were adjusted for age, sex, residence, educational attainment, and income. The solid red line represents the manual labor group (Occupation 2), whereas the dashed blue line represents the mental worker group (Occupations 4 and 5). Shaded areas indicate 95% confidence intervals. Statistical tests for nonlinearity: (i) manual laborers: $P_{\text{overall}} < 0.01$, $P_{\text{nonlinear}} = 0.312$ (indicating a linear relationship); (ii) mental workers: $P_{\text{overall}} < 0.01$, $P_{\text{nonlinear}} = 0.004$ (indicating a significant nonlinear relationship)