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The Relationship Between Strength Training, Wellbeing, and Exercise Motivation in Adults

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ABSTRACT

Background: Strength training (ST) is a form of physical activity (PA) increasingly linked to psychological wellbeing, yet its relationship with wellbeing and exercise motivation remains under-researched compared to aerobic activity. This study examined the relationship between ST parameters (frequency, duration, intensity, and level) and two dimensions of wellbeing – eudaimonic (EW) and hedonic (HW) – as well as intrinsic and extrinsic exercise motives.

Methods: A cross-sectional online survey was completed by 339 adults (241 women, 98 men; aged 18–42, M = 26.07, SD = 6.02). ST was assessed using items from the EHIS-PAQ and IPAQ; EW was measured with a shortened Psychological Wellbeing Scale (PWBS; Ryff & Keyes, 1995), HW with the WHO-5 Wellbeing Index, and exercise motives with a modified Exercise Motivation Inventory-2 (EMI-2).

Results: ST level during a typical week correlated positively with EW (r = .17, p = .002), and ST level during the past week correlated positively with HW (r = .29, p < .001). Higher ST frequency was associated with higher EW (p = .001) and HW (p < .001). Moderate-to-high intensity ST was associated with higher HW (p < .001), but not consistently with EW. Intrinsic motives correlated positively with EW (r = .27, p < .001) and with sufficient ST level (r = .12, p = .037), whereas extrinsic motives showed no significant associations. Men reported higher ST levels than women (p = .001), but no gender differences emerged in motives.

Conclusion: Higher ST frequency was associated with both eudaimonic and hedonic wellbeing, while moderate-to-high ST intensity was associated more consistently with hedonic wellbeing, and intrinsic motivation appears to be a key correlate of both wellbeing and ST adherence. These findings support incorporating motivational and wellbeing considerations into strength-training promotion.

Keywords: Strength training, wellbeing, exercise motivation, eudaimonic wellbeing, hedonic wellbeing

1. INTRODUCTION

Physical activity (PA) plays a key role in physical and mental health (Faulkner et al., 2015). The World Health Organization recommends at least 150 minutes of moderate-intensity aerobic PA per week, complemented by strength training (ST) on at least two days per week (World Health Organization, 2010). Regular PA is associated with personal wellbeing (Marques et al., 2016), commonly conceptualised as comprising two dimensions: hedonic wellbeing (HW) – the experience of pleasure and positive affect – and eudaimonic wellbeing (EW) – associated with good psychological functioning (Ryan & Deci, 2001; VanderWeele et al., 2020).

ST represents one of the key forms of PA, encompassing exercise performed with free weights,

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resistance machines, resistance bands, or one's own body weight, and aimed at improving or maintaining the strength of the major muscle groups (American College of Sports Medicine, 2009; Fisher et al., 2017). In the present study, ST performed during a 'typical' week refers to the frequency and duration of such muscle-strengthening activity as part of an individual's regular, ongoing exercise routine, as distinct from ST performed specifically within the most recent seven days, which was assessed separately. ST is traditionally associated with the development of strength and fitness (Eklund, 2017), but a growing body of research indicates that it also produces psychological benefits, including improvements in wellbeing (Giessing et al., 2022; Nestler et al., 2017; Walters & Hefferon, 2020). ST may enhance positive affect and reduce negative affect (Cavarretta et al., 2018; Hollander & Kraemer, 2012), improve self-esteem and body image (Kim & Ahn, 2021), and support autonomy, competence, and social affiliation (Hall & Noonan, 2023). Ryff's model of psychological wellbeing (Ryff & Keyes, 1995) provides a useful framework for understanding how ST may relate to EW through dimensions such as self-acceptance, autonomy, environmental mastery, personal growth, purpose in life, and positive relations with others.

Despite these benefits, fewer than 20% of adults meet ST recommendations (Bennie et al., 2020), and participation is lower among women, who more frequently report barriers such as low confidence and stereotypes associating ST with a hypermasculine environment (Cholewa et al., 2018; Howe et al., 2017). Since psychological benefits depend on regular participation, and participation itself appears to be shaped by why people exercise in the first place, it is therefore also important to focus on motivation.

Motivation to exercise can be explained through Self-Determination Theory (SDT; Ryan & Deci, 2000), which distinguishes between intrinsic motives (e.g. enjoyment, personal growth, stress management) and extrinsic motives (e.g., appearance, social recognition). According to SDT, intrinsic motives are oriented towards personal growth and the satisfaction of basic psychological needs, and are therefore more consistently linked to long-term adherence and wellbeing, whereas extrinsic motives are oriented towards external validation and are associated with lower adherence and a higher risk of exercise-dependence symptoms upon interruption (Marin et al., 2018; Rodrigues et al., 2022). This suggests that the wellbeing benefits of ST may not be uniform across individuals, but may instead depend on the type of motivation driving their participation – a link that, to date, has rarely been examined jointly with ST-specific parameters such as frequency, duration, and intensity.

ST-specific research on wellbeing and motivation remains limited, especially outside international contexts (Hall & Noonan, 2023; Marin et al., 2018; Martinez Kercher et al., 2024), and the joint examination of ST parameters, both dimensions of wellbeing, and exercise motives within a single study is, to the knowledge of the authors of this article, still lacking. By addressing this gap, the present study aims to clarify not only whether ST is associated with wellbeing, but which specific parameters of ST (frequency, duration, intensity, and level) relate to which dimension of wellbeing, and whether these associations depend on the type of motivation underlying participation. This distinction has practical relevance: if eudaimonic and hedonic wellbeing are related to different ST parameters, or if intrinsic and extrinsic motives relate differently to wellbeing and ST participation, this would provide a more precise basis for designing interventions that promote both regular ST participation and psychological wellbeing, rather than treating ST as a uniformly beneficial activity regardless of how, how often, or why it is performed. The aim of the present study was therefore to examine the relationship between ST parameters (frequency, duration, intensity, and level) and both dimensions of wellbeing (EW, HW), as well as intrinsic and extrinsic exercise motives, in a Slovak adult sample. A secondary aim was to examine gender differences in ST participation and motivation.

2. METHODS

Participants

The final sample consisted of 339 adults aged 18–42 years (M = 26.07, SD = 6.02), of whom 241 (71%) were women and 98 (29%) were men. Two respondents outside the target age range were excluded prior to analysis. Participants were divided into those meeting the recommended ST level (≥2 days/week, ≥ 30 minutes/session) and those not meeting it, based on WHO (2010) and ACSM (2009) recommendations.

Instruments

Data were collected using an online questionnaire comprising demographic items (age, sex) and several measures relevant to strength training, wellbeing, and exercise motivation.

ST frequency and duration during a typical week were assessed using a single item on muscle-strengthening activity frequency taken from the European Health Interview Survey-Physical Activity Questionnaire (EHIS-PAQ; Finger et al., 2015), together with an author-constructed item assessing typical training duration. ST frequency during a typical week was assessed using an item from the EHIS-PAQ, the only standardised instrument specifically targeting muscle-strengthening activity ("How many days in a typical week do you perform physical activities specifically intended to strengthen your muscles?"; six response options ranging from *I do not perform such activities* to *Five times a week or more*; coded 0–5). Average ST duration was assessed with an analogous author-constructed item (five options ranging from *I do not perform strength training* to *More than 90 minutes*; coded 0–4), and ST intensity with a single item ("How would you describe the intensity of your training?"; *I do not perform strength training* / *Low* / *Moderate* / *High*; coded 0–3). ST frequency and duration over the past seven days were assessed using two items adapted from the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003), a validated PA instrument (α = .83), using the same response format and coding as above but referring to the preceding seven days rather than a typical week.

Eudaimonic wellbeing (EW) was measured using a shortened, 18-item version of the Psychological Wellbeing Scale (PWBS; Ryff & Keyes, 1995), rated on a 7-point scale (α = .73 in this sample). Hedonic wellbeing (HW) was assessed with the WHO-5 Wellbeing Index (WHO, 1998), a 5-item measure rated on a 6-point scale (α = .85). Exercise motives were measured using a modified, 10-subscale version of the Exercise Motivation Inventory-2 (EMI-2; Markland & Ingledew, 1997), rated on a 6-point scale. Consistent with Self-Determination Theory, subscales were grouped into intrinsic motives (enjoyment, revitalisation, positive health, affiliation, stress management, challenge, and strength/endurance; α = .88) and extrinsic motives (appearance, social recognition, and weight management; α = .60).

ST level for the typical week and for the past week was computed separately as the sum of the coded frequency (0–5) and duration (0–4) scores. Frequency and duration were coded numerically to create a composite indicator of overall strength-training level, with higher scores indicating more frequent and/or longer training. Scores of 2 or higher were classified as reflecting a 'sufficient' ST level, based on the predefined scoring criterion aligned with the WHO (2010) and ACSM (2009) recommendations.

Procedure

Data were collected online between 3 February and 1 March 2025 via social media and university mailing lists, following a two-phase pilot test (20 and 10 reviewers, respectively). Participation was voluntary and anonymous.

Statistical analysis

Data were analysed in jamovi (v. 2.3.28). Normality was assessed via skewness/kurtosis, the Shapiro–Wilk Test, and Q–Q plots. Pearson correlations were used to test associations between ST parameters, wellbeing, and motives. One-way ANOVAs (with Tukey post-hoc tests) were used to compare wellbeing across ST frequency and intensity levels, and independent-samples t-tests were used to test gender differences.

3. RESULTS

Descriptive statistics are presented in Table 1.

Table 1. **Descriptive statistics of strength training parameters, wellbeing, and exercise motives**

Variable	*M*	*SD*	*Min*	*Max*
ST frequency – typical week	2.26	1.26	0	5
ST duration – typical week	1.92	1.07	0	4
ST intensity	1.76	0.92	0	3
ST frequency – past week	1.26	1.00	0	4
ST duration – past week	1.70	1.20	0	4
PWBS total score (EW)	31.35	4.19	14.67	40.33
WHO-5 total score (HW)	19.81	4.79	5.00	30.00
Intrinsic motives	4.43	0.88	1.00	6.00
Extrinsic motives	3.61	0.93	1.00	6.00

Notes: *N* = 339; SD = standard deviation; ST = strength training; PWBS = Psychological Wellbeing Scale; WHO-5 = WHO-5 Wellbeing Index; EW = eudaimonic wellbeing; HW = hedonic wellbeing.

ST level during a typical week correlated significantly, though weakly, with EW (r = .17, p = .002); this association also held for the sufficient-ST-level subgroup (r = .13, p = .026), but not for the insufficient-level subgroup (r = .09, p = .353). ST level during the past week correlated positively with HW (r = .29, p < .001), though this was not significant when split into sufficient/insufficient subgroups. Intrinsic motives correlated positively with EW (r = .27, p < .001) and with sufficient ST level (r = .12, p = .037); extrinsic motives showed no significant association with either EW or ST level (Table 2).

Table 2. **Correlations between ST level, exercise motives, and wellbeing**

Variable	Outcome	*r*	*p*
ST level – typical week	EW (PWBS)	.17	.002
Sufficient ST level – typical week	EW (PWBS)	.13	.026
Insufficient ST level – typical week	EW (PWBS)	.09	.353
ST level – past week	HW (WHO-5)	.29	<.001
Intrinsic motives	EW (PWBS)	.27	<.001
Extrinsic motives	EW (PWBS)	.08	.896
Intrinsic motives	Sufficient ST level	.12	.037
Extrinsic motives	Sufficient ST level	.06	.190

Notes: ST = strength training; PWBS = Psychological Wellbeing Scale; WHO-5 = WHO-5 Wellbeing Index; EW = eudaimonic wellbeing; HW = hedonic wellbeing.

ANOVA revealed significant differences in EW across ST frequency (typical week), F(5, 333) = 4.15, p = .001, ω^2 = .04; participants training 4–5 times/week reported higher EW than non-exercisers and those training less than once/week. HW also differed significantly by ST frequency (past week), F(4, 334) = 10.24, p < .001, ω^2 = .10, with non-exercisers scoring lower than all active groups except those training ≥5 times/week. Intensity was significantly associated with HW, F(3, 335) = 7.77, p < .001, ω^2 = .06 – moderate- and high-intensity trainers reported higher HW than non-exercisers – but its association with EW, although statistically significant, F(3, 335) = 2.69, p = .046, ω^2 = .01, did not survive post-hoc correction (Table 3).

Table 3. **ANOVA results for ST frequency and intensity in relation to wellbeing**

Predictor	Outcome	*F*	*df*	*p*	ω^2
ST frequency – typical week	EW	4.15	5, 333	.001	.04
ST frequency – typical week	HW	10.24	4, 334	<.001	.10
ST intensity	EW	2.69	3, 335	.046	.01
ST intensity	HW	7.77	3, 335	<.001	.06

Notes: ST = strength training; EW = eudaimonic wellbeing; HW = hedonic wellbeing.

Men reported significantly higher ST levels than women (M = 2.38 vs. 1.97; t(337) = 3.29, p = .001, d = 0.39), but no significant gender differences emerged for intrinsic (p = .376) or extrinsic motives (p = .777) (Table 4).

Table 4. **Gender differences in ST level and exercise motives**

Variable	Men *M* *(SD)*	Women *M* *(SD)*	*df*	*p*	*d*
ST frequency – typical week	2.38 (1.02)	1.97 (1.07)	337	.001	0.39
Intrinsic motives	4.36 (0.79)	4.46 (0.91)	337	.376	−0.11
Extrinsic motives	3.67 (0.82)	3.62 (0.97)	337	.777	−0.03

Notes: $N = 339$ (men $n = 98$, women $n = 241$); ST = strength training.

4. DISCUSSION

The present study examined how ST parameters relate to eudaimonic and hedonic wellbeing and exercise motivation among Slovak adults. The association observed between sufficient ST level and EW appears to reflect the broader psychological mechanisms through which ST is thought to operate. Regular ST may be related to EW not merely through the act of exercising itself, but through the accumulation of concrete, self-relevant experiences – improvements in physical capability, a growing sense of control over one's own training, and opportunities for goal-setting and mastery – that map closely onto Ryff's dimensions of self-acceptance, autonomy, and personal growth (Walters & Hefferon, 2020). In this sense, our finding is consistent with a body of qualitative and quantitative work suggesting that ST's psychological benefits emerge from the same features that make ST distinct from other forms of PA – namely, its emphasis on measurable progress and self-directed effort (Hall & Noonan, 2023). The absence of a significant relationship for insufficient ST level suggests that EW is unlikely to be reduced simply by not meeting a training threshold, but instead reflects a broader constellation of factors – such as other forms of PA, social support, or personality – not captured in the present design.

The pattern observed for HW points to a somewhat different mechanism than that underlying EW. While EW was more consistently associated with ST reported for a typical week, HW was more closely associated with ST reported for the preceding seven days. This is consistent with evidence for the acute, short-term mood-enhancing effects of resistance exercise, which are thought to arise from immediate physiological and affective responses to training rather than from its cumulative practice (Cavarretta et al., 2018; Hollander & Kraemer, 2012). Similar to these studies, our results suggest that hedonic wellbeing may respond primarily to the proximity of the last training session rather than to whether an individual meets long-term training recommendations – a distinction that weakened once the sample was split into sufficient/insufficient subgroups, further suggesting that the recency of training, rather than its adequacy relative to guidelines, may be more closely associated with short-term affective benefit.

Higher ST frequency was associated with higher EW and HW, in line with previous findings linking regular ST participation to greater wellbeing (Giessing et al., 2022; Nestler et al., 2017). However, the descriptive pattern suggested lower HW among participants reporting ≥5 ST sessions per week than among those reporting 4–5 sessions per week. Regarding intensity, the fact that moderate-to-high intensity was associated with higher HW, while its relationship with EW was comparatively weak, suggests that intensity and frequency may not affect wellbeing through the same pathway. Intensity, as a marker of physical exertion and immediate physiological arousal, aligns well with WHO (2010) recommendations for moderate-to-vigorous activity and may map most directly onto momentary affective experience, whereas the weaker and statistically fragile link between intensity and EW suggests that intensity alone may not be the primary driver of eudaimonic benefits, which instead may depend more on other variables such as intrinsic motivation or a person's subjective sense of control during training.

The motivational findings suggest that the type of exercise motives underlying ST participation may be relevant to both wellbeing and ST participation. Intrinsic motives were positively associated with EW, supporting the view that focusing on eudaimonic goals during exercise – such as personal fulfilment and growth – can be more effective in improving overall wellbeing while also reinforcing intrinsic motivation itself (Marin et al., 2018; Rodrigues et al., 2022; Ryan & Deci, 2007). This finding is consistent with SDT (Ryan & Deci, 2000), which holds that motivation rooted in intrinsic goals – such as enjoyment, social affiliation, positive health, revitalisation, challenge, and strength/endurance – contributes to the satisfaction of basic

psychological needs and thereby supports EW. Intrinsic motives were similarly associated with sufficient ST level, consistent with previous research suggesting that more self-determined exercise motives may be related to sustained participation in physical activity, including ST (Marin et al., 2018; Ryan & Deci, 2000). Extrinsic motives, by contrast, showed no significant association with either EW or sufficient ST level. This finding is consistent with prior work suggesting that appearance- or recognition-based motives are not strongly linked to wellbeing or sustained exercise participation (Marin et al., 2018). One possible explanation is that extrinsic motives tend to be associated with heightened expectations and external pressure (Ryan & Deci, 2007), which may not be sufficiently stable to support sustained engagement over time (Rodrigues et al., 2022).

Finally, the gender differences observed in this study were limited to ST participation and did not extend to exercise motivation. Men reported higher ST participation than women, replicating earlier findings on gender gaps in ST attributable to stereotypes and confidence barriers (Cholewa et al., 2018; Hall & Noonan, 2023). Yet the absence of gender differences in motivation type suggests that women and men in this sample were not exercising for systematically different reasons – rather, women may face structural or social barriers to participation itself, independent of their underlying motivation. Prior literature has suggested that men tend to emphasise intrinsic motives such as enjoyment and physical performance, whereas women more often report extrinsic motives such as appearance and social recognition (Ryan & Deci, 2017; Vasudevan & Ford, 2022). The absence of such differences in the present sample suggests that motivational profiles for ST may be converging between men and women, even as participation levels remain unequal.

Limitations

Limitations include reliance on self-reported, non-validated items for ST frequency, duration, and intensity; a cross-sectional design precluding causal inference; an unbalanced gender distribution; and an age range restricted to 18–42 years, limiting generalisability.

5. CONCLUSIONS

Regular strength training, particularly at higher frequency and moderate-to-high intensity, is associated with both eudaimonic and hedonic wellbeing in adults, although effect sizes were generally small. Intrinsic exercise motives were positively associated with both wellbeing and sufficient strength training level, whereas extrinsic motives showed no such association. These findings support prevention and training programmes that foster intrinsic motives – such as enjoyment, personal growth, and stress relief – rather than appearance-based goals, to promote both regular strength training participation and psychological wellbeing. Future research should employ longitudinal and objective measures of strength training behaviour and explore these relationships across broader age ranges.

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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