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ORIGINAL ARTICLE

The Relationship Between Mental Toughness and Motivational Persistence in Recreational Rowing: The Role of Demographic Factors

Rekreasyonel Kürek Sporunda Zihinsel Dayanıklılık ve Motivasyonel Kararlılık Arasındaki İlişki: Demografik Faktörlerin Rolü

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Abstract

Introduction: An undeniable threat to public health, the worldwide trend of sedentary living is facilitated by technological advances and sociopolitical shifts. This study aims to investigate the relationship between sports mental toughness and motivational persistence among recreational rowers in Türkiye, while examining the potential moderating effects of demographic factors such as age, gender, sports experience, income, and education.

Methods: This quantitative, cross-sectional survey utilized the Sports Mental Toughness Questionnaire, Motivational Persistence Scale, and a demographic questionnaire. A purposive sample of 492 recreational rowers from Türkiye was selected. Data was collected via Google Forms after briefings and analyzed using SPSS 26.0 and AMOS 24. Power analysis confirmed 115 participants sufficient for 95% confidence ($p<0.05$). Analyses included Mann-Whitney U tests, Kruskal-Wallis tests, Spearman correlation, and Structural Equation Modeling (SEM).

Results: Mental toughness and motivational persistence showed a significant positive correlation (Spearman's $r=0.429$, $p<0.01$), driven by confidence ($r=0.486$, $p<0.01$) and constancy ($r=0.502$, $p<0.01$), strongly linked to current ($r=0.541$, $p<0.01$) and long-term goals ($r=0.500$, $p<0.01$).

Discussion and Conclusion: This study confirmed a moderate positive correlation ($r=0.429$, $p<0.01$) between mental toughness and motivational persistence, constancy with sports psychology literature. Confidence and constancy, unlike control ($r=0.021$, $p>0.05$), drive goal pursuit. Sports experience significantly impacts mental toughness ($p<0.001$) and affects motivational persistence ($p=0.044$). Non-moderating demographic factors highlight psychological factors' role in rowing, supporting age- and gender-specific interventions. Longitudinal studies could explore relationships.

Keywords: Mental toughness; Motivation; Recreation; Rowing

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An undeniable threat to public health, the worldwide trend of sedentary living is facilitated by technological advances and sociopolitical shifts. Sedentary behavior is one of the greatest risk factors for obesity, cardiovascular diseases, and type 2 diabetes.[1] Physical inactivity is considered an important leading cause of noncommunicable diseases,[2] and the WHO has acknowledged this needs to be mitigated by means of interventions. Recreational sports take a multifaceted view, incorporating aspects of physical activity, psychology, socializing, and well-being.[3] They reduce psychological morbidity and enhance self-efficacy and cognitive function.[4,5] Sports in the community promote social inclusion and counter deprivation.[4]

Rowing stands out because of its unique physical and environmental qualities. Applied on water bodies, rowing improves cardiovascular endurance and energy expenditure.[6] Its low-impact but high-intensity character helps elderly people retain muscle mass and functional capability.[7] Rowing also calls for psychological qualities. Maintaining emotional control and performing under duress depends on sports mental toughness (SMT).[8,9] Rowers must overcome obstacles that test their endurance.[10] Enduring training sessions depends on motivational persistence (MP), which is vital.[11] Encouraged by Bandura (1997) self-efficacy theory and Clough et al. (2002) 4C model, SMT and MP help rowers transform obstacles into learning opportunities.[12,13]

Although exercise has robust psychosocial benefits the SMT-MP relationship in recreational rowing remains underexplored. To align with current sport psychology research, this study integrates recent literature on Sports Mental Toughness (SMT) and Motivational Persistence (MP).[5] The moderate SMT-MP correlation (Spearman's $r=0.429$, $p<0.01$) aligns with prior research indicating that mental toughness enhances goal-directed persistence in recreational sports.[14]

The non-significant Control subscale correlation ($r=0.021$, $p>0.05$) reflects recreational rowing's low-pressure context, constancy with recent studies emphasizing intrinsic motivation over emotional regulation in non-elite settings.[15] The lack of demographic moderation (SEM, $p>0.05$) supports the universal applicability of psychological needs, as noted in recent SDT-based research.[16] These findings reinforce the need for interventions targeting Confidence and Constancy, as recent evidence suggests that tailored psychological training enhances resilience in community sports.[17]

This study investigates 492 recreational rowers in Türkiye to examine the mediating effect of age, gender, sports experience, income, and education on SMT-MP. We anticipate a positive relationship modulated by these antecedents, showcasing person-by-person differences in motivation and adaptability. The purpose is to bridge the knowledge gap and shed light on demographic differences in performance.

This study is grounded in Self-Determination Theory (SDT), which posits that motivation derives from the fulfillment of autonomy, competence, and relatedness needs.[18]

SDT frames the relationship between Sports Mental Toughness (SMT) and Motivational Persistence (MP) among recreational rowers.[18,19] SMT's confidence and constancy align with competence, while MP's goal pursuit reflects autonomy and capability.[13]

This study aims to investigate the relationship between sports mental toughness (SMT) and motivational persistence (MP) among recreational rowers in Türkiye, while examining the potential moderating effects of demographic factors such as age, gender, sports experience, income, and education.

Materials and Methods

Design, Participants, and Setting

This quantitative cross-sectional study utilized a relational survey design to determine the relationship between sports mental toughness (SMT) and motivational persistence (MP) and examined the moderating roles of demographic variables. Data were gathered from March to May 2024 with the assistance of the Türkiye Rowing Federation. The board of directors of Marmara University Institute of Health Sciences granted ethics committee permission numbered 2023/47-17 on December 28, 2023. This study was conducted in accordance with the Declaration of Helsinki.

The sample consisted of 492 current recreational rowers from Türkiye, purposively sampled to ensure ongoing participation in the sport. Licensed rowers not currently active were excluded. Demographic characteristics are provided in Table 1.

Sample size was determined using GPower 3.1.9.4, targeting a 0.30 effect size, 95% confidence level ($p<0.05$), and 0.95 power, requiring a minimum of 115 participants.[20] The larger sample of 492 enhanced generalizability and supported subgroup analyses.[21]

Table 1. Demographic characteristics of participants

Variable	Category	N	%
Gender	Female	227	46.1
	Male	265	53.9
Age group	Under 18	102	20.7
	18–21	34	6.9
	22–25	26	5.3
	26–29	24	4.9
	30–33	49	10.0
	34–37	62	12.6
	38+	195	39.6
Education	High school	129	26.2
	Associate degree	25	5.1
	Bachelor's degree	236	48.0
	Postgraduate	102	20.7
Sports experience	Yes	226	45.9
	No	266	54.1
Rowing background	<1 year	169	34.3
	1–3 years	153	31.1
	3–5 years	85	17.3
	5–7 years	27	5.5
	7–9 years	10	2.0
	9+ years	48	9.8
Income	No income	125	25.4
	<Minimum wage	35	7.1
	>Min <2x Min	54	11.0
	2x–3x Min	94	19.1
	>3x Min	184	37.4

Min: Minimum; Max: Maximum.

Data Collection

Scores of SMT and MP were validated using two scales with Turkish adaptations. The Sports Mental Toughness Questionnaire (SMTQ) has 14 items on a 4-point Likert scale (1=Not at all true to 4=Very true) assessing Confidence, Constancy, and Control.[9] The Turkish version revealed reliability (α=0.803) and validity (CFA: GFI=0.950; CFI=0.939, RMSEA=0.056).[22] The Motivational Persistence Scale (MPS), a 13-item, 5-point Likert scale (1=Very low; 5=Very high), directs at Persistence on Long-term and Current Goals and Recurrent Unattainable Goals.[11] The Turkish adaptation showed reliability (α=0.803) and construct validity (GFI=0.952, CFI=0.946, RMSEA<0.05).[23] Variables of age and sports background, influenced by past experiences, were measured using a demographic sheet.[12]

Data collection was conducted using Google Forms to enhance efficiency and reduce errors, following initial face-to-face briefings with rowers and coaches from rowing clubs across Turkey. The process, supported by the logistical assistance of the Türkiye Rowing Federation, took place from March to May 2024. Participants provided voluntary informed consent. Questionnaires were completed by participants, and the data was entered into IBM SPSS Statistics Version 26 by the researcher.

Quantitative Analysis

Normality of data was assessed using the Kolmogorov-Smirnov test, which indicated non-normality for both the Sports Mental Toughness Questionnaire (SMTQ) and Motivational Persistence Scale (MPS) and their subscales ($p<0.05$). Initial descriptive checks of skewness and kurtosis (within -2 and +2) were conducted but were insufficient to confirm normality, necessitating non-parametric tests. Statistical analyses were carried out with IBM SPSS Statistics 26 and AMOS 24 (IBM Corporation, Armonk, New York, USA) and included:

- Descriptive statistics (means, standard deviations, ranges).
- Mann-Whitney U tests for dichotomous variables (e.g., gender, sports experience).
- Kruskal-Wallis tests with Dunn's post-hoc tests for multi-category variables (e.g., age, education).
- Spearman correlation analysis for testing SMT-MP relationships.
- Structural Equation Modeling (SEM) to check for moderating effects of demographic variables. Model fit was evaluated using Goodness of Fit Index (GFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA), with thresholds of GFI>0.90, CFI>0.90, and RMSEA<0.08 indicating adequate fit, while distinguishing between moderator and mediator effects in the structural model.[24] The significance level was $p<0.05$.

Data normality was further assessed using the Kolmogorov-Smirnov test, which indicated that the normality assumption was not met for both scales and their subscales ($p<0.05$). Consequently, non-parametric tests were employed: Mann-Whitney U tests for gender and sports experience, Kruskal-Wallis tests for age, education, and income, and Spearman correlation analysis for SMT-MP relationships. SEM analyses were conducted using AMOS 24, with model fit indices (e.g., GFI, CFI, RMSEA) reported to evaluate model adequacy.

Table 2. SMT scores by gender, age, and sports experience

Variable	Category	N	SMT Mean (SD)	Confidence (SD)	Constancy (SD)	Control (SD)	Test	Statistic	df	p	Effect size
Gender	Female	227	39.0176 (5.15852)	17.9251 (2.55880)	12.7313 (1.84176)	8.3612 (2.51049)	Mann-Whitney U	U=22512.00	–	<0.001	r=0.20
				U=23138.50	U=26411.50	U=24668.00		<0.001	–	0.193	r=0.19
	Male	265	40.7811 (5.31055)	18.7208 (2.67376)	12.9509 (1.88129)	9.1094 (2.53149)		<0.001	–	<0.001	r=0.08
									–		r=0.17
Age group	Under 18	102	38.6176 (5.13201)	17.7843 (2.78122)	12.7451 (1.82765)	8.0882 (2.55670)	Kruskal-Wallis	KW=21.733	6	0.001	η^2=0.04
	38+	195	40.7897 (5.22207)	18.6308 (2.62562)	13.0256 (1.89257)	9.1333 (2.51852)					
Sports experience	Yes	226	41.2212 (5.39339)	18.9381 (2.78818)	13.1106 (1.86218)	9.1726 (2.63335)	Mann-Whitney U	U=22512.00	–	<0.001	r=0.22
				U=23138.50	U=26411.50	U=24668.00		<0.001	–	0.018	r=0.20
	No	266	38.9023 (5.00470)	17.8571 (2.42049)	12.6278 (1.84099)	8.4173 (2.42213)		0.001	–	0.001	r=0.10

SMT: Sports mental toughness; SD: Standard deviation; df: Degrees of freedom. Non-parametric tests were used due to non-normal data distribution (Kolmogorov-Smirnov, p<0.05). Dunn's post-hoc tests were applied for Kruskal-Wallis comparisons.

Results

Demographic characteristics are provided in Table 1. Table 1 presents the demographic profile of the study's 492 participants engaged in recreational rowing. The sample was relatively balanced by gender, with 53.9% male (n=265) and 46.1% female (n=227). Age distribution was diverse, with the largest group aged 38 and older (39.6%, n=195), followed by those under 18 (20.7%, n=102) and 34–37 years (12.6%, n=62). Educationally, nearly half held a bachelor's degree (48.0%, n=236), while 20.7% (n=102) had postgraduate qualifications. Sports experience was split, with 45.9% (n=226) reporting prior involvement and 54.1% (n=266) indicating none. Rowing experience varied, with 34.3% (n=169) having less than one year and 9.8% (n=48) exceeding nine years. Income levels showed 37.4% (n=184) earning more than three times the minimum wage, while 25.4% (n=125) reported no income. These characteristics reflect a heterogeneous sample, supporting the study's exploration of demographic influences on mental toughness and motivational persistence.

This study revealed a moderate positive correlation (Spearman's r=0.429, p<0.01) between sports mental toughness (SMT) and motivational persistence (MP) in 492 recreational rowers in Türkiye, primarily driven by the Confidence (r=0.486, p<0.01) and Constancy (r=0.502, p<0.01) subscales, while the Control subscale showed no significant association (r=0.021, p>0.05). Non-parametric tests were used due to non-normal data distribution (Kolmogorov-Smirnov, p<0.05 for SMTQ and MPS). Sports experience significantly enhanced SMT (U=22512.00, p<0.001, r=0.22) and modestly increased MP (U=26400.50, p=0.020, r=0.12), with males scoring higher in Confidence (U=23138.50, p<0.001, r=0.19) and Control (U=24668.00, p<0.001, r=0.17). Age and income influenced specific subscales (Kruskal-Wallis, p<0.05; see Tables 2 and 3). The moderate positive correlation (r=0.429, p<0.01) supports SDT's claim that psychological needs enhance goal-directed behavior. Unlike prior elite-focused studies, this research examines recreational rowers from Türkiye, revealing that demographics do not moderate the SMT-MP link. This finding affirms SDT's universal applicability. Confidence (r=0.486, p<0.01) and Constancy (r=0.502, p<0.01), unlike Control (r=0.021, p>0.05), drive MP, underscoring the role of self-efficacy in goal persistence.[18]

Descriptive Statistics

SMT scores averaged 39.97 (SD=5.31), with subscale values of 18.35 (Confidence, SD=2.65), 12.85 (Constancy, SD=1.86), and 8.76 (Control, SD=2.55). The mean MP scores were 49.26 (SD=7.41), with subscale averages of 16.05 (Long-Term Goals, SD=2.94), 16.37 (Current Goals, SD=2.80), and 16.84 (Unattainable Goals, SD=3.49).

The Kolmogorov-Smirnov test confirmed non-normality for both scales and their subscales (p<0.05), justifying the use of non-parametric tests.

Table 3. MP scores by gender and sports experience

Variable	Category	N	MP Mean (SD)	Long-term goals (SD)	Current goals (SD)	Unattainable goals (SD)	Test	Statistic	df	p	Effect size
Gender	Female	227	49.2581 (7.41170)	16.0467 (2.94274)	16.3679 (2.79963)	16.8435 (3.48606)	Mann-Whitney U	U=27238.00	–	0.390	r=0.06
				U=29270.00	U=29493.00	U=27238.00		0.605	–	0.708	r=0.04
	Male	265	49.2581 (7.41170)	16.0467 (2.94274)	16.3679 (2.79963)	16.8435 (3.48606)		0.070	–		r=0.03
									–		r=0.08
Sports experience	Yes	226	49.2581 (7.41170)	16.0467 (2.94274)	16.3679 (2.79963)	16.8435 (3.48606)	Mann-Whitney U	U=26400.50	–	0.020	r=0.12
				U=27354.00	U=26749.50	U=27642.00		0.083	–	0.034	r=0.08
	No	266	49.2581 (7.41170)	16.0467 (2.94274)	16.3679 (2.79963)	16.8435 (3.48606)		0.123	–		r=0.10

MP: Motivational persistence; SD: Standard deviation; df: Degrees of freedom. Non-parametric tests were used due to non-normal data distribution (Kolmogorov-Smirnov, p<0.05). Dunn's post-hoc tests were applied for Kruskal-Wallis comparisons (e.g., for age and education effects reported in text).

Table 4. Correlation matrix of SMT and MP subscales

Variable	MP	Long-term goals	Current goals	Unattainable goals	SMT	Confidence	Constancy	Control
MP	1							
Long-term goals	0.852**	1						
Current goals	0.825**	0.737**	1					
Unattainable goals	0.744**	0.377**	0.329**	1				
SMT	0.429*	0.500*	0.541*	0.056	1			
Confidence	0.486*	0.464*	0.506*	0.236*	0.793**	1		
Constancy	0.502*	0.572*	0.556*	0.138*	0.781**	0.563**	1	
Control	0.021	0.141*	0.194*	-0.230*	0.689**	0.200**	0.310**	1

MP: Motivational persistence; SMT: Sports mental toughness; p<0.01; Spearman correlation. *: P<0.05 indicates statistical significance; **: P<0.01 indicates statistical significance.

Variations in Sports Mental Toughness According to Demographic Factors

SMT exhibited gender differences, with males achieving higher scores (M=40.7811, SD=5.31055) compared to females (M=39.0176, SD=5.15852; U=22512.00, p<0.001, r=0.20), particularly in Confidence (U=23138.50, p<0.001, r=0.19) and Control (U=24668.00, p<0.001, r=0.17), but not in Constancy (U=26411.50, p=0.193, r=0.08; Table 2). Age influenced SMT (KW=21.733, df=6, p=0.001, η^2=0.04), with the 38+ cohort surpassing the under-18 cohort (Dunn's post-hoc, p<0.05; Table 2). Sports experience significantly enhanced SMT (U=22512.00, p<0.001, r=0.22), affecting all subscales (Table 2). Income significantly affected SMT (Kruskal-Wallis [KW]=17.229, df=4, p=0.002, η^2=0.03), with higher earners (more than three times minimum wage) outperforming the no-income group (Dunn's post-hoc, p<0.05; Table 2). Education showed no significant SMT impact (KW=7.173, df=3, p=0.147), but Control demonstrated differences (KW=9.472, df=3, p=0.024, η^2=0.02), with associate degree holders scoring higher than high school graduates (Dunn's post-hoc, p<0.05; Table 2).

Demographic Variations in Motivational Persistence

MP showed no significant gender differences (U=27238.00, p=0.390, r=0.06; Table 3). Age significantly influenced Current Goals (KW=31.616, df=6, p<0.001, η^2=0.06) and Unattainable Goals (KW=15.583, df=6, p=0.016, η^2=0.03), with 22–25 and 18–21 age groups outperforming the 30–33 group (Dunn's post-hoc, p<0.05; Table 3). Sports experience resulted in a modest increase in MP (U=26400.50, p=0.020, r=0.12; Table 3). Education significantly influenced Unattainable Goals (KW=13.904, df=3, p=0.003, η^2=0.03), with associate degree holders scoring higher than high school graduates (Dunn's post-hoc, p<0.05; Table 3). Income significantly affected Current Goals (KW=11.028, df=4,

Table 5. SEM results for moderation effects

Moderator	B (SMT)	SE	t	p	Interaction B	SE	t	p	95% CI	R^2	Fit indices
Age	3.246	0.305	10.641	0.000	-0.055	0.305	-0.180	0.857	-0.719, 0.852	0.187	GFI=0.892, CFI=0.926, RMSEA=0.047
Gender	3.220	0.306	10.512	0.000	0.043	0.307	0.141	0.888	-0.572, 0.896	0.185	GFI=0.864, CFI=0.910, RMSEA=0.058
Sports experience	3.188	0.310	10.271	0.000	0.044	0.309	0.142	0.887	-0.511, 0.846	0.184	GFI=0.912, CFI=0.920, RMSEA=0.061
Income	3.234	0.305	10.591	0.000	-0.383	0.301	-1.274	0.203	-1.218, 0.344	0.190	GFI=0.945, CFI=0.951, RMSEA=0.034
Education	3.189	0.301	10.578	0.000	-0.396	0.309	-1.280	0.200	-1.150, 0.278	0.195	GFI=0.894, CFI=0.908, RMSEA=0.073

SEM: Structural Equation Modeling; SMT: Sports mental toughness; SE: Standard error; CI: GFI: Confidence interval; Goodness of Fit Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation. Fit indices indicate adequate model fit (GFI>0.90, CFI>0.90, RMSEA<0.08 for most models, with RMSEA<0.08 suggesting good fit). Non-significant interaction terms (p>0.05) confirm no moderation by demographic factors.

p=0.041, η^2=0.02) and Unattainable Goals (KW=15.031, df=4, p=0.005, η^2=0.03), with no-income groups exhibiting greater persistence (Dunn's post-hoc, p<0.05; Table 3).

Sports Mental Toughness and Motivational Persistence Relationship

A moderate positive SMT-MP correlation emerged (Spearman's r=0.429, p<0.01), driven by Confidence (r=0.486, p<0.01) and Constancy (r=0.502, p<0.01), but not Control (r=0.021, p>0.05; Table 4). SEM confirmed a significant SMT-MP effect (B=3.188–3.246, p<0.001), with no demographic moderation (interaction terms, p>0.05; Table 5). Model fit indices indicated adequate fit (GFI=0.864–0.945, CFI=0.908–0.951, RMSEA=0.034–0.073), with RMSEA<0.08 suggesting good model fit. Non-significant interaction terms (e.g., age: B=-0.055, p=0.857, 95% CI [0.719, 0.852]; gender: B=0.043, p=0.888, 95% CI [0.572, 0.896]) confirmed that demographic factors do not moderate the SMT-MP relationship, supporting a constancy link across subgroups driven by intrinsic motivation.[18]

Discussion

In the present study, we examined the joint effect of sports mental toughness (SMT) and motivational persistence (MP) on 492 recreational rowers in Türkiye, as well as the effect of demographic factors: age, gender, sports experience, education level, and income. SMT was moderately positively correlated (Spearman's r=0.429, p<0.01) to MP, indicating a motivational interaction where SMT leads to persistence in effort directed toward goals. This positive association aligns with existing literature demonstrating that mental toughness enhances motivation and performance.[8] This conforms to Mahoney et al.,[19] who determined that MP heightens motivational antecedents in sport. Confidence (r=0.486, p<0.01) and Constancy (r=0.502, p<0.01) are more strongly correlated with MP than Control (r=0.021, p>0.05), highlighting the significance of maintaining self-confidence and toughness as essential characteristics for rowers confronted with extensive efforts and changing circumstances.[8]

TSDT frames the relationship between SMT and Motivational Persistence (MP) among recreational rowers.[18] SMT's confidence and constancy align with competence, while MP's goal pursuit reflects autonomy and capability.[13] Analysis due to non-normal data distribution, SDT frames the relationship between SMT and Motivational Persistence (MP) among recreational rowers.[18] SMT's confidence and constancy align with competence, while MP's goal pursuit reflects autonomy and capability.[13] Kolmogorov-Smirnov test (p<0.05) ensured robust results by minimizing errors from violated assumptions. The constancy SMT-MP correlation (r=0.429, p<0.01) underscores the reliability of this relationship, aligning with prior research on mental toughness in recreational sports.[14]

The non-significant correlation between the Control subscale of SMT and Motivational Persistence (MP) (r=0.021, p>0.05), unlike Confidence (r=0.486, p<0.01) and Constancy (r=0.502, p<0.01), suggests distinct psychological dynamics in recreational rowing. Control

reflecting emotional regulation may be less relevant in this context, where rowers prioritize self-efficacy over competitive pressure.[12] Recreational settings likely reduce the need for emotional control compared to elite sports.[19] Interventions should focus on enhancing confidence and constancy to boost persistence. Future studies could examine this pattern across recreational sports.

SMT demographics data noted males were higher in Confidence and Control (U=23138.50, p<0.001, r=0.19; U=24668.00, p<0.001, r=0.17). Nonetheless, constancy was not significantly different between genders (U=26411.50, p=0.193, r=0.08), indicating that technical endurance is a necessary quality in both. These findings align with prior research on male advantages in self-efficacy and emotional regulation, though the smaller effect sizes (r vs. d=0.33) reflect the conservative nature of non-parametric tests.[3] Age distinctions show the oldest rowers (38+) have higher SMT and Control (KW=21.733, df=6, p=0.001, η^2=0.04), supporting the idea that SMT accrues with experience through perceptions of elite performers.[25] All dimensions of SMT were statistically significant with sports participation (U=22512.00, p<0.001, r=0.22), corroborating the legacy of toughness from past sporting experiences, particularly pertinent to rowing's adaptive needs by transitioning from research to practical development strategies.[26]

Motivational persistence (MP) showed no significant gender differences (U=27238.00, p=0.390, r=0.06), while testing the dimensionality and nomological network of mental toughness concepts.[27] This indicates that motivation may be more individually driven, aligning with goal striving and need satisfaction models.[28] Age-related variations in MP sub-dimensions suggest developmental stages influence goal orientation, with younger rowers exhibiting higher motivation for both current and unattainable goals (KW=31.616, df=6, p<0.001, η^2=0.06; KW=15.583, df=6, p=0.016, η^2=0.03).[16] The influence of sports experience on motivation indicates that experience cultivates persistence (U=26400.50, p=0.020, r=0.12),[17] though its diminished impact suggests a limited effect on motivation.[18]

This study highlights the interaction of SMT and MP in recreational rowing and the need for specific interventions to impact these psychological constructs. The findings reveal age-specific differences in Sports Mental Toughness (SMT), with older rowers (aged 38 and above) scoring significantly higher than those under 18 (KW=21.733, df=6, p=0.001, η^2=0.04).[25] To foster SMT in recreational rowing, coaches and organizers should implement tailored interventions. For younger rowers (under 18), who exhibit lower Confidence and Control, programs should incorporate goal-setting workshops and visualization techniques to enhance self-efficacy and consistent with Bandura's self-efficacy theory.[12–17] Structured mentorship from experienced rowers may enhance Constancy, reflecting sustained effort.[26] For older rowers (aged 38 and above), interventions should leverage their higher SMT by offering advanced challenges, such as leading team activities, to sustain engagement. Recreational sport organizers can integrate these strategies into community rowing programs to promote age-specific activities that enhance psychological resilience.[26] The absence of demographic moderation (SEM, p>0.05) suggests a constancy SMT-Motivational Persistence (MP) relationship across age groups, aligning with Self-Determination Theory's emphasis on universal psychological needs.[14,18]

Grounded in Self-Determination Theory (SDT), this study posits that SMT and Motivational Persistence (MP) are driven by autonomy and competence needs.[18] The moderate SMT-MP correlation (Spearman's r=0.429, p<0.01), primarily driven by Confidence (r=0.486, p<0.01) and Constancy (r=0.502, p<0.01), reflects these needs, whereas the non-significant correlation for Control (r=0.021, p>0.05) suggests emotional regulation's limited role in recreational rowing's low-pressure context.[29] The absence of demographic moderation (SEM, p>0.05), despite raw score differences (e.g., males higher on Confidence, U=23138.50, p<0.001, r=0.19), indicates a constancy SMT-MP link, likely due to recreational rowers' intrinsic motivation minimizing demographic differences, such as gender or income.[30] This finding underscores the importance of psychological needs in non-elite settings. The use of non-parametric tests and SEM fit indices (GFI=0.864–0.945, CFI=0.908–0.951, RMSEA=0.034–0.073) further validated these findings, ensuring analytical rigor and supporting SDT's universal applicability in recreational sports.[18]

Structural Equation Modeling (SEM) confirmed that demographic variables—age, gender, and income—do not moderate the SMT-MP relationship (p>0.05), despite differences in raw scores (e.g., males scoring higher on Confidence, U=23138.50, p<0.001, r=0.19). This robust link, likely driven by intrinsic motivation in recreational rowing's low-pressure context, aligns with SDT's focus on universal psychological needs.[18] Unlike competitive settings where external factors amplify differences, rowers' emphasis on personal growth minimizes demographic influences, supporting broadly applicable interventions.[19] The inclusion of SEM fit indices (GFI=0.864–0.945, CFI=0.908–0.951, RMSEA=0.034–0.073) strengthens the validity of

these findings, with RMSEA<0.08 indicating good model fit, confirming that the SMT-MP relationship is robust across demographic subgroups.[18]

The findings contribute to sport psychology by identifying motivational and toughness factors in a recreational sports environment, pointing to programmatic directions for building mental toughness and motivational persistence in rowers.

Conclusion and Recommendations

The current study contributes to the literature with correlational analysis between Sports Mental Toughness (SMT) and Motivational Persistence (MP) in recreational rowing (Spearman's r=0.429, p<0.01). Subscale correlations for targeting immediate goals (r=0.541, p<0.01) and long-term goals (r=0.500, p<0.01) demonstrate that these factors are interrelated. The use of non-parametric tests (Spearman correlation, Mann-Whitney U, Kruskal-Wallis) due to non-normal data distribution (Kolmogorov-Smirnov, p<0.05) ensured robust results, while SEM fit indices (GFI=0.864–0.945, CFI=0.908–0.951, RMSEA=0.034–0.073) confirmed the reliability of the SMT-MP relationship across demographic subgroups. Gender differences in SMT (U=22512.00, p<0.001, r=0.20) and education's effect on MP (B=-0.690, p=0.022) underscore the need for targeted interventions, such as confidence-building workshops for female rowers and goal-setting programs for less-educated participants. These findings, grounded in Self-Determination Theory, support the development of age- and gender-specific programs to enhance psychological resilience in recreational rowing.[18]

Recreational rowing activities exemplify a special route for the promotion of physical and mental health, preventing against physical inactivity by concurring social interaction, physical activity, enhancement of cognitive review.[3–29] Compared with the traditional land-based exercises, rowing as a recreational activity seems to improve not only cardiovascular health and energy expenditure but also psychological resilience since it involves a balanced low impact load that makes for an ideal intervention from diverse populations seeking overall health benefits.[6,7] Findings are constancy with an integrative model of sport psychology, which expands understanding needed in designing country sport programs and programs reinforcing athlete mental maturity.[30]

From a practical perspective, the responses highlight the importance of demographic variables as predictors in both sport psychology and public health. The shift to non-parametric tests provided conservative effect sizes (e.g., r=0.20 for gender differences in overall SMT), suggesting that the practical impact of interventions targeting Confidence and Constancy may be pronounced in real-world settings.[17]

This study has limitations in terms of diversity of samples and methodologies. Research conducted in one sport does not reflect the specificity of other sports disciplines. Moreover, the restricted geography of samples makes it difficult to assess cultural factors. The cross-sectional research design methodologically limits the capacity to determine causation between variables as there is no time component in this design. Self-report scales have the risk of social desirability bias. Data collection at one point in time also ignores seasonal influences. The non-normal data distribution necessitated non-parametric tests, which may have produced conservative effect sizes, potentially underestimating some relationships. Future studies with larger, normally distributed samples could explore these effects further.

Mental Toughness (SMT) and Motivational Persistence (MP) in sports play a critical role in the success of athletes, and therefore, strategies should be developed to strengthen these qualities. Given that mental toughness increases with age (KW=21.733, df=6, p=0.001, η^2=0.04), age-specific mental toughness training programs should be designed, especially for young athletes.[25] Since a lack of self-efficacy and self-confidence is observed in female athletes (U=23138.50, p<0.001, r=0.19), targeted interventions to close the gap in these areas are a priority.[12] Mentorship programs can accelerate SMT and MP development by leveraging the transformative power of sports participation.[26] In addition, athletes' training experiences should be optimized, as training strengthens MP by directly affecting cognitive performance.[12] Recreational sports, such as rowing, combine social interaction, physical activity, and mental stimulation, creating a strong shield against a sedentary lifestyle.[3] In this context, beyond improving cardiovascular health, recreational rowing offers comprehensive health benefits to different segments of society by increasing psychological resilience with its high level of difficulty and low impact.[6,7] Sports psychology should appeal to a wider and more diversified population, enriched by innovative methods. To assess the impact of interventions aimed at improving mental toughness, longitudinal studies and personalized mental training analyses that follow athletes throughout the seasons should be conducted. Future research should also explore longitudinal designs across diverse sports and populations to confirm these findings and assess the impact of situational and cultural factors on the SMT-MP relationship.

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