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Developing A Scale for Factors Influencing The Physical Activity of Students at The University of Danang, Vietnam, Based on The Theoretical Domains Framework

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Abstract

Introduction: University students' physical activity is influenced by various personal, social, and environmental factors. However, there is currently no standardized scale in Vietnam based on the Theoretical Domains Framework (TDF) to comprehensively assess these factors. This study aimed to develop and preliminarily test the reliability of a scale measuring factors influencing the physical activity of students at the University of Danang, based on the TDF.

Methods: A methodological study was conducted in three stages: (1) a literature review to develop an initial set of items based on the 14 domains of the TDF; (2) content validity assessment through two rounds of interviews with 15 experts; and (3) reliability testing using Cronbach's alpha with 400 students from two-member universities of the University of Danang. Data were analyzed using SPSS 22.0 software.

Results: From an initial set of 65 criteria, the study selected 51 criteria that achieved a consensus level exceeding 75%, representing the 14 domains of the TDF. Reliability analysis showed that Cronbach's Alpha coefficients for the domains ranged from 0.706 to 0.916; furthermore, all observed variables exhibited item-total correlation coefficients greater than 0.30, confirming the scale's reliability and internal consistency.

Conclusion: The 51-item scale, covering the 14 TDF domains, demonstrates good reliability and serves as a scientifically grounded tool for assessing factors influencing the physical activity of university students. These findings provide a foundation for future research aimed at validating the scale's structural validity and designing intervention programs to enhance physical activity within Vietnamese universities.

Keyword: Physical activity, Theoretical Domains Framework, TDF, university students, Da Nang University, Vietnam

1. Introduction

Physical activity is a key factor in enhancing health, preventing non-communicable diseases, and improving quality of life. According to the World Health Organization (WHO, 2020), adults should engage in at least 150–300 minutes of moderate-intensity physical activity or 75–150 minutes of vigorous-intensity activity per week to achieve health benefits. Physical activity is a complex health

behavior influenced by a combination of cognitive, motivational, environmental, and social factors; consequently, examining the determinants of this behavior serves as a foundation for developing effective intervention programs (Sallis *et al.*, 2008) ^[10]. However, rates of physical inactivity remain high globally—particularly among young adults and university students—due to academic pressure, prolonged sedentary behavior, and lifestyle changes.

Therefore, identifying the factors influencing students' physical activity has become a priority in public health and higher education research.

Student physical activity is a complex health behavior influenced by a multitude of factors, including knowledge, skills, motivation, beliefs, emotions, social influences, and environmental conditions. Over the years, behavioral theories such as the Theory of Planned Behavior (Ajzen, 1991)^[1], Social Cognitive Theory (Bandura, 1986)^[3], the Health Belief Model (Rosenstock *et al.*, 1988)^[9], and the Theory of Interpersonal Behaviour (Triandis, 1977)^[11] have been widely used to explain physical activity behavior. While each theory offers significant contributions, they primarily focus on specific constructs and do not fully capture the multidimensional nature of the behavior.

To address this limitation, the Theoretical Domains Framework (TDF) was developed by Michie *et al.* (2005)^[7] by synthesizing 33 theories and 128 behavioral constructs, and was subsequently validated and refined by Cane *et al.* (2012)^[5] into 14 theoretical domains. The TDF enables a comprehensive assessment of behavioral determinants; furthermore, when combined with the COM-B model and the Behaviour Change Wheel, it facilitates the identification of root causes and the selection of appropriate interventions (Michie *et al.*, 2005; Michie *et al.*, 2011; Cane *et al.*, 2012)^[7, 8, 5]. Since its refinement, the TDF has been widely applied in research and practice to identify factors influencing behavior and to support the design of evidence-based behavior change programs (Atkins *et al.*, 2017)^[12].

Regarding physical activity among university students, a systematic review of 39 studies involving 17,771 students conducted by Brown *et al.* (2024)^[4] identified environmental contexts and resources, social influences, and goals as the three areas with the most significant impact on physical activity behavior. These findings confirm that promoting physical activity requires a comprehensive approach—one that simultaneously considers individual, social, and environmental factors—rather than focusing solely on raising awareness about the benefits of exercise.

In Vietnam, research on university students' physical activity has primarily focused on assessing activity levels or analyzing isolated influencing factors; survey instruments have largely been developed for specific studies rather than being grounded in a comprehensive behavioral theory framework. To the research team's knowledge, no study to date has developed and validated a scale measuring factors influencing university students' physical activity based on all 14 domains of the Theoretical Domains Framework (TDF). This gap limits the ability to comprehensively assess behavioral determinants and to design evidence-based intervention programs.

Based on the aforementioned premises, the study "Developing a scale for factors influencing the physical activity of University of Danang students using the Theoretical Domains Framework (TDF)" was conducted to develop and validate the reliability of the scale. It aims to provide a theoretically grounded and reliable assessment tool for investigating factors affecting physical activity and to support the design of intervention programs within Vietnamese universities.

2. Research Materials and Methods

Methods

- **Literature review method:** Used to collect, analyze, and synthesize scientific literature, legal documents, and

domestic and international research regarding students' physical activity behaviors. The synthesized findings serve as the basis for establishing an initial set of criteria and guiding the selection process for criteria used to construct a scale based on the Theoretical Domains Framework (TDF).

- **Interview method:** Used to consult experts, administrators, and experienced professionals in the field of physical education. The interview content focuses on criteria for assessing physical activity behavior. The questionnaire was developed in three steps: Step 1: Drafting the initial questionnaire; Step 2: Refining the questionnaire scale and determining the response format; and Step 3: Testing the questionnaire's reliability using Cronbach's alpha.
- **Statistical methods:** Used to process and analyze data collected during the research process. The collected data were processed with the support of SPSS 22.0 software.
- **Participants**
 - **Interview subjects:** Interviewees selected criteria for evaluating behavior based on the Theoretical Domains Framework (TDF) and the COM-B model of human behavior; 15 experts and professionals in the fields of physical education and school sports were selected using purposive sampling.
 - **Survey subjects:** The subjects for the validation of the Theoretical Domains Framework (TDF) scale consisted of 400 students (200 male, 200 female) from the University of Economics (200 students: 100 male, 100 female) and the University of Education (200 students: 100 male, 100 female)—both under the University of Danang—who were currently enrolled in a physical education course; they were selected using a combination of convenience and random sampling methods.

3. Results

To develop a scale measuring the factors influencing the physical activity of students at the University of Danang based on the Theoretical Domains Framework (TDF), the study was conducted in three steps:

- Step 1: Synthesizing criteria to assess factors influencing students' physical activity based on the Theoretical Domains Framework (TDF).
- Step 2: Interviewing experts and professionals.
- Step 3: Testing the reliability of the criteria.

3.1. A compilation of criteria for assessing factors influencing students' physical activity based on the Theoretical Domains Framework (TDF)

This study selects criteria to evaluate factors influencing students' physical activity based on the Theoretical Domains Framework (TDF) developed by Michie *et al.* to integrate key constructs from various behavioral theories into a unified system (Michie *et al.*, 2005; Michie *et al.*, 2011)^[7, 8]. Based on validation research by Cane, O'Connor, and Michie, the TDF was refined into 14 domains: (1) knowledge; (2) physical skills; (3) social/professional role and identity; (4) beliefs about capabilities; (5) optimism; (6) beliefs about consequences; (7) reinforcement; (8) intentions; (9) goals; (10) memory, attention, and decision processes; (11) environmental context and resources; (12) social influences; (13) emotion; and (14) behavioral regulation (Cane *et al.*, 2012)^[5].

Brown *et al.* (2024) ^[4], in a systematic review of factors influencing university students' physical activity using the TDF and COM-B frameworks, demonstrated that this behavior is influenced by a variety of domains (Brown *et al.*, 2024). Based on the purpose, objectives, and practical conditions at the University of Da Nang, this study develops 65 evaluation criteria across 14 fields, aligned with the Theoretical Field Framework (TDF).

3.2. Interviews with experts and specialists

The study involved developing a questionnaire (Appendix 2) to survey 15 experts and specialists on two occasions, using a five-point scale — (1) Highly inappropriate, (2) Inappropriate, (3) Undecided/Unsure, (4) Appropriate, and (5) Highly appropriate — with the results presented in Table 1.

Table 1: Results of interviews regarding assessment criteria for 14 domains based on the Theoretical Domains Framework (TDF).

	Area/Criterion	First time (n = 15)		Second time (n = 15)	
		Σ	%	Σ	%
I	Knowledge				
C1	I know the benefits of physical activity for health.	68	90.67	67	89.33
C2	I am aware of the WHO recommendations on physical activity duration.	70	93.33	71	94.67
C3	I know how to choose a suitable form of physical activity.	65	86.67	66	88.00
C4	I know how to use the equipment at school.	54	72.00	55	73.33
C5	I am aware that the school's sports programs or sports clubs are currently conducting activities.	62	82.67	62	82.67
C6	I know how to sign up for physical activities.	60	80.00	61	81.33
II	Physical skills				
C7	I know how to create a suitable training plan.	65	86.67	66	88.00
C8	I know how to perform the exercise with the correct technique.	63	84.00	63	84.00
C9	I know how to warm up and cool down properly.	55	73.33	55	73.33
C10	I know how to use the equipment safely.	51	68.00	50	66.67
C11	I am healthy enough to participate in physical activities.	62	82.67	60	80.00
C12	I am not limited by injuries when training.	68	90.67	67	89.33
III	Social/professional roles and personal identity				
C13	I view physical activity as part of my lifestyle.	65	86.67	65	86.67
C14	I view physical activity as a responsibility toward my health.	64	85.33	63	84.00
TC15	I believe that university students need to maintain regular physical activity.	50	66.67	50	66.67
TC16	I believe that university students need to maintain regular physical activity	49	65.33	50	66.67
C17	I consider myself someone with an active lifestyle.	62	82.67	63	84.00
IV	Belief in capabilities				
C18	I am confident in my ability to stay physically active, even when busy or facing challenges.	66	88.00	65	86.67
C19	I believe I can maintain physical activity in the long term.	65	86.67	65	86.67
C20	I am confident I can meet the recommended level of physical activity each week.	68	90.67	67	89.33
C21	I am confident I can start exercising, even if I haven't been very active in the past.	51	68.00	50	66.67
V	Optimism				
C22	I am optimistic about my ability to maintain physical activity in the future.	69	92.00	70	93.33
C23	I believe that maintaining physical activity will bring long-term benefits to my life.	65	86.67	65	86.67
C24	I believe that if I keep exercising, my health will improve.	50	66.67	50	66.67
VI	Beliefs about consequences				
C25	Physical activity helps me improve my health.	66	88.00	65	86.67
C26	Physical activity helps me improve my mental health and reduce stress.	65	86.67	65	86.67
C27	Physical activity helps me improve my appearance and quality of life.	62	82.67	63	84.00
C28	Failing to maintain regular physical activity will negatively affect my health and quality of life.	64	85.33	63	84.00
VII	Consolidation				
C29	My family and friends encourage me to be physically active.	61	81.33	60	80.00
C30	The school has a policy to encourage physical activity.	62	82.67	62	82.67
C31	The school's sports activities motivate me to participate.	52	69.33	51	68.00
C32	I feel satisfied after every physical activity.	66	88.00	65	86.67
C33	Positive feedback helps me stay physically active.	68	90.67	67	89.33
VIII	Intent				
C34	I have a plan to stay physically active.	68	90.67	68	90.67
C35	I am determined to carry out the physical activity plan.	67	89.33	68	90.67
C36	I will devote more time to physical activity.	65	86.67	66	88.00
C37	I am determined to stay physically active, even when I am busy.	51	68.00	50	66.67
IX	Goal				
C38	I set specific goals for physical activity.	63	84.00	63	84.00
C39	I track and adjust my training goals.	62	82.67	63	84.00
C40	Physical activity is one of the important goals in my life.	50	66.67	51	68.00
C41	I prioritize physical activity alongside my studies.	66	88.00	65	86.67
X	Memory, attention, and decision-making processes				
C42	I usually remember my training schedule.	65	86.67	66	88.00
C43	I usually make a conscious effort to schedule my time so I don't miss a workout.	68	90.67	67	89.33
C44	I rarely miss a workout due to forgetfulness or a lack of planning.	63	84.00	63	84.00
XI	Environmental and resource context				

C45	The school's facilities meet the needs for physical activities.	61	81.33	60	80.00
C46	Fully equipped for training.	52	69.33	52	69.33
C47	I have easy access to the courts and equipment.	64	85.33	65	86.67
C48	I have enough time for physical activity.	67	89.33	66	88.00
C49	The school offers a wide range of physical activities.	63	84.00	63	84.00
C50	I easily access information about the school's physical activities	66	88.00	67	89.33
C51	The school has a policy encouraging students to participate in physical activities.	65	86.67	65	86.67
XII	Social impact				
C52	My friends encourage me and join me in physical activities.	65	86.67	65	86.67
C53	My family supports me in participating in physical activities.	67	89.33	66	88.00
C54	My physical education instructor encouraged me to participate in physical activities.	66	88.00	66	88.00
C55	People with active lifestyles inspire me.	61	81.33	61	81.33
C56	Working out with friends helps me stay physically active.	51	68.00	50	66.67
XIII	Emotions				
C57	I feel excited when participating in physical activities.	66	88.00	66	88.00
C58	I feel motivated to continue exercising after every physical activity session.	62	82.67	63	84.00
C59	I worry about injury or feel self-conscious when participating in physical activity.	63	84.00	63	84.00
C60	I find physical activity monotonous and boring.	51	68.00	52	69.33
XIV	Behavioral adjustment				
C61	I plan my weekly physical activities.	65	86.67	65	86.67
C62	I regularly track the results of my physical activity.	65	86.67	65	86.67
C63	I adjust my physical activity plan based on the monitoring results.	66	88.00	65	86.67
C64	I use an app or device to help track my physical activity.	62	82.67	63	84.00
C65	I regularly track my step count or active time.	49	65.33	50	66.67

Based on the interview data presented in Table 1, the study selected criteria that achieved a score exceeding 75% of the total possible points across both interview rounds. The results yielded 51 criteria (C1–C51) for evaluating 14 domains within the Theoretical Domains Framework (TDF), comprising:

1. Knowledge (5 criteria) (C1–C5)
2. Physical skills (4 criteria) (C6–C9)
3. Social/professional roles and personal identity (3 criteria) (C10–C12)
4. Belief in capabilities (3 criteria) (C13 - C15)
5. Optimism (2 criteria) (C16–C17)
6. Beliefs about consequences (4 criteria) (C18–C21)
7. Consolidation (4 criteria) (C22–C25)
8. Intention (3 criteria) (C26–C28)
9. Objectives (3 criteria) (C29–C31)

10. Memory, attention, and decision-making processes (3 criteria) (C32–C34)
11. Environmental and resource context (6 criteria) (C35–C40)
12. Social impact (4 criteria) (C41–C44)
13. Emotions (3 criteria) (C45–C47)
14. Behavioral adjustment (4 criteria) (C48–C51)

3.3. Assessing the reliability of the criteria

To accurately assess the reliability of the criteria used to develop the interview questionnaire (Appendix 3), 400 students (200 male, 200 female) currently enrolled in the Physical Education course were interviewed; the criteria for evaluating the 14 domains of the Theoretical Domains Framework (TDF) were validated using Cronbach's Alpha reliability coefficients, with the results presented in Table 2.

Table 2: Cronbach's Alpha reliability coefficients for the criteria assessing the 14 domains based on the Theoretical Domains Framework (TDF)

Criteria	Average of the scale if the variable is removed	Scale variance if item deleted	Total variable correlation	Cronbach's Alpha if variables are excluded
C1	16.1275	3.239	.496	.731
C2	16.4425	3.089	.582	.702
C3	16.2075	3.197	.435	.755
C4	16.7625	2.953	.588	.698
C5	17.0300	3.102	.564	.708
Cronbach's Alpha = .762 N of Items = 5				
C6	11.2650	1.839	.612	.759
C7	11.5900	1.947	.586	.770
C8	11.8950	1.849	.691	.720
C9	11.7950	1.958	.590	.768
Cronbach's Alpha = .804 N of Items = 4				
C10	8.2350	.727	.566	.738
C11	8.1350	.794	.461	.820
C12	8.1800	.757	.532	.749
Cronbach's Alpha = .759 N of Items = 3				
C13	8.3150	1.013	.549	.734
C14	8.0800	1.056	.394	.742
C15	8.6350	1.034	.442	.774
Cronbach's Alpha = 7.48 N of Items = 3				
C16	3.6125	.338	.578	

C17	3.8800	.387	.578	
Cronbach's Alpha = .732 N of Items = 2				
C18	10.9600	2.204	.530	.891
C19	11.2650	1.839	.850	.759
C20	11.1650	2.103	.618	.856
C21	11.2650	1.839	.850	.759
Cronbach's Alpha = .859 N of Items = 4				
C22	12.5500	1.577	.419	.646
C23	12.3550	1.573	.420	.508
C24	12.6700	1.575	.418	.510
C25	12.4350	1.364	.496	.540
Cronbach's Alpha = .706 N of Items = 4				
C26	7.8625	.901	.477	.476
C27	8.1300	.880	.579	.530
C28	7.9325	.898	.585	.732
Cronbach's Alpha = .730 N of Items = 3				
C29	7.3400	.957	.525	.749
C30	7.6450	.881	.648	.610
C31	7.5450	.910	.597	.667
Cronbach's Alpha = 7.61 N of Items = 3				
C32	8.2350	.727	.566	.758
C33	8.1350	.794	.461	.620
C34	8.3400	.817	.432	.749
Cronbach's Alpha = .716 N of Items = 3				
C35	20.1025	4.007	.570	.692
C36	19.8675	4.070	.456	.724
C37	20.4225	4.014	.502	.710
C38	20.6900	4.079	.525	.704
C39	20.0525	4.130	.488	.714
C40	20.3775	4.421	.392	.738
Cronbach's Alpha = 7.50 N of Items = 6				
C41	11.0600	2.222	.806	.892
C42	10.9600	2.204	.809	.891
C43	11.0600	2.222	.806	.892
C44	10.9600	2.204	.809	.891
Cronbach's Alpha = .916 N of Items = 4				
C45	8.6350	1.034	.438	.574
C46	8.9500	1.015	.458	.547
C47	8.7150	.896	.476	.524
Cronbach's Alpha = .746 N of Items = 3				
C48	11.7875	1.646	.433	.592
C49	12.0550	1.656	.487	.553
C50	11.4175	1.677	.457	.575
C51	11.7425	1.851	.371	.630
Cronbach's Alpha = .756 N of Items = 4				

The Cronbach's Alpha test results for the 51 criteria, presented in Table 2, indicate the following:

The overall Cronbach's Alpha coefficients ranged from 0.706 to 0.916 (exceeding the 0.6 threshold), and all items demonstrated corrected item-total correlation coefficients above the acceptable standard (>0.3). The study developed a scale to assess 14 domains based on the Theoretical Domains Framework (TDF), comprising 51 criteria as shown in Table 3.7, including:

1. Knowledge (5 criteria) (C1–C5)
2. Physical skills (4 criteria) (C6–C9)
3. Social/professional roles and personal identity (3 criteria) (C10–C12)
4. Belief in capabilities (3 criteria) (C13 - C15)
5. Optimism (2 criteria) (C16–C17)
6. Beliefs about consequences (4 criteria) (C18–C21)
7. Consolidation (4 criteria) (C22–C25)
8. Intention (3 criteria) (C26–C28)

9. Objectives (3 criteria) (C29–C31)
10. Memory, attention, and decision-making processes (3 criteria) (C32–C34)
11. Environmental and resource context (6 criteria) (C35–C40)
12. Social impact (4 criteria) (C41–C44)
13. Emotions (3 criteria) (C45–C47)
14. Behavioral adjustment (4 criteria) (C48–C51)

4. Discussion

The study developed a scale comprising 51 criteria across 14 domains of the Theoretical Domains Framework (TDF) to assess factors influencing the physical activity of students at the University of Danang. The scale was developed through a three-step process: synthesizing the theoretical basis and previously published instruments, assessing content validity via expert opinion, and testing reliability on a student sample. This process is appropriate for scale development

research, helping to ensure the scientific rigor, systematic nature, and applicability of the instrument within the context of Vietnamese higher education (Hair *et al.*, 2019) ^[6].

Selecting the TDF as the foundation for scale development is appropriate because this theoretical framework integrates core constructs from various behavior change theories, enabling a comprehensive assessment of the individual, social, and environmental factors influencing physical activity behavior (Michie *et al.*, 2005; Michie *et al.*, 2011) ^[7]. Compared to models such as the TPB, HBM, or SCT, the TDF not only explains behavior but also facilitates the selection of intervention strategies through the COM-B model and the Behaviour Change Wheel. Developing a scale based on all 14 domains of the TDF aligns with the validation study by Cane *et al.* (2012) ^[5] and helps lay the groundwork for future intervention research (Cane *et al.*, 2012) ^[5].

Starting with an initial set of 65 criteria and proceeding through two rounds of evaluation by 15 experts, the study selected 51 criteria that achieved a consensus level exceeding 75%. This indicates that the retained criteria are highly relevant, accurately reflecting the characteristics of students at the University of Danang and aligning with the context of higher education in Vietnam. Furthermore, the retention of all 14 domains of the TDF—despite varying numbers of criteria per domain—demonstrates that physical activity behavior is simultaneously influenced by factors related to knowledge, skills, motivation, emotion, social influences, and the environment, consistent with the perspective of Cane *et al.* (2012) ^[5].

Reliability analysis results indicate that Cronbach's Alpha coefficients for the dimensions ranged from 0.706 to 0.916, while all observed variables exhibited item-total correlation coefficients greater than 0.30. According to Hair *et al.* (2019) ^[6], this represents an acceptable level of reliability for scale development studies, demonstrating good internal consistency and suitability for use in subsequent research (Hair *et al.*, 2019) ^[6].

Notably, the "Social Influence" domain exhibited the highest Cronbach's Alpha coefficient (0.916), highlighting the significant role of family, friends, and lecturers in shaping and sustaining students' physical activity behaviors. This finding aligns with the systematic review by Brown *et al.* (2024) ^[4], which identified "Social influences," "Environmental context and resources," and "Goals" as the three domains with a prominent impact on university students' physical activity (Brown *et al.*, 2024) ^[4]. This suggests that programs aimed at promoting physical activity should integrate awareness-raising, enhanced social support, and improvements to the exercise environment.

This study contributes further evidence regarding the application of the Theoretical Domains Framework (TDF) within the context of higher education in Vietnam. Unlike many domestic studies that rely primarily on self-developed questionnaires or assess only isolated factors, this scale comprehensively reflects all 14 domains of the TDF, thereby providing a theoretically grounded tool for evaluating the factors influencing students' physical activity. The findings not only serve to assess the current situation but also provide a scientific basis for designing intervention programs—guided by the COM-B model and the Behaviour Change Wheel—to help enhance the effectiveness of promoting physical activity in universities.

Despite the results achieved, the study assessed reliability solely through Cronbach's Alpha. Therefore, future research

should further validate the scale's construct validity using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) with larger and more diverse samples to refine and standardize the scale for Vietnamese university students.

5. Conclusions

This study successfully developed a scale comprising 51 criteria across 14 domains of the Theoretical Domains Framework (TDF) to assess factors influencing the physical activity of students at the University of Danang. Validation results demonstrated good scale reliability, with Cronbach's Alpha coefficients ranging from 0.706 to 0.916, and all observed variables meeting the requirements for item-total correlation. The scale serves as a scientifically grounded and reliable tool for evaluating factors affecting student physical activity, while also providing a basis for future research on structural validity testing and the development of intervention programs to enhance physical activity within universities.

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