# A Systematic Review of the Relationships Between Attitude, Subjective Norms, Perceived Behavioral Control, and Exercise Intention

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**Abstract:**

***Background:*** The Theory of Planned Behavior (TPB) identifies Attitude (AT), Subjective Norms (SN), and Perceived Behavioral Control (PBC) as key determinants of Exercise Intention (EI). Although numerous studies have explored these constructs, a limited number of systematic reviews incorporate both the measurement tools and the interrelationships among these variables.

***Objective:*** This review evaluates empirical findings published between 2013 and 2023 concerning (1) the measurement instruments used for AT, SN, PBC, and EI and (2) the predictive influence of each factor on EI.

***Methods:*** Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic search was conducted using the Web of Science, Scopus, and PubMed databases with keywords related to AT, SN, PBC, and EI. The inclusion criteria comprised English-language empirical studies employing TPB constructs and published between 2013 and 2023. The risk of bias in the included studies was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Tool.

***Results:*** A total of t34 articles were selected for this study: 23 focused on measurement instruments, highlighting a range of tools and their psychometric properties, while 11 examined the relationships between TPB constructs and EI. The findings indicated that PBC and AT are strong predictors of EI, whereas SN demonstrated variable significance across studies. The effect size estimates and confidence intervals were extracted when available.

***Limitations:*** Variations in sample demographics, study designs, and measurement tools may limit the generalizability of findings.

***Conclusion:*** This review provides insights into the operationalization and predictive power of TPB constructs in EI research and recommends the adoption of standardized measurement tools and longitudinal designs to enhance comparability and robustness.

**Keywords:** Systematic review, Attitude, Subjective norms, Perceived behavioral control, Exercise intention, Theory of Planned Behavior.

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## 1. INTRODUCTION

Building on the Theory of Reasoned Action (TRA), Ajzen developed the Theory of Planned Behavior (TPB), which adds Perceived Behavioral Control (PBC) to the original TRA components—attitude (AT) and subjective norms (SN), to better explain non-volitional behaviors [1]. The fundamental tenet of TPB is that an individual's

intention to perform a specific behavior is influenced by three primary factors: AT, SN, and PBC [2]. These factors have also been identified as important determinants of exercise intention (EI) [3].

SN refers to the perceived social pressure to engage in exercise, whereas AT reflects an individual's positive or negative evaluation of exercising. PBC, on the other hand, represents an individual's confidence in their ability to perform the behavior [4]. These factors have consistently been shown to significantly predict EI, offering valuable insights for promoting healthy behaviors and informing the design of interventions aimed at increasing Physical activity (PA) levels [5].

Physical inactivity is a major global health concern, underscoring the need to identify factors that can effectively promote EI [6]. Among various psychological and social factors, research has increasingly emphasized the roles of AT, SN, and PBC, which are central constructs in the TPB and are widely recognized for their relevance in healthy behavior research [4]. These constructs have been shown to directly influence EI by addressing individual beliefs, social expectations, and perceived control over engaging in exercise [7]. Understanding their impact offers valuable insights for developing strategies to foster active lifestyles and reduce physical inactivity [8].

Although Systematic Literature Reviews (SLRs) on this topic are limited, their value lies not in the scarcity of existing reviews but in their ability to address critical gaps in the research [9]. The justification for conducting this review stems from the need to synthesize and interpret existing findings meaningfully rather than merely filling a void in the literature [10]. Existing SLRs have predominantly focused on narrow aspects of EI, such as specific interventions or targeted populations, while failing to provide a comprehensive analysis of the broader psychological constructs—AT, SN, and PBC, and their relationship with EI across diverse contexts [11]. This gap underscores the necessity of the present review in offering a holistic understanding of the key constructs—AT, SN, and PBC—and their implications for advancing both theoretical and practical knowledge in the field. This review builds on existing findings by examining how these constructs relate to EI through a comprehensive analysis of the current literature. Specifically, it addresses the following research questions: (i) What instruments are used to assess AT, SN, and PBC about EI? and (ii) How do AT, SN, and PBC individually influence EI?

## 2. METHOD

The SLR followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which provide a rigorous and standardized framework to ensure transparency, reproducibility, and comprehensiveness in the review process. Adhering to PRISMA facilitated a systematic analysis of studies investigating the relationships among AT, SN, PBC, and EI. This review synthesizes empirical findings published between 2013 and 2023 to enhance the understanding of how these constructs influence exercise behavior.

By the PRISMA process, the steps of searching, screening, initial inclusion, eligibility assessment, and final inclusion were systematically followed. Web of Science and Scopus were chosen for the database search because of their broad coverage of high-quality, peer-reviewed publications in fields relevant to this study, including psychology, health sciences, and behavioral research. These databases are recognized for offering access to reliable and comprehensive studies on EI [12]. The inclusion of peer-reviewed articles also ensures a level of quality control, supporting the accuracy and credibility of the research findings.

The search was limited to studies published between 2013 and 2023 to prioritize contemporary research while maintaining a manageable scope for analysis. This 10-year period reflects a time of notable progress in health behavior research, particularly regarding the application and evaluation of TPB constructs in the context of EI. Focusing on this recent decade enables the review to highlight emerging trends, methodological advancements, and the latest empirical findings that are more likely to inform current practice and future investigations. Although a broader review might offer historical insights, emphasizing recent literature ensures greater relevance to the rapidly evolving field. This approach aligns the review with up-to-date theoretical and practical developments that are essential for understanding the current state and implications of health behavior research.

The search focused on three key term combinations—"AT and EI," "SN and EI," and "PBC and EI,"—to align with the core constructs of the TPB. This targeted approach helped identify robust and relevant sets of articles for further analysis, ensuring that the review captures the most current and pertinent literature on the subject.

### 2.1. Search

To initiate the systematic literature review, specific keywords were defined to capture the core constructs of the TBP in relation to EI. Initial searches using broad terms like "EI" produced an overwhelming number of results with varying relevance. To improve specificity and alignment with the study's focus, the search strategy was refined to include targeted phrases such as "AT and EI," "SNs and EI," and "PBC and EI." Within the TPB framework, AT refers to an individual's favorable or unfavorable evaluation of exercising; SN denotes the perceived social pressure from significant others to engage or not engage in exercise; and PBC reflects one's perceived ease or difficulty in performing the behavior, which is closely related to self-efficacy. EI refers to an individual's motivational readiness to engage in PA. To ensure comprehensive coverage of relevant literature, searches were conducted across three major databases: Web of Science, Scopus, and PubMed. This strategy produced a focused set of academic articles that aligned with the study objectives. Between 2013 and 2023, a total of 605 titles were retrieved: 297 related to "AT and EI," 128 to "SNs and EI," and 180 to "PBC and EI." The search results, organized by publication year and article type, are presented in Table **1**.

**Table 1. Search results.**

| Keywords (n) | Year (n) | Article Type (n) |
|---|---|---|
| "Attitude, exercise intention" (297) | 2023 (65); 2022 (50); 2021 (45); 2020 (40); 2019 (35); 2018 (30); 2017 (20); 2016 (15); 2015 (10); 2014 (5); 2013 (2) | Research articles (282); Review articles (15) |
| "Subjective norms, exercise intention" (128) | 2023 (30); 2022 (25); 2021 (20); 2020 (15); 2019 (10); 2018 (8); 2017 (6); 2016 (5); 2015 (4); 2014 (3); 2013 (2) | Research articles (118); Review articles (2); |
| "Perceived behavioral control, exercise intention" (180) | 2023 (35); 2022 (30); 2021 (25); 2020 (20); 2019 (15); 2018 (10); 2017 (8); 2016 (6); 2015 (5); 2014 (3); 2013 (2) | Research articles (176); Review articles (4) |

## 2.2. Screening

The initial search yielded 605 titles, which were screened for duplicates to maintain the integrity and uniqueness of the dataset. Microsoft Word's "Navigation" feature was used for this process by copying and pasting titles into the "Find" function to identify repeated entries. Although manual, this method allowed for precise control over the screening. After thorough checking, 340 duplicates were removed, leaving 265 unique titles for further analysis. The titles and abstracts were independently screened by two reviewers, with discrepancies resolved through discussion or consultation with a third reviewer. Citation tracking was also performed to identify additional relevant studies. This refinement ensured that the final selection of articles was closely aligned with the review objectives. A visual summary of the screening process, including the flow of information, is presented in Fig. (**1**).

Additionally, citation searching was conducted, focusing on influential authors such as Icek Ajzen, Martin Hagger, and Nikos Chatzisarantis, who have made substantial contributions to the field. This method helps identify high-impact studies that may not appear through keyword searches alone, thereby enhancing the comprehensiveness of the review. While this approach adds depth, it also increases complexity; however, excluding it in favor of relying solely on database searches might risk omitting critical literature. The final set of articles was subsequently analyzed to ensure alignment with the study objectives.
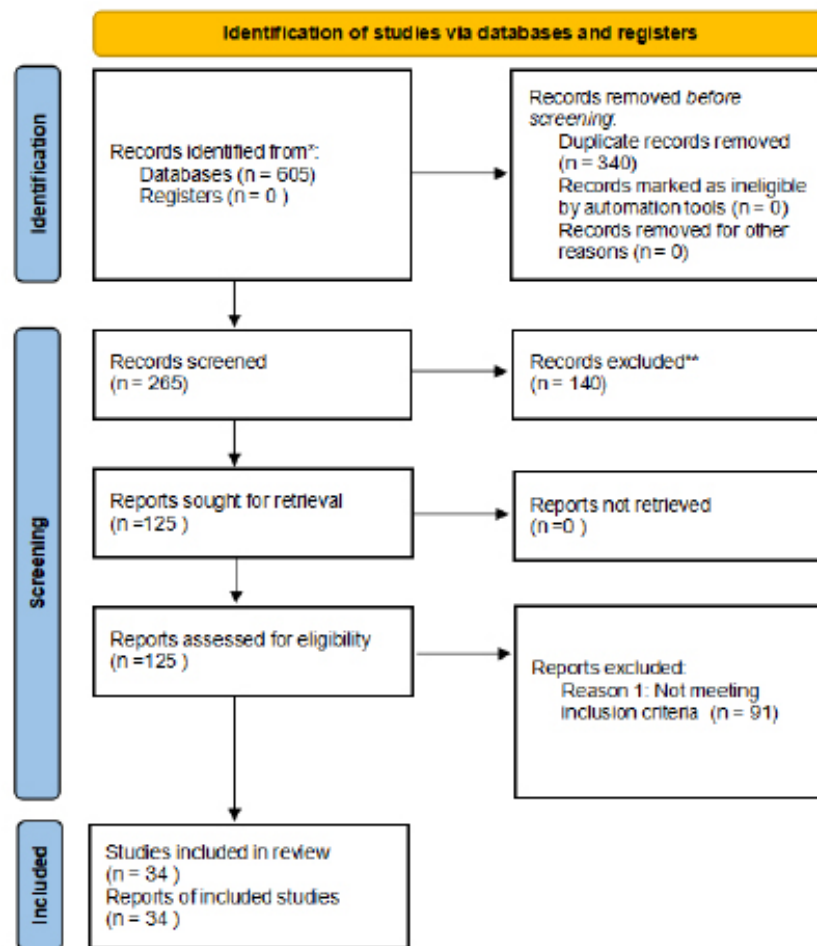


**Fig. (1).** Flowchart of the systematic literature review process.

## 2.3. Initial Inclusion

One of the central aims of this research was to assess the relationships among AT, SN, PBC, and EI. To guide the initial selection of studies, specific inclusion criteria were established: studies must present empirical findings, be published in English, and fall within the publication period of 2013–2023. These criteria ensured the selection of relevant, current, and high-quality research for analysis. Studies that did not measure AT, SN, PBC, or EI, employed unrelated theoretical frameworks, or lacked access to full-text versions were excluded. All exclusions were documented and categorized to maintain transparency in the review process.

During this phase, the abstracts of the remaining 265 titles were carefully reviewed and assessed based on the established inclusion criteria. As a result, 125 abstracts met all the specified requirements and were included for further evaluation, whereas 140 were excluded for failing to meet one or more of the criteria. Figure 1 presents a graphical summary of the screening criteria and the outcomes of the abstract evaluation.

## 2.4. Eligibility and Inclusion

To conduct a more thorough eligibility assessment, full-text versions were obtained for the 125 abstracts initially included. However, access issues arose with 31 articles due to subscription limitations or other restrictions, rendering them unavailable for review. Of the remaining accessible articles, 30 were excluded because they lacked sufficient information relevant to the theoretical focus, specifically, AT, SN, and PBC in relation to EI. An additional 30 articles were excluded because their themes diverged substantially from the central focus on EI as framed within the TPB, making them unsuitable for inclusion.

As a result, 34 publications that met all inclusion criteria were selected for in-depth analysis and synthesis in this review. These studies were considered both complete and directly relevant to the central research questions concerning the influence of AT, SN, and PBC on EI, and all stages of the eligibility assessment were completed.

## 2.5. Risk of Bias Assessment

The risk of bias was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tool for analytical cross-sectional studies. Each article was independently evaluated by two reviewers, and the studies were categorized as having a low, moderate, or high risk of bias. A summary of these assessments is provided in the Results section.

## 3. RESULTS

## 3.1. Instruments for Assessing AT, SN, PBC, and EI

### 3.1.1. AT Assessment Instruments

Several studies have concentrated on developing and validating instruments to measure AT for exercise, with an emphasis on their reliability and validity in capturing emotional, cognitive, and social components. For instance, Jones and Norman (2021) [13] created and validated a 20-item scale designed to assess experiential AT, self-identity as an exerciser, and related behavioral intentions (BI). Through rigorous psychometric evaluations, including exploratory and confirmatory factor analyses, the scale demonstrated strong internal consistency and construct validity. These results indicate that the instrument reliably captures key attitudinal dimensions relevant to EI and serves as a valuable tool for future research in this domain.

Ahmad *et al.* (2014) [14] conducted a randomized controlled trial with 150 elderly participants, using an 18-item instrument to assess instrumental ATs, SN, and PBC. This study found that beliefs about the health benefits of exercise, along with perceived social pressure, were significant predictors of EI in older adults. These findings underscore the importance of cognitive perception and social influences in shaping exercise-related behaviors among the elderly.

McEachan *et al.* (2016) [15] conducted a meta-analysis involving 500 participants, using a 15-item instrument that measured subjective experiences and outcome-based evaluations across a range of health behaviors. The findings revealed that experiential ATs—emotional and affective responses toward exercise—were strong predictors of both EI and actual behavior. These results underscore the importance of incorporating emotional components into interventions aimed at promoting physical activity.

In a comparative study, Guelfi *et al.* (2015) [16] surveyed 300 pregnant women from Chinese and Australian backgrounds using a 25-item instrument that assessed cultural ATs, health beliefs, and social support related to exercise during pregnancy. The findings indicate that cultural beliefs have a significant influence on exercise ATs. Among Australian participants, practical beliefs strongly predicted EI, whereas in the Chinese sample, PBC emerged as the sole significant predictor.

Salim (2023) [17] conducted a cross-sectional survey with 200 female college students to examine predictors of PA behavior using a 12-item instrument that assessed positive ATs, perceived barriers, and intentions to engage in exercise. The results revealed that positive ATs toward PA played a key role in enhancing EIs among the participants.

Feng *et al.* (2022) [18] investigated EI among aortic dissection survivors using a 20-item scale that measured both cognitive and emotional ATs toward PA. The study found that survivors' intentions to engage in exercise after recovery were significantly influenced by their cognitive assessments of exercise benefits as well as their emotional reactions to PA.

Lastly, Chen and Gu (2018) [19] examined ATs toward physical education among 300 middle school students using a 20-item instrument that measured perceived enjoyment and perceived usefulness of PA. The findings revealed that students with more positive ATs toward

physical education demonstrated higher intentions in engaging in physical activities.

Overall, the reviewed studies demonstrate various instruments for assessing ATs for EI. Sample sizes varied from 150 to 500 participants and included diverse populations such as students, older adults, and pregnant women. Methodologies encompassed cross-sectional surveys, randomized controlled trials, and meta-analyses, underscoring the multifaceted approach to researching exercise ATs. Instrument length ranged from 12 to 25 items, with most employing Likert scale formats to capture detailed responses. Collectively, the instruments addressed cognitive, emotional, and social components, offering a comprehensive view of the factors shaping ATs toward exercise.

### 3.1.2. SN Assessment Instruments

Instruments measuring SN focus on the social pressures and influences that affect EIs, particularly the roles of family, peers, and cultural expectations. Hasbullah *et al.* (2016) [20] conducted a study involving 300 tertiary education students using a 10-item instrument designed to assess close relationships, perceived social norms, and cultural expectations. The results revealed that perceived social pressure and the influence of close interpersonal relationships were key determinants of EIs among the student population.

Similarly, Radia and Wulandari (2021) [21] conducted a study involving 400 consumers who completed a 14-item survey assessing situational factors, peer pressure, and social comparisons. The findings indicate that both situational contexts and peer pressure significantly predicted EIs, indicating that individuals are more inclined to engage in PA when they receive social support and encouragement from their peers.

Furthermore, Budiman and Wıjaya (2014) [22] conducted a study involving 300 entrepreneurs using a 16-item instrument to assess family influences, community norms, and social identity. The results revealed that family opinions and community expectations significantly impacted EIs, highlighting the crucial role of social identity in shaping behaviors. Similarly, Singh and Kaur (2021) [23] studied 150 patients prescribed opioids, employing a 10-item instrument to measure social pressure, normative beliefs, and BI. Their findings indicated that SN was a stronger predictor of intentions to engage in health-promoting activities than personal AT, emphasizing the importance of social influences in shaping health-related behaviors.

Overall, the reviewed studies demonstrated a diverse range of instruments for assessing SN in relation to EI. Sample sizes varied from 150 to 400 participants and encompassed a broad spectrum of populations, including students, entrepreneurs, and patients. Methodologies used across these studies included cross-sectional surveys, structural equation modeling, and validation studies, underscoring the complex nature of research in this area. The instruments typically comprised 10 to 16 items and used Likert scale format to capture nuanced perceptions.

The domains assessed—such as peer influence, family expectations, and cultural beliefs, offered a comprehensive understanding of the social pressures shaping EIs.

### 3.1.3. PBC Assessment Instruments

Instruments assessing PBC emphasize individuals' confidence and perceived control over their ability to engage in PA, frequently incorporating measures of self-efficacy and access to resources. Hagger and Chatzisarantis (2013) [24] conducted a cross-sectional survey with 250 university students using a four-item instrument to assess self-efficacy and control beliefs. Their results demonstrated that both confidence and the availability of resources significantly influenced regular PA participation. In a longitudinal study, Teixeira *et al.* (2015) [25] examined 500 adults using a five-item measure focused on beliefs about overcoming barriers and perceived control over exercise decisions. This study further underscored the critical role of self-efficacy in encouraging consistent PA.

Maxwell-Smith *et al.* (2020) [26] conducted a cross-sectional survey with 183 cancer survivors, using a four-item instrument to assess self-efficacy and perceived control over exercise choices. The findings of this study underscored the relevance of PBC in influencing PA within this specific population. Similarly, Khalid (2023) [27] carried out a survey-based study involving 250 Pakistani adults, using a six-item scale to measure perceived control and exercise capability. This study emphasized the importance of self-efficacy and effective time management in encouraging PA among adults.

These studies collectively underscore the importance of PBC in shaping EIs across various populations. The variation in the number of items used and the methodological approaches highlights the necessity for context-specific assessment tools that can effectively capture the complex dimensions of PBC. These findings offer valuable insights for designing targeted health interventions that promote PA by enhancing individuals' confidence and perceived control.

### 3.1.4. EI Assessment Instruments

Studies assessing EI have often examined self-regulation, social influences, and motivational factors as key elements in understanding individual commitment to PA. For example, Ahn *et al.* (2016) [28] conducted a cross-sectional survey with 300 Korean university students, using a five-item instrument to measure self-regulation, exercise participation, and adherence intention. Their results highlighted the predictive role of self-regulation in fostering exercise commitment. Similarly, Calogiuri *et al.* (2015) [29] conducted a controlled clinical trial involving 100 participants and used a six-item measure to assess exercise behavior and health promotion outcomes, demonstrating the effectiveness of interventions in increasing PA levels.

In another study, Flowers *et al.* (2017) [30] developed and validated three questionnaires to assess beliefs about green exercise among a general population of 400

individuals, using 12 items to measure AT, SN, and PBC. This provided valuable insights into the factors influencing EI in natural settings. Similarly, Chen *et al.* (2022) [31] investigated elementary school students, analyzing data from 676 participants using path analysis, an eight-item instrument, to explore the relationship between EI and behavior. Their findings confirmed that stronger intentions are positively associated with increased participation in PA.

Berry *et al.* (2023) [32] investigated the effects of fitcspiration in 150 adults using a ten-item instrument to assess motivation and intention to exercise and found that media influences play a complex role in shaping exercise behavior. Similarly, Guelfi *et al.* (2015) [[16]] conducted a comparative study on beliefs about exercise during pregnancy among Chinese and Australian women, employing a seven-item scale to evaluate AT and PBC. Their findings revealed significant cultural differences, with varying predictors of EI between the two populations.

Huang and Wu (2021) [33] surveyed 300 older adults in Taipei City using a nine-item instrument to assess EI and social influences and found that social support significantly impacted exercise participation. Similarly, Lee and Lee (2020) [34] conducted a cross-sectional survey of 740 Korean adolescents, employing six items to explore the relationship between parental and peer exercise participation and adolescents' EIs and behaviors. Their results emphasized that EI plays a mediating role in translating social influences into actual exercise behaviors.

Rodrigues *et al.* (2020) [35] conducted a systematic review examining how dual aspects of motivation predict enjoyment, intention, and exercise persistence among adults, using a five-item instrument to analyze these relationships. Similarly, Kwan *et al.* (2017) [36] investigated the role of anticipated affect in a randomized controlled trial involving 200 adults, employing 10 items to assess both anticipated emotional responses and EI. Their findings demonstrated that anticipated affect significantly influences exercise behavior, highlighting the importance of emotional expectations in motivating PA.

Collectively, these studies demonstrate the wide range of instruments and research methodologies employed to assess EI across diverse populations and settings. The findings emphasize the importance of self-regulation, social influences, and motivational factors in shaping individuals' intentions to engage in PA. These insights are essential for designing targeted and effective interventions to promote PA. A detailed summary of the methodologies, instrument adaptations, and key findings from each study is provided in Table **2**.

**Table 2. Summary of instruments used to assess Attitude (AT), Subjective norms (SN), Perceived behavioral control (PBC), and Exercise intention (EI).**

| Variables | Study | N. Samples | Method | N. Items | N. Domains | Domain names |
|---|---|---|---|---|---|---|
| AT | [13] | 250 university students | Cross-sectional survey | 20 | 3 | Experiential Attitudes, Self-Identity, Behavioral Intentions, |
| | [14] | 150 elderly participants | Randomized controlled trial | 18 | 3 | Instrumental Attitude, Subjective Norms, Perceived Behavioral Control, |
| | [15] | 500 participants across various health behaviors | Meta-analysis | 15 | 3 | Experiential Attitudes, Instrumental Attitudes, Behavioral Outcomes, |
| | [16] | 300 pregnant women (Chinese and Australian) | Comparative study | 25 | 3 | Attitudes, Perceived Behavioral Control, Intention to Exercise |
| | [17] | 200 female college students | Cross-sectional survey | 12 | 3 | Positive Attitudes, Barriers to Exercise, Intentions to Exercise, |
| | [18] | 100 aortic dissection survivors | Exploratory factor analysis | 20 | 3 | Cognitive Attitudes, Emotional Attitudes, Behavioral Intentions, |
| | [19] | 300 middle school students | Cross-sectional survey | 20 | 3 | Positive Attitude, Perceived Usefulness, Physical Activity, |
| SN | [20] | 300 tertiary education students | Cross-sectional survey | 10 | 3 | Close Relationship, Social Norms, Cultural Expectations, |
| | [21] | 400 consumers | Cross-sectional survey | 14 | 3 | Situational Factors, Peer Pressure, Social Comparisons, |
| | [22] | 300 entrepreneurs | Cross-sectional survey | 16 | 3 | Family Influence, Community Norms, Social Identity |
| | [23] | 150 patients prescribed opioids | Cross-sectional survey | 10 | 3 | Social, Pressure, Normative Beliefs, Behavioral Intentions. |
| PBC | [24] | 250 university students | Cross-sectional survey | 4 | 2 | Self-efficacy, Control Beliefs, |
| | [25] | 500 adults | Longitudinal study | 5 | 2 | Self-efficacy, Perceived Control, |
| | [26] | 183 cancer survivors | Cross-sectional survey | 4 | 2 | Self-efficacy, Control beliefs, |
| | [27] | 240 Pakistani adults | Survey-based study | 6 | 2 | Self-efficacy, Perceived Control, |

*(Table 4) contd.....*

| Variables | Study | N. Samples | Method | N. Items | N. Domains | Domain names |
|-----------|-------|------------|--------|----------|------------|--------------|
| EI | [28] | 300 Korean university students | Cross-sectional survey | 5 | 3 | Self-Regulation Exercise, Participation, Adherence and Intention to |
| | [29] | 100 Adults | Controlled clinical trial | 6 | 2 | Exercise behavior, Health promotion, |
| | [30] | 400 Adults | Questionnaire development and validation | 12 | 4 | Beliefs in Green Exercise, Attitudes, Subjective Norms, Perceived Behavioral Control, |
| | [31] | 676 Junior school students | Path analysis | 8 | 2 | Exercise Intention, Exercise Behavior |
| | [32] | 150 Adults | Randomized controlled trial | 10 | 3 | Fitspiration, Exercise Intention, Motivation |
| | [13] | 200 Pregnant women | Comparative study | 7 | 3 | Attitudes, Perceived Behavioral Control, Intention to Exercise, |
| | [33] | 300 Older adults in Taipei City | Survey | 9 | 2 | Exercise Intention, Social Influences, |
| | [34] | 740 Korean adolescents | Cross-sectional survey | 6 | 3 | Exercise Intention, Action control, Social Influences |
| | [35] | 300 Adults | Systematic review | 5 | 2 | Motivation, Exercise Adherence, |
| | [36] | 200 Adults | Randomized controlled trial | 10 | 2 | Anticipated Effect and Exercise Intention. |

## 3.2. Relationships Among AT, SN, PBC, and EI

This study examined the relationship between the core components of TPB, such as AT, SN, PBC, and EI, while also evaluating the instruments used to measure these constructs. Understanding these relationships is crucial for designing effective interventions and strategies to enhance PA engagement. The findings provide valuable insights into the motivational factors that influence exercise behavior, contributing to the fields of health psychology and behavioral medicine.

Several studies included in the systematic review reported significant relationships between AT, SN, PBC, and EI. For example, Stehr *et al.* (2021) [3] used structural equation modeling (SEM) with a sample of 865 older adults to examine the associations among the core constructs of the TPB. The results indicated that AT had a significant positive effect on EI (AT-EI, $\beta$=0.135, P<0.01), while SN showed a negative and non-significant effect (SN-EI, $\beta$=-0.059). In contrast, PBC exhibited a strong and significant positive influence on EI (PBC-EI, $\beta$ = 0.496, P<0.01).

Idris *et al.* [37] conducted a cross-sectional survey in Omdurman, Sudan, to investigate the psychosocial determinants of Leisure-Time Physical Activity (LTPA) using the Reasoned Action Approach (RAA). The study included 378 adults (61% male), and assessed EI, AT, SN, and PBC in relation to LTPA. SEM was used to analyze the relationships among the RAA constructs. The results showed that AT ($\beta$ = 0.39), SN ($\beta$ = 0.18), and PBC ($\beta$ = 0.11) were positively associated with intention, collectively explaining 22% of its variance. The study concluded that AT had the strongest influence on intention and recommended that interventions should focus on enhancing both ATs and SNs to effectively promote LTPA among Sudanese adults.

In another study, Trigueros *et al.* [38] examined the influence of social context, including parents, friends, and teachers—on motivation and intention to engage in PA among 653 high school students in Spain, using the TPB framework and SEM. Confirmatory factor analysis was employed to validate the measurement scales for perceived social support and psychological control related to PA. The findings demonstrated significant relationships among AT, PBC, SN, and EI. Specifically, AT had a direct effect on EI (AT-EI, $\beta$ = 0.27, P<0.01), whereas PBC exerted a stronger influence (PBC-EI, $\beta$ = 0.30, P<0.01). SN also had a moderate but significant effect on EI (SN-EI, $\beta$ = 0.25, P<0.01). These results underscore the importance of both AT and PBC as key predictors of of EI, with SN contributing meaningfully as well.

The studies frequently reviewed highlight the practical applications of their findings, with many recommending targeted interventions that use key psychological constructs to promote PA. For example, Rhodes *et al.* [39] found that AT had the strongest influence on EI (AT-EI, $\beta$=0.44, P<0.01), followed by PBC (PBC-EI, $\beta$=0.36, P<0.01), and SN (SN-EI, $\beta$=0.25, P<0.05). Based on these findings, the authors recommended that interventions should aim to foster more positive ATs toward exercise, enhance individuals' perceived control over engaging in PA, and take into account the role of social influences.

Lu *et al.* [40] conducted a study involving 951 Taiwanese high school students to examine the predictors of exercise behaviors and intentions using SEM and TPB. Hierarchical multiple regression analyses were performed to assess the relationships among the TPB constructs. The findings revealed that AT, PBC, and SN each had significant impacts on EI. Specifically, AT had a moderate direct effect on EI (AT-EI, $\beta$ = 0.24, P<0.01), while PBC showed a substantially stronger influence (PBC-EI, $\beta$ = 0.64, P<0.01). SN, although weaker still exerted a significant effect on EI (SN-EI, $\beta$ = 0.05, P<0.05). These results indicate that PBC is the strongest predictor of EI, followed by AT, with SN having a smaller yet significant influence.

Min *et al.* (2022) [41] conducted a study applying TPB to understand PA intentions and behaviors among 286 Korean breast cancer survivors. Participants completed face-to-face surveys assessing PA levels, demographic characteristics, and TPB constructs, including AT, SN, PBC, planning, and intention. The SEM was used to examine the relationships among these variables, with adjustments for age, cancer stage, and clinical treatment.

The results indicated that instrumental AT (β = 0.34, P<0.01), SN (β = 0.12, P<0.05), and PBC (β = 0.57, P<0.01) had significant direct effects on PA intentions. Additionally, both PBC (β = 0.17, P<0.05) and intention (β = 0.46, P<0.05) significantly influenced planning behavior. Furthermore, PBC (β = 0.28, P<0.05) and planning (β = 0.22, P<0.05) were found to have direct effects on PA behavior. These findings indicate that TPB is a useful framework for understanding PA behavior in Korean breast cancer survivors. Accordingly, interventions focusing on enhancing AT, SN, and PBC, intentions, and planning may be effective in improving PA levels in this population.

Liu *et al.* (2022) [42] investigated the key factors influencing walking BI among older adults, particularly in developing countries like China, where research on elderly walking habits remains limited. Using face-to-face surveys with 501 older adults in Nanjing, the study found a significant positive relationship between AT and walking intention (β = 0.234, p < 0.05), indicating that older adults' intentions to walk are strongly associated with their favorable ATs toward walking. Moreover, PBC exhibited an even stronger effect on walking intention (β = 0.361, p < 0.01), emphasizing the role of confidence and perceived control in shaping walking behavior among elderly individuals. However, the relationship between SN and walking intention was not statistically significant (β = -0.1, p > 0.05), indicating that social expectations or the influence of others did not significantly affect older adults' walking intentions. These findings underscore the importance of enhancing older adults' self-efficacy and positive ATs toward walking to effectively encourage walking behaviors, while also highlighting the limited impact of SN within this population.

Similarly, Zhou *et al.* (2023) [43] applied TPB to investigate EIs and related factors in stroke patients. A total of 333 participants completed self-administered questionnaires. The results showed that only 38.4% of patients intended to exercise after discharge, indicating a generally low EI in this population. Using multiple linear regression analysis, the study identified monthly income, living situation, SN, AT, and PBC as significant predictors of EI. Notably, PBC had the strongest effect (β = 0.436, p < 0.01), emphasizing the importance of patients' confidence in their ability to engage in PA. AT (β = 0.241, p < 0.01) and SN (β = 0.183, p < 0.01) also positively influenced EI, indicating that favorable ATs and perceived social support play meaningful roles in shaping EIs after stroke. Based on these findings, the study recommends that healthcare professionals provide comprehensive exercise guidance for stroke patients, with particular emphasis on educating family members—especially spouses, to support and encourage patients' EIs and rehabilitation efforts. These results offer valuable insights for designing effective EIs for stroke survivors, highlighting the critical role of PBC and the influence of the living environment.

Furthermore, Sicilia *et al.* (2020) [44] conducted a study integrating the TPB and Self-Determination Theory (SDT) to examine how autonomy support from parents and peers influences adolescents' EIs while also exploring the mediating roles of AT, PBC, SN, and descriptive norms. The study involved 428 secondary school students (211 boys and 217 girls) aged 13 to 19 (M = 15.30, SD = 1.15), with data analyzed using SEM and bootstrapping techniques. Findings showed that perceived parental autonomy support was positively associated with EI. Among girls, this influence occurred indirectly through AT and PBC (β = 0.139, p < 0.01), as well as through SN (β = 0.528, p < 0.01). However, boys' EI was primarily influenced by parental autonomy support through AT and PBC (β = 0.217, p < 0.01). In contrast, peer autonomy support was directly associated with EI in both boys and girls (β = 0.217, p < 0.01), with an additional indirect influence observed among girls through AT (β = 0.139, p < 0.01). Furthermore, SN had a significant positive effect on girl's EI (β = 0.212, p < 0.01), but no significant effect was found among boys (β = -0.045, p > 0.05). These findings indicate that while parental and peer autonomy support influences adolescents' EIs, they do so through distinct pathways, with parental support shaping both AT and control and peer support primarily affecting AT. The study highlights that social influences, particularly subjective and descriptive norms, may be more influential in shaping adolescents' EIs than previously recognized.

Huang and Wu (2021) [33] used the TPB to examine how AT, SN, and PBC influenced EI among older adults, emphasizing the role of these psychological constructs in shaping their PA behavior. The study found that older adults with varying levels of SN and PBC demonstrated significant differences in EIs, with those requiring more social support and companionship from family members showing stronger intentions. Specifically, AT had a significant positive effect on EI (β = 0.280, p < 0.01), SN also showed a significant positive effect (β = 0.119, p < 0.01), while PBC emerged as the strongest predictor (β = 0.611, p < 0.01). These findings support the idea that improving older adults' AT and PBC is essential for promoting their EIs while emphasizing the importance of social support in fostering self-efficacy and confidence. The study indicates that enhancing exercise AT alone is not sufficient; support from key social groups, such as family and peers, is also necessary to effectively encourage older adults' participation in PA.

Finally, Arevalo and Brown (2019) [45] applied the RAA to explore factors influencing organized exercise participation among Hispanic adults. Using linear regression analysis, the study found that AT had a significant positive correlation with EI (β = 0.36, p < 0.01), indicating that more p=favorable AT lead to stronger intentions to engage in exercise. Similarly, PBC was positively correlated with EI (β = 0.36, p < 0.01), indicating that greater perceived control enhances the likelihood of participation. However, SN had a weak and non-significant negative relationship with EI (β = -0.13, p > 0.05), implying that social or familial expectations had minimal influence in this context. The study concluded that AT and PBC were the primary predictors of EI among

Hispanic adults, emphasizing their role in developing effective interventions for promoting organized PA.

The reviewed studies underscore the utility of TPB for understanding EIs across diverse populations. A consistent finding across the literature was the strong influence of PBC on EI, which was evident in demographic groups such as older adults [3] and high school students [37]. This recurring relationship highlights the importance of fostering an individual's sense of control and self-efficacy to promote PA. AT also emerged as a significant predictor, with studies such as those by Rhodes *et al.* (2023) [36] and Arevalo and Brown (2019) [44] demonstrating that positive AT toward exercise substantially enhances individual's intentions to be physically active. However, although SN also contributed to EI, their influence was notably weaker and more inconsistent across the reviewed studies. For instance, Sicilia *et al.* [42] found that SN positively affected adolescents' EIs, likely reflecting strong peer and parental influences. In contrast, Liu *et al.* [39] reported that older adults were less responsive to social expectations. These findings indicate that, unlike PBC and AT, which appear to be broadly applicable across populations, the impact of SN may be more context-dependent, particularly varying with age and social environment.

By providing an in-depth overview of the existing literature, this section identifies knowledge gaps and guides future research in the field of health behavior. This study emphasizes that understanding the relationships among AT, SN, PBC, and EI can facilitate the development of more effective health promotion strategies and interventions tailored to the needs of diverse populations.

Table **3** in this section provides a summary of the reviewed studies, including methodologies, sample sizes, and significant predictors, offering a robust framework for researchers seeking to further explore these relationships. This comprehensive analysis lays the groundwork for developing new theoretical models or refining existing ones to better understand and apply the relationships between psychological constructs and exercise behavior in efforts to improve public health.

### 3.3. Summary of Risk of Bias and Effect Sizes

All 34 included studies were evaluated for risk of bias using the JBI checklist. Of these, 20 were classified as having low risk of bias, 10 as moderate risk, and 4 as high risk, primarily due to limitations in sampling methods or inadequate reporting. A detailed risk classification table for each study is provided in the supplementary material.

To enhance transparency and rigor, effect sizes (β coefficients) and p-values were extracted and are presented in Table **3**, enabling clearer comparisons of the strength of theoretical constructs across different demographic groups and research settings.

**Table 3. Relationships among AT, SN, PBC, and EI.**

| Study | N. Sample | Method | Variables | Beta coefficient |
|---|---|---|---|---|
| [36] | 865 older adults | SEM | AT, SN, PBC, and EI | AT-EI (β=0.135,P<0.01), SN-EI (β=-0.059, P>0.05), PBC-EI (β=0.496,P<0.01) |
| [37] | 384 adults | SEM | AT, SN, PBC, and EI | AT-EI (β=0.39,P<0.01), SN-EI (β=0.18,P<0.01), PBC-EI (β=0.11,P<0.01) |
| [38] | 653 high school students | SEM | AT, PBC, SN, and EI | AT-EI (β=.27,P<0.01), PBC-EI (β=.30,P<0.01), SN-EI (β=.25,P<0.01) |
| [39] | 264 adults | Dyadic path modeling | AT, PBC, SN, and EI | AT-EI (β=.44,P<0.01), PBC-EI (β=.36,P<0.01), SN-EI (β=.25,P<0.05) |
| [40] | 951 urban high school students | Liner regression | AT, PBC, SN, and EI | AT- EI (β=.33,P<0.01), PBC-EI (β=.57,P<0.01), SN-EI (β=.05,P<0.05) |
| [41] | 286 Korean breast cancer survivors | SEM | AT, SN, PBC, and EI | AT-EI (β= 0.34,P<0.01), SN- EI (β= 0.12,P<0.05), PBC-EI (β= 0.57,P<0.01) |
| [42] | 501 older adults | SEM | AT, SN PBC, and EI | AT- EI (β=.234,P<0.01), PBC-EI (β=.361,P<0.01) SN-EI (β=.-0.1, P>0.05) |
| [43] | 333 individuals post-stroke | Linear regression | AT, SN, PBC, and EI | AT-EI (β=0.241,P<0.01) SN-EI (β=0.183, P<0.01) PBC-EI (β=0.436, P<0.01) |
| [44] | 428 secondary school students((211 boys and 217 girls) | SEM | AT, SN, PBC, and EI | AT-EI (girls β= .139 boys β= .217, P<0.01) Pbc -EI (girls β=.528 boys β=.589, P<0.01) SN (girls β= 0.212, P<0.01 Boys, β=-0.045, P>0.05) |
| [45] | 420 older adults | Linear regression | AT, SN, PBC, and EI | AT β=.280, P<0.01 SN β=.119,P<0.01 PBC β=.611,P<0.01 |
| [46] | 330 Hispanic adults | linear regression | AT, SN, PBC, and EI | AT β=0.36 P<0.01 SN β=-0.13 P>0.05 PBC β=0.36 P<0.01 |

## 4. DISCUSSION

This systematic review synthesized empirical studies published between 2013 and 2023 that applied the TPB to examine EI. This study focused on the predictive roles of AT, SN, and PBC across various populations. The findings consistently showed that both PBC and AT are strong predictors of EI, reinforcing conclusions from prior research, including studies by Stehr *et al.* (2021) [3], Rhodes *et al.* (2023) [35], and Liu *et al.* (2022) [42].

The predictive value of SN significantly varied across the reviewed studies. In some cases, particularly among adolescents or participants from collectivist cultures, SN exerted a stronger influence on EI, likely due to heightened sensitivity to social approval and peer expectations. Conversely, studies involving older adults or individuals from more individualist cultures often found that SN was weak or non-significant predictors of EI. These inconsistencies highlight the need to refine both the conceptual understanding and measurement of SN. Future research should distinguish between descriptive norms (perceptions of what others commonly do) and injunctive norms (perceptions of what others approve or disapprove of), as this distinction may enhance theoretical clarity and improve the construct's predictive validity.

Another important observation was the prevalent reliance on cross-sectional study designs, which restrict the ability to draw causal inferences and overlook how constructs within the TPB may evolve over time. These limitations highlight the need for future research to adopt longitudinal designs to better understand the temporal dynamics of AT, SN, and PBC in predicting exercise behavior. Moreover, applying multilevel analytical frameworks could offer valuable insights into how individual-level psychological factors interact with contextual variables, such as age, gender, cultural background, and environmental conditions, to shape EIs and behaviors.

This review also highlights the importance of methodological diversity in EI research. Integrating qualitative methods with quantitative designs can provide a more comprehensive understanding of the motivational processes underlying exercise behavior. While quantitative surveys offer generalizable patterns, qualitative approaches can reveal culturally embedded meanings and personal motivations that are often overlooked. These deeper insights are crucial for designing more nuanced and context-sensitive health promotion interventions that resonate with diverse populations.

From an applied perspective, the findings support the development of interventions that enhance PBC, such as training programs that build self-efficacy, teach practical skills, and improve access to exercise-friendly environments. Additionally, interventions should aim to cultivate positive ATs toward PA by highlighting its health benefits, enjoyment, and opportunities for personal achievement. In populations where SNs have greater influence—such as adolescents or individuals in collectivist cultures, community-driven strategies and peer support mechanisms may further improve intervention outcomes by leveraging social influence.

## CONCLUSION

This systematic review confirms that PBC and AT are consistent and significant predictors of EI, whereas the influence of SN is more variable and appears contingent on cultural and demographic contexts. By evaluating the measurement instruments and examining the predictive relationships among the TPB constructs, this review provides both theoretical clarification and practical guidance for designing interventions aimed at promoting PA.

To advance the field, future studies should adopt longitudinal research designs, investigate contextual moderators, and improve theoretical clarity, particularly regarding the construct of SNs. Standardizing measurement instruments is essential for enhancing comparability across studies, while the integration of qualitative methods can provide deeper insights into the psychological and cultural factors that shape exercise behavior.

Overall, the findings contribute to the refinement of the TPB framework and offer actionable insights for designing culturally sensitive, evidence-based interventions. Such strategies can support sustained improvements in PA participation and promote broader public health outcomes.

## AUTHORS' CONTRIBUTIONS

The authors confirm their contributions to the paper as follows: study conception and design: XS KBSA; data collection: WJ; analysis and interpretation of results: WJ; draft manuscript: WJ. All authors have reviewed the results and approved the final version of the manuscript.

## CONSENT FOR PUBLICATION

Not applicable.

## STANDARDS OF REPORTING

The study adhered to the PRISMA guidelines and methodology.

The PRISMA checklist is available on the publisher's website.

## AVAILABILITY OF DATA AND MATERIALS

The data and supporting information are available within the article.

## CONFLICT OF INTEREST

The authors declare no conflicts of interest, financial or otherwise.

## SUPPLEMENTARY MATERIAL

PRISMA checklist is available as supplementary material on the publisher's website along with the published article.

## REFERENCES

[1]   Ateş H. Merging Theory of Planned Behavior and Value Identity Personal norm model to explain pro-environmental behaviors. Sustain Prod Consum 2020; 24: 169-80.
http://dx.doi.org/10.1016/j.spc.2020.07.006

[2]   Hagger MS, Cheung MWL, Ajzen I, Hamilton K. Perceived behavioral control moderating effects in the theory of planned behavior: A meta-analysis. Health Psychol 2022; 41(2): 155-67.
http://dx.doi.org/10.1037/hea0001153 PMID: 35143225

[3]   Stehr P, Rossmann C, Kremer T, Geppert J. Determinants of physical activity in older adults: Integrating self-concordance into the theory of planned behavior. Int J Environ Res Public Health 2021; 18(11): 5759.
http://dx.doi.org/10.3390/ijerph18115759 PMID: 34072012

[4]   Ajzen I. The theory of planned behavior: Frequently asked questions. Hum Behav Emerg Technol 2020; 2(4): 314-24.
http://dx.doi.org/10.1002/hbe2.195

[5]   Banerjee S, Ho SS. Applying the theory of planned behavior: Examining how communication, attitudes, social norms, and perceived behavioral control relate to healthy lifestyle intention in Singapore. Int J Healthcar Manag 2020; 13(3): 496.
http://dx.doi.org/10.1080/20479700.2019.1605687

[6]   DiPietro L, Al-Ansari SS, Biddle SJH, *et al.* Advancing the global physical activity agenda: Recommendations for future research by the 2020 WHO physical activity and sedentary behavior guidelines development group. Int J Behav Nutr Phys Act 2020; 17(1): 143.
http://dx.doi.org/10.1186/s12966-020-01042-2 PMID: 33239105

[7]   Tsai TH, Wong AM, Lee H-F, Tseng KC. A study on the motivation of older adults to participate in exercise or physical fitness activities. Sustainability 2022; 14(10): 6355.
http://dx.doi.org/10.3390/su14106355

[8]   van Sluijs EMF, Ekelund U, Crochemore-Silva I, *et al.* Physical activity behaviours in adolescence: current evidence and opportunities for intervention. Lancet 2021; 398(10298): 429-42.
http://dx.doi.org/10.1016/S0140-6736(21)01259-9 PMID: 34302767

[9]   De G, Sondhi N, Bhattacharjee A, Joshi H. Preventive healthcare behavior: A hybrid systematic literature review (1998–2023). Int J Consum Stud 2024; 48(1): e13000.
http://dx.doi.org/10.1111/ijcs.13000

[10]  Zhang WJ, Xu M, Feng YJ, Mao ZX, Yan ZY, Fan TF. The value-added contribution of exercise commitment to college students' exercise behavior: Application of extended model of theory of planned behavior. Front Psychol 2022; 13: 869997.
http://dx.doi.org/10.3389/fpsyg.2022.869997 PMID: 35719512

[11]  Kim YJ, Kim ES. Analysis of Korean fencing club members' participation intention using the TPB model. Int J Environ Res Public Health 2021; 18(6): 2813.
http://dx.doi.org/10.3390/ijerph18062813 PMID: 33802048

[12]  Singh VK, Singh P, Karmakar M, Leta J, Mayr P. The journal coverage of web of science, scopus and dimensions: A comparative analysis. Scientometrics 2021; 126(6): 5113-42.
http://dx.doi.org/10.1007/s11192-021-03948-5

[13]  Jones G, Norman P. Predicting exercise after university: An application of the reasoned action approach across a significant life transition. Psychol Health Med 2022; 27(7): 1495-506.
http://dx.doi.org/10.1080/13548506.2021.1890160 PMID: 33622096

[14]  Ahmad MH, Shahar S, Teng NI, Manaf ZA, Sakian NI, Omar B. Applying theory of planned behavior to predict exercise maintenance in sarcopenic elderly. Clin Interv Aging 2014; 9: 1551-61.

PMID: 25258524

[15]  McEachan R, Taylor N, Harrison R, Lawton R, Gardner P, Conner M. Meta-analysis of the reasoned action approach (RAA) to understanding health behaviors. Ann Behav Med 2016; 50(4): 592-612.
http://dx.doi.org/10.1007/s12160-016-9798-4 PMID: 27169555

[16]  Guelfi KJ, Wang C, Dimmock JA, Jackson B, Newnham JP, Yang H. A comparison of beliefs about exercise during pregnancy between Chinese and Australian pregnant women. BMC Pregnancy Childbirth 2015; 15(1): 345.
http://dx.doi.org/10.1186/s12884-015-0734-6 PMID: 26693690

[17]  Al Salim ZA. Investigating the predictors of physical activity behavior among female college students in Saudi Arabia using the theory of planned behavior. Physic Educ Student 2023; 27(5): 270-8.
http://dx.doi.org/10.15561/20755279.2023.0507

[18]  Feng D, Huang S, Lang X. Attitudes and behavioral intentions of aortic dissection survivors towards exercise: An application of the health action process approach framework. Rev Cardiovasc Med 2022; 23(2): 64.
http://dx.doi.org/10.31083/j.rcm2302064 PMID: 35229555

[19]  Chen S, Gu X. Effects of cardiorespiratory fitness and weight status on knowledge of physical activity and fitness, attitude toward physical education, and physical activity. BMC Public Health 2018; 18(1): 273.
http://dx.doi.org/10.1186/s12889-018-5176-4 PMID: 29463218

[20]  Hasbullah NA, Osman A, Abdullah S, Salahuddin SN, Ramlee NF, Soha HM. The relationship of attitude, subjective norm and website usability on consumer intention to purchase online: An evidence of Malaysian youth. Procedia Econ Finance 2016; 35: 493-502.
http://dx.doi.org/10.1016/S2212-5671(16)00061-7

[21]  Radia EH, Wulandari AI. Responsibility attitudes assessment instrument for integrated thematic learning of grade III. J Edu Res Evaluat 2021; 5(4): 664-73.
http://dx.doi.org/10.23887/jere.v5i4.33651

[22]  Budiman S, Wijaya T. Purchase intention of counterfeit products: The role of subjective norm. Int J Market Stud 2014; 6(2): 145.
http://dx.doi.org/10.5539/ijms.v6n2p145

[23]  Singh J, Kaur R. Influencing the intention to adopt anti-littering behavior: An approach with modified TPB model. Soc Mar Q 2021; 27(2): 117-32.
http://dx.doi.org/10.1177/15245004211013333

[24]  McLachlan S, Hagger MS. The influence of chronically accessible autonomous and controlling motives on physical activity within an extended theory of planned behavior. J Appl Soc Psychol 2011; 41(2): 445-70.
http://dx.doi.org/10.1111/j.1559-1816.2010.00721.x

[25]  McCrory C, Dooley C, Layte R, Kenny RA. The lasting legacy of childhood adversity for disease risk in later life. Health Psychol 2015; 34(7): 687-96.
http://dx.doi.org/10.1037/hea0000147 PMID: 25150540

[26]  Maxwell-Smith C, Hagger MS, Kane R, *et al.* Psychological correlates of physical activity and exercise preferences in metropolitan and nonmetropolitan cancer survivors. Psychooncology 2021; 30(2): 221-30.
http://dx.doi.org/10.1002/pon.5553 PMID: 32920935

[27]  Khalid MA. Assessment of antecedents and barriers to physical activity among Pakistani adults. Open J Soc Sci 2023; 11(2): 159-81.
http://dx.doi.org/10.4236/jss.2023.112012

[28]  Ahn J, Jeon H, Kwon S. Associations between self-regulation, exercise participation, and adherence intention among Korean university students. Percept Mot Skills 2016; 123(1): 324-40.
http://dx.doi.org/10.1177/0031512516659874 PMID: 27450864

[29]  Calogiuri G, Nordtug H, Weydahl A. The potential of using exercise in nature as an intervention to enhance exercise behavior: Results from a pilot study. Percept Mot Skills 2015; 121(2): 350-70.
http://dx.doi.org/10.2466/06.PMS.121c17x0 PMID: 26348226

[30]  Flowers E, Freeman P, Gladwell V. The development of three questionnaires to assess beliefs about green exercise. Int J Environ Res Public Health 2017; 14(10): 1172.
http://dx.doi.org/10.3390/ijerph14101172 PMID: 28976924

[31]  Chen Y, Yao SJ, Ma QS, Shao W, Liu C, Guo KL. The relationship between exercise intention and exercise behavior of junior school students: An analysis of chain mediating effect. Front Psychol 2022; 13: 935264.
http://dx.doi.org/10.3389/fpsyg.2022.935264 PMID: 36003092

[32]  Berry TR, Locke S, Ori EM. Effects of fitspiration on believability and intention to exercise. Front Psychol 2023; 14: 1094276.
http://dx.doi.org/10.3389/fpsyg.2023.1094276 PMID: 36891214

[33]  Huang WY, Wu CE. Predict the exercise behavior intention of the older adults in Taipei City to promote exercise behavior. Sci Prog 2021; 104(3_suppl) (Suppl.): 00368504211042468.
http://dx.doi.org/10.1177/00368504211042468 PMID: 34519552

[34]  Lee K, Lee K. Relationship of friend/parent exercise participation levels and adolescents' exercise intention/behavior as moderated by action control. Percept Mot Skills 2020; 127(2): 347-66.
http://dx.doi.org/10.1177/0031512519900058 PMID: 31959077

[35]  Rodrigues F, Teixeira DS, Neiva HP, Cid L, Monteiro D. The bright and dark sides of motivation as predictors of enjoyment, intention, and exercise persistence. Scand J Med Sci Sports 2020; 30(4): 787-800.
http://dx.doi.org/10.1111/sms.13617 PMID: 31858648

[36]  Kwan BM, Stevens CJ, Bryan AD. What to expect when you're exercising: An experimental test of the anticipated affect–exercise relationship. Health Psychol 2017; 36(4): 309-19.
http://dx.doi.org/10.1037/hea0000453 PMID: 27991804

[37]  Idris AM, Yousif AO, Assil SM, El-Samani EFZ. Psychosocial determinants of leisure-time physical activity among adults in omdurman city, Sudan: Reasoned action approach. Public Health Pract (Oxf) 2022; 3: 100226.
http://dx.doi.org/10.1016/j.puhip.2022.100226 PMID: 36101769

[38]  Trigueros R, Aguilar-Parra JM, Cangas AJ, Fernández-Batanero JM, Álvarez JF. The influence of the social context on motivation towards the practice of physical activity and the intention to be physically active. Int J Environ Res Public Health 2019; 16(21): 4212.
http://dx.doi.org/10.3390/ijerph16214212 PMID: 31671662

[39]  Rhodes RE, Beauchamp MR, Quinlan A, Symons Downs D, Warburton DER, Blanchard CM. Predicting the physical activity of new parents who participated in a physical activity intervention. Soc Sci Med 2021; 284: 114221.
http://dx.doi.org/10.1016/j.socscimed.2021.114221 PMID: 34274708

[40]  Lu YJ, Lai HR, Lin PC, Kuo SY, Chen SR, Lee PH. Predicting exercise behaviors and intentions of Taiwanese urban high school students using the theory of planned behavior. J Pediatr Nurs 2022; 62: e39-44.
http://dx.doi.org/10.1016/j.pedn.2021.07.001 PMID: 34272134

[41]  Min J, Yu YW, Lee J, et al. Application of the theory of planned behavior to understand physical activity intentions and behavior among Korean breast cancer survivors. Support Care Cancer 2022; 30(11): 8885-93.
http://dx.doi.org/10.1007/s00520-022-07258-1 PMID: 35792923

[42]  Liu J, Liu L, Pei M. Analysis of older people's walking behavioral intention with the extended theory of planned behavior. J Transp Health 2022; 26: 101462.
http://dx.doi.org/10.1016/j.jth.2022.101462

[43]  Zhou Y, Hua B, Shi X, Du S, Yuan J, Wang Y. Exercise intention and its associated factors among persons post-stroke: A cross-sectional study. Patient Prefer Adherence 2023; 17: 2535-44.
http://dx.doi.org/10.2147/PPA.S424595 PMID: 37849617

[44]  Sicilia A, Águila C, Posse M, Alcaraz-Ibáñez M. Parents' and peers' autonomy support and exercise intention for adolescents: Integrating social factors from the self-determination theory and the theory of planned behaviour. Int J Environ Res Public Health 2020; 17(15): 5365.
http://dx.doi.org/10.3390/ijerph17155365 PMID: 32722479

[45]  Arevalo M, Brown LD. Using a reasoned action approach to identify determinants of organized exercise among Hispanics: A mixed-methods study. BMC Public Health 2019; 19(1): 1181.
http://dx.doi.org/10.1186/s12889-019-7527-1 PMID: 31462313