SYSTEMATIC REVIEW/META ANALYSIS

The Relationship between Self-Efficacy, Kinesiophobia, and Physical Activity in People with Heart Failure: A Systematic Review and Meta-Analysis

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DOI: 10.55489/njcm.170520266417

ABSTRACT

Background: In heart failure (HF), self-efficacy facilitates physical activity (PA), whereas kinesiophobia is known as a barrier to PA. Understanding their relationship with PA may support the effectiveness of interventions to enhance PA performance in HF patients. The objective was to investigate the strength of the relationship between self-efficacy, kinesiophobia, and PA in HF patients.

Method: Five databases were used to search for eligible articles, including PubMed, Scopus, ScienceDirect, ProQuest and CINAHL from 2015 to 2025. Six correlations were included in the meta-analysis between self-efficacy and PA, and the other five articles were analyzed in the kinesiophobia and PA meta-analysis.

Results: Self-efficacy was associated positively with PA (pooled r = 0.29, 95%CI: 0.22 to 0.36), while kinesiophobia was associated negatively with PA (pooled r = -0.33, 95%CI: -0.45 to -0.21). Exercise-task self-efficacy had a higher relationship to PA (pooled r = 0.31, 95%CI: 0.23 to 0.39). Kinesiophobia measured by FActS-HF had a higher relationship to PA compared to the other. pooled r = - 0.37 (95%CI: -0.59 to -0.15).

Conclusion: Both kinesiophobia and self-efficacy have a moderate relationship with PA in HF. These results highlight the significance of psychological factors, including self-efficacy and kinesiophobia in the PA of individuals with HF.

Keywords: Heart Failure, Kinesiophobia, Meta-Analyses, Physical Activity, Self-Efficacy, Systematic Review

ARTICLE INFO

Financial Support: This study was funded by Chulalongkorn University's Scholarship program for ASEAN or Non-ASEAN Countries.

Conflict of Interest: The authors have declared that no conflict of interest exists.

Received: 22-01-2026, **Accepted**: 02-04-2026, **Published**: 01-05-2026

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How to cite this article: Hoang TNA, Sasat S. The Relationship between Self-Efficacy, Kinesiophobia, and Physical Activity in People with Heart Failure: A Systematic Review and Meta-Analysis. Natl J Community Med 2026;17(5):326-336. DOI: 10.55489/njcm.170520266417

www.njcmindia.com | pISSN: 0976-3325 | eISSN: 2229-6816 | Published by Medsci Publications

INTRODUCTION

Heart failure (HF) is a long-term condition and is a major global health problem affecting about 64 million people all over the world.[1] The admission cases have gradually increased in recent years[2], and the leading cause of morbidity, mortality, and hospitalization all over the world[3]. Cardiac rehabilitation includes a multidisciplinary program such as exercise training, physical and psychological health evaluations, cardiac risk factor assessment, and outcomes assessment. In people living with HF, exercise training and programs of cardiac rehabilitation are known as core and safe strategies in the improvement of quality of life, functional capacity, exercise performance, and HF-caused hospitalizations.[4]

Regular PA was guided as a crucial part of treatment and rehabilitation for HF patients.[5] PA is defined as a bodily movement produced by skeletal muscles that requires energy expenditure and refers to all movement, including during leisure time, transportation, occupations, and activities for sports.[6] There are numerous factors influencing PA, including intrapersonal, interpersonal, and environmental variables. Among those factors, there is evidence in support of enabler self-efficacy and barrier kinesiophobia, which are related to PA.[7,8]

Self-efficacy is defined as beliefs in one's capability to exert control over personal and situational events required to produce behavioral accomplishments.[9] Self-efficacy is the most important contributor to PA.[10] In HF, those with a higher self-efficacy were more physically active in daily life than those with lower self-efficacy[11] because they had more cognition of PA to overcome the obstacles when involved in PA. Additionally, the previous study demonstrated that a lack of inside confidence is known as a major barrier to PA.[12]

Contrary to self-efficacy, kinesiophobia, which is known as the fear of movement, has been confirmed to be a barrier to PA.[13] Kinesiophobia is defined as an excessive and irrational fear of physical activity stemming from the belief of vulnerability to harm or re-injury.[14] Many previous studies' results showed that kinesiophobia was negatively associated with PA in HF patients.[8,15,16] This fear may come from evidence that showed HF patients' belief that PA may worsen their CHF condition.[17]

Although many studies showed the association between self-efficacy, kinesiophobia, and PA in HF patients, there were some changes in the effect size from low to moderate to high. The variability in findings from previous studies could be due to differences in sample size and characteristics of participants. Additionally, there was review research related to self-efficacy and kinesiophobia in people with cardiac diseases, rheumatologic, neurologic conditions, and COPD.[18,19] The results from research by Goubran[18] synthesized evidence related to the relationship between kinesiophobia and PA across mixed chronic diseases population (e.g., cardiac, neurological diseases, etc). Although cardiac diseases were included in that study, the symptom burden and exercise limitation of HF may differ from those of other cardiac illnesses, which may not reflect correctly on kinesiophobia in HF individuals. Similarly, the association between self-efficacy and PA in COPD may not be appropriate if applying in people with HF, despite similar symptoms such as dyspnea.[19] There is a need for a systematic review with a meta-analysis to synthesize the available data in the literature and clarify the relationship between self-efficacy, fear of movement, and PA in specific-disease as HF. This study aimed to explore and synthesize the relationship between self-efficacy, kinesiophobia, and PA in individuals living with HF. These findings were expected to build a foundation for further interventions to improve PA, based on psychological factors such as self-efficacy and kinesiophobia.

This review was searched in five databases: PubMed, Scopus, ScienceDirect, ProQuest and CINAHL because of the comprehensive coverage of the topic. These databases ensure robust coverage of peer-reviewed healthcare literature. In addition, a start date of January 2015 was chosen to coincide with the booklet of guideline PA in HF, which was developed by the Queensland Health, State-wide Heart Failure Exercise and Rehabilitation network[20] and parallel with updated guidelines for the diagnosis and treatment of acute and chronic HF of the European Society of Cardiology (ESC)[21].

METHODOLOGY

Design and protocol registration: This systematic review and meta-analysis follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[22]. The review was registered in the International Prospective Register of Systematic Review (PROSPERO) Registry: CRD420251232722 before data extraction.

Searching strategy: The searching strategy was performed in five databases, including PubMed, Scopus, ScienceDirect, ProQuest and CINAHL, from 2015 to 2025. The search was finished on 18th November 2025. The keywords were followed by PECO with P (population): "heart failure" or "chronic heart failure"; AND E (exposure): kinesiophobia or "fear of movement" or "movement fear" or "self-efficacy" or confidence; AND O (outcome): "physical activity" or "exercise". The Boolean "AND" and "OR" were used in the process of searching. The details of the searching strategy were shown in Table S1- Supplementary 1.

Inclusion and exclusion criteria

Inclusion Criteria: Eligible studies met criteria: (1) Population: Participants diagnosed with Heart failure, with any HF classification in any gender and religion; (2) Exposures: studies measured self-efficacy or kinesiophobia and physical activity; (3) Studies

provided association between self-efficacy, kinesiophobia and physical activity, or results can be converted into Pearson's r, (4) Outcome: Physical Activity, which has been defined as any bodily movement produced by skeletal muscles that requires energy expenditure[23]; (5) Study design: cross-sectional, cohort, and longitudinal studies; (6) Publication Period: Published between January 2015 and November 2025; (7) Language: Published in peer-reviewed journals in English or Thai.

Exclusion criteria*:* Articles were excluded if they were grey literature (unpublished theses, conference abstracts, clinical trial registries) systematic reviews, notes, editorials, qualitative studies, or unpublished in a peer-reviewed journal.

Study selection: After searching, all found studies were imported into EndNote 20, and duplicates were removed. Two authors are healthcare providers with experience in systematic review. First of all, all selected articles after duplication were screened for title and abstract by both authors independently. Any discrepancies were discussed by two authors to reach a final decision of agreement. Secondly, the selected studies were searched for full-text versions, which were then screened based on the inclusion criteria. If there was any disagreement, both authors discussed and decided on a consensus.

Data extraction: Information was extracted, including the publication year, authors, study location, study design, sample size, age, class of heart failure (NYHA), main purpose of study, measurement of self-efficacy, kinesiophobia, and PA, and indicators of the association between self-efficacy, kinesiophobia, and PA. Firstly, two researchers extracted data independently. After that, they cross-checked together. Any disagreements were discussed and extracted again from the beginning until a consensus was reached.

Assessment of quality of studies: The quality of individual studies was assessed by JBI Critical appraisal tools[24]. If the answer is "yes," the score item is scored as "1"; if the answer is "no" or "unclear," the score item is scored as "0" (Table 1, and Table S1, S2-Supplementary 2). High-quality studies have a JBI score of 70% or higher. Scores of 50% to 70% were considered medium quality studies, and scores of less than 50% were considered low quality studies[25]. Only high- and medium-quality studies were included in this review.

Two researchers independently evaluated the study quality. The assessment of the cohort was based on 11 criteria: (1) population comparability, (2) exposure classification consistency, (3) exposure measurement validity, (4) confounding identification, (5) confounding control, (6) baseline outcome-free status, (7) outcome measurement validity, (8) follow-up adequacy, (9) completeness of follow-up, (10) handing of missing data, and (11) statistical analysis appropriateness[24]. The assessment of cross-sectional study was based on 8 criteria: (1) clear inclusion criteria, (2) detailed description of participants and setting, (3) valid and reliable expose measurement, (4) objective outcome, (5) confounding factors, (6) control confounding, (7) valid and reliable expose measurement, and (8) appropriate statistical analysis[24]. Answer "Yes" was scored 1, and answers "No, Not application, Unclear" were scored 0. The final score was determined by averaging the two authors' scores. Any unresolved disagreements were evaluated again for a final quality decision.

Table 1: Summary of studies' quality

First author, year	Study Design	Total score	Quality
Lüke T et al, 2025 [26]	Cross-sectional study	6/8	High
Yifan T et al, 2023 [27]	Cross-sectional study	5/8	Medium
Lobyaem C et al, 2023 [28]	Cross-sectional study	6/8	High
Spaderna H et al, 2024 [15]	Cross-sectional study	6/8	High
Klomptra L et al, 2018 [29]	Cross-sectional study	6/8	High
Lee H et al, 2017 [30]	Cross-sectional study	6/8	High
Klomptra L et al, 2015 [31]	Cross-sectional study	6/8	High
Deka P et al, 2021 [32]	Cross-sectional study	6/8	High
Marques E et al, 2022 [33]	Cross-sectional study	6/8	High
Pozeh B et al, 2018 [34]	Cohort study	7/11	Medium
Meng T et al, 2024 [35]	Longitudinal study	7/11	Medium
Chen M et al, 2020 [36]	Longitudinal study	7/11	Medium

Statistical analysis: Jamovi software version 2.3.28 was used to analyze data. We used I^2 statistics to examine heterogeneity between studies. An I^2 value of about 25% represents low heterogeneity, about 50% as moderate, and about 75% as high[37]. In cases, the between-study heterogeneity was moderate to high (I^2 >50%), the sensitivity analysis technique was employed to explore the source of heterogeneity[38]. The publication bias was assessed by using both Egger's test[39] and Begg's test[40]. The trim and fill method was performed if there was publication bias. A random effects meta-analysis of proportions was performed. In correlational meta-analysis, Pearson's correlation (r) can be calculated from OR or β by equations: r= β * SD(X)/ SD(Y) with X: independent variable, Y: dependent variable[41,]

$r=\frac{\sqrt{3}}{\pi} * \ln(OR)$.[42]

RESULTS

The study selection: Through searching via five databases: PubMed, Scopus, ScienceDirect, ProQuest and CINAHL, a total of 4,892 articles were found. 1,379 duplicate articles were removed. After screening the remaining articles for title and abstract, 65 eligible articles were identified for full-text reading. Among them, 55 studies were excluded. Finally, 10 studies were selected based on the appropriateness of the inclusion and exclusion criteria in this review. Additionally, 2 articles were searched on the Website, which were suitable for the inclusion criteria. Totally, there were 12 selected articles in this analysis, including 7 articles in review for the relationship between self-efficacy and PA, and 5 articles in review for the relationship between kinesiophobia and PA (Figure 1).

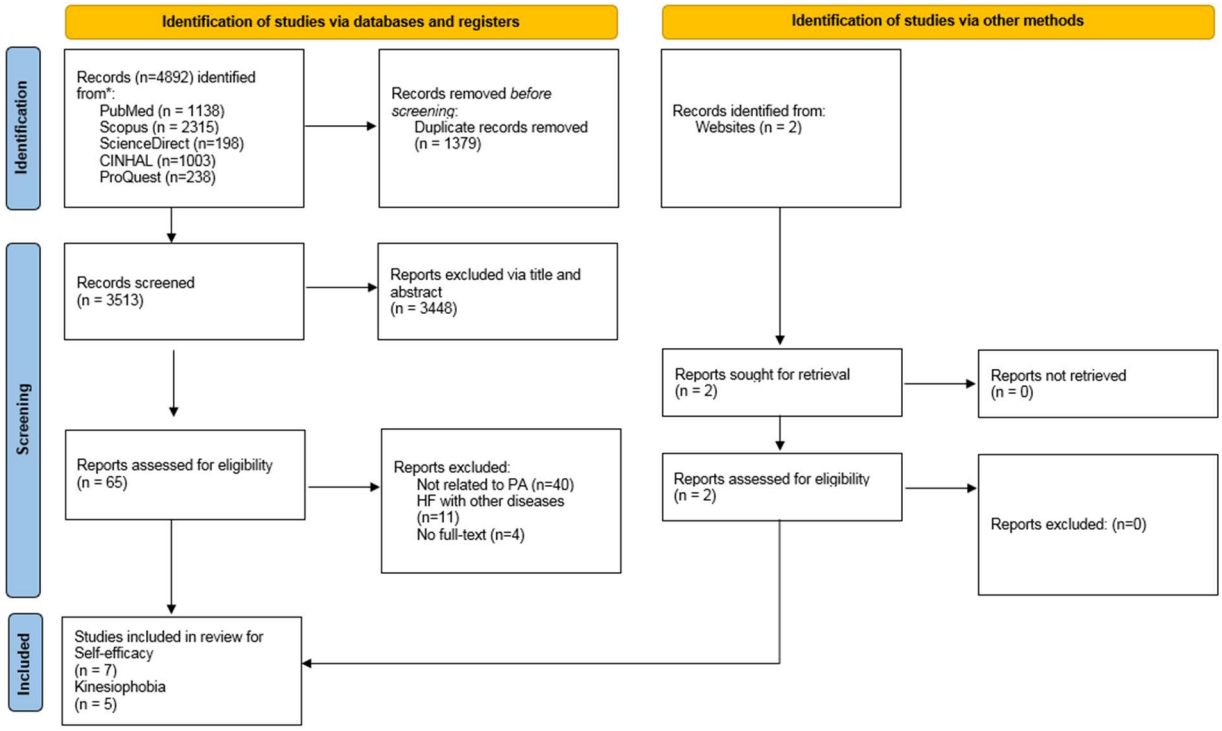

Figure 1: PRISMA flow diagram capturing systematic review study selection

Characteristics of the included studies

Self-efficacy: Seven studies met the inclusion criteria for this review. The results of correlation coefficients from six studies were used for conducting a meta-analysis, with a sample size between 100 and 182. These studies come from four regions, including Taiwan[36], Sweden[29,31], Korea[30], Spain[32,33] and the USA[34] with five cross-sectional studies[29-33], one longitudinal study[36] and one cohort study[34]. Across studies, the mean age was 66.37, including 21.5% female, and almost all participants had NYHA II and III. Two types of self-efficacy were assessed in HF, including self-efficacy for exercise[29-33,36] and self-efficacy for exercise barriers[34].

Kinesiophobia: Five studies met the inclusion criteria for this systematic review and meta-analysis. The sample size was from 82 to 244. These studies were conducted in China[27,35], Germany[15,26], Thailand[28] with four cross-sectional studies[15,26-28], and one longitudinal study[35]. Across studies the mean age was 62.6 (±12), including 35.1% female, and almost participants had NYHA II and III. Kinesiophobia was measured by two instruments, including Tampa Scale for Kinesiophobia Heart (TSK-Heart)[27,28,35], and Fear of Activity in Situations-Heart Failure (FActS-HF)[15,26].

Physical activity: Physical activity was measured by device-based instruments (e.g., an accelerometer) in two studies[28,34,] and question-based instruments in the remaining of studies, including International Physical Activity Questionnaire (IPAQ)[31-33,35,36], Global Physical Activity Questionnaire (GPAQ)[28], Barthel index for assessing Activities of daily living[27], Subscale avoidance exercise of Herzangstfragebogen Questionnaire (HAF-17)[15] and one self-report question of researcher[29,30].

The detailed characteristics of individual articles were shown in Table 4.

Meta-analysis of the association between self-efficacy and physical activity: Regarding the relationship between self-efficacy and PA, six of seven articles were selected for meta-analysis due to sufficient data. A total of six studies reporting Pearson's correlation coefficient were included in this analysis. The estimate of the overall relationship between self-efficacy and PA was moderate (pooled correlation coefficient = 0.29 (95%CI: 0.22 to 0.36), indicating that greater self-efficacy is associated with better PA.

Table 4: Characteristics of individual studies

Study	Country	Study Design	Sample Size	Gender	NYHA	Age mean (SD)	PA Measurement	Kinesiophobia Measurement	Self-efficacy Measurement	Association	Purpose of study
Meng T et al, 2024 [35]	China	longitudinal	184	F: 37%	NYHA II: 46.2% NYHA III: 55.4%	-	IPAQ	TSK-Heart		Path analysis: direct association r= -0.441	(1) to examine the influencing factors of PA change, and (2) to verify the mediating pathways between influencing factors and PA during the postdischarge transition period in CHF patients
Lüke T et al, 2025 [26]	Germany	cross-sectional	82	F: 25.6%	NYHA I-II:67.1% NYHA II-III: 24.4%	61.0 (±11.0)	Accelerometer	FActS-HF15		Pearson's coefficients: MVPA: r=-0.52 step counts: r= -0.45	Describe associations of FoPA with accelerometer-assessed daily physical activity indicators
Yifan T et al, 2023 [27]	China	cross-sectional	244	F: 43.4%	NYHA I: 6.5% NYHA II: 60.6% NYHA III: 27% NYHA IV: 5.7%	64.45 (±11.076)	Barthel index for assessing ADL	TSK- Heart		Pearson's correlation: r=-0.187	To explore the mediational effect of activities of daily living (ADL) and kinesiophobia on the cardiac function and health status of patients with chronic heart failure (CHF).
Lobyaem C et al, 2023 [28]	Thailand	cross-sectional	146	F: 38.4%	NYHA I: 26% NYHA II: 60.3% NYHA III: 13.7%	61.05 (±14.41)	GPAQ	TSK- Heart		Pearsons' correlation: r =-0.254	To investigate the association between hemoglobin levels, fear of movement, family support, and trust in healthcare providers and their predictive power over physical activities
Spaderna H et al 2024 [15]	Germany	cross-sectional	185	F: 24%	NYHA I/I-II: 28.1% NYHA II/II-III: 47% NYHA III/IV: 18.4%	62 (±11)	Subscale avoidance of Herzangstfragebogen Questionnaire (HAF-17)	FActS-HF15		OR = 1.34, 95% CI 1.03-1.74, p = 0.028	Examine associations of fear of PA, heart-focused anxiety and trait anxiety with clinical characteristics and self-reported PA in outpatients with chronic HF
Klomptra L et al, 2018 [29]	Sweden	cross-sectional	100	F:38%	NYHA I, II: 64% NYHA III, IV: 36%	67 (±13)	1 self-reported question from researcher*		Exercise Self-Efficacy Questionnaire	Mediator model: Pearsons' corelation (r = 0.46, P < .01)	To examine the role of exercise self-efficacy in the relationship between exercise motivation and physical activity in patients with HF.
Lee H et al,2017 [30]	Korea	cross-sectional	116	F: 19.8%	NYHA I: 61.2% NYHA II:	62.15	1 self-reported question from researcher**		Exercise self-efficacy scale	Pearsons' correlation: r= 0.329	To examine the impact of physical functioning, physical activity, and exercise self-efficacy on

Study	Country	Study Design	Sample Size	Gender	NYHA	Age mean (SD)	PA Measurement	Kinesiophobia Measurement	Self-efficacy Measurement	Association	Purpose of study
					29.3% NYHA III: 9.5%						quality of life among individuals with chronic heart failure
Klomptra L et al, 2015 [31]	Sweden	cross-sectional	154	F: 27%	NYHA I: 4% NYHA II: 55% NYHA III: 33%	70 (±10)	IPAQ		Exercise Self-Efficacy Questionnaire	p<0.001	To evaluate physical activity in HF patients, to describe the factors related to physical activity, and to examine potential barriers and motivations to physical activity with special focus on sex differences.
Deka P et al, 2021 [32]	Spain	cross-sectional	163	F: 50%	NYHA I: 63% NYHA II: 37%	66 (±16)	IPAQ		Exercise Self-Efficacy Scale	Mediation model with effects: β= 0.136; p= 0.004	To investigate the mediatory effect of depression on PA readiness (physical limitation and psychological readiness) and self-reported PA in patients with HF.
Pozeh B et al, 2018 [34]	USA	cohort	182	F: 44%	NYHA I: 7.7% NYHA II: 55.5% NYHA III: 35.7% NYHA IV: 1.1%	60.4 (11.5)	Accelerometer		(1) Barriers Specific Self-Efficacy Scale, (2) Subscale of KCCQ	Pearsons' correlation: BARSE: r= 0.195 KCCQ self-efficacy: r= 0.153	(1) Describe physical activity levels (accelerometer physical activity energy expenditure and number of minutes of moderate-vigorous PA per day) in patients with HF entering a longitudinal exercise trial. (2) Explore factors (demographic, clinical, psychological, physical functioning and previous exercise behavior) associated with physical activity.
Marques E et al, 2022 [33]	Spain	cross-sectional	163	F: 50%	NYHA I: 63% NYHA II: 37%	66 (±16)	IPAQ		Exercise Self-efficacy Scale	Pearson's' correlation: r= 0.274	To explore the readiness for physical activity and its related factors in patients with heart failure.
Chen M et al, 2020 [36]	Taiwan	longitudinal study	128	F: 35.2%	NYHA II: 28.9% NYHA III: 48.4% NYHA IV: 22.7%	70.59	IPAQ-SF		Exercise Self-Efficacy (ESE) scale	Correlation between sedentary behavior and self-efficacy (r=-0.26, p=0.003)	To explore the multidimensional associated factors and impacts of sedentary behavior in heart failure patients

Note: TSK-Heart - Tampa Scale for Kinesiophobia Heart; FActS-HF15 - Fear of Activity in Situations-Heart Failure; GPAQ - Global Physical Activity Questionnaire; IPAQ - International Physical Activity Questionnaire; KCCQ - Kansas City Cardiomyopathy Questionnaire, ADL - Activities of daily living, NYHA - New York Heart Association (HF classification)

*1 self-reported question from researcher: "In the past week (even if it is not a typical week), how much time did you spend exercising or being physically active (eg, strength training, walking, swimming, gardening, or other type of training)?

**1 self-reported question from researcher: recall the types, frequency, duration, and intensity of physical activity that they had engaged in for at least 10 minutes during the past month.

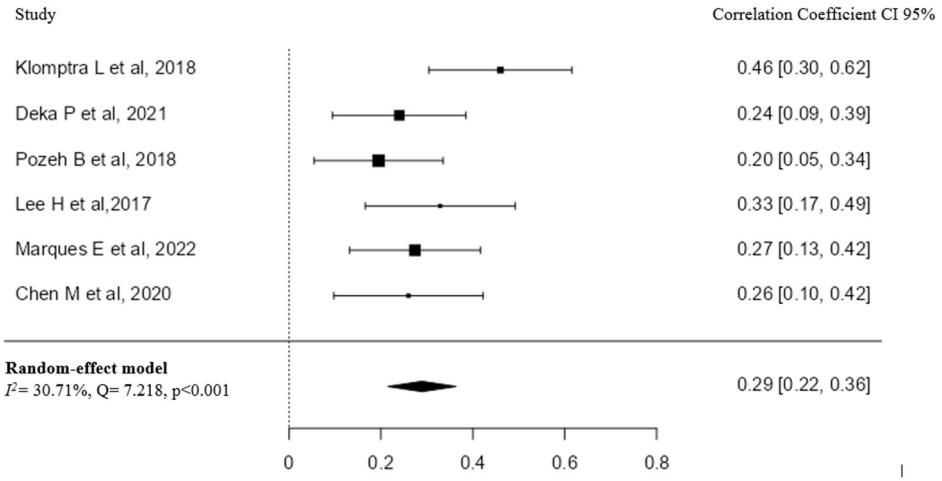

Figure 2: The forest plot of self-efficacy and PA relationship

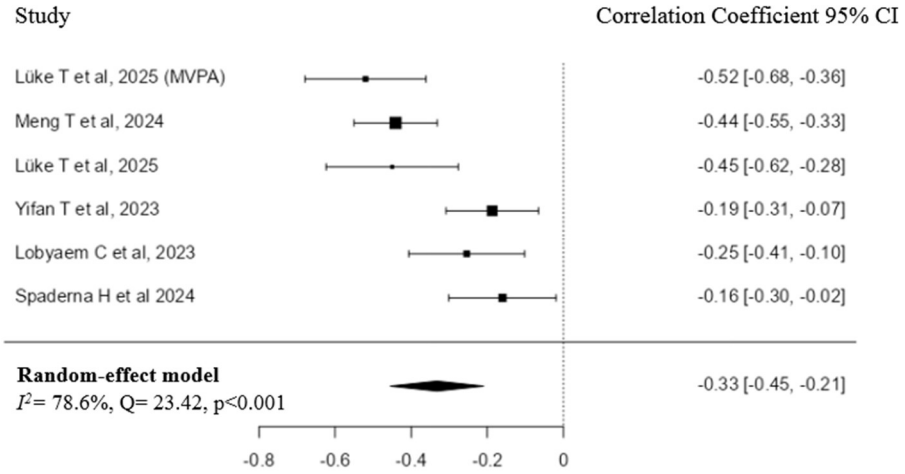

Figure 3: The forest plot of kinesiophobia and PA relationship

The low heterogeneity was reported (I^2=30.71%) (Figure 2). Subgroup analysis was conducted following self-efficacy type; exercise self-efficacy had a moderate association with PA (pooled correlation coefficient = 0.31 (95%CI: 0.23 to 0.43) (Figure S1 - Supplementary 3)

Meta-analysis of the association between kinesiophobia and physical activity: A total of five studies reporting Pearson's correlation coefficient were included in this analysis. However, Luke Teresa's study[26], which used two instruments to measure PA, including MET/min for moderate-vigorous PA and step measures for general PA, found two results of correlation between kinesiophobia and PA. Therefore, a total of six results were analyzed for meta-analysis, despite five studies reporting. The pooled correlation coefficient between kinesiophobia and PA was -0.33 (95%CI: -0.45 to -0.21) with high heterogeneity (I^2=78.34%) *(Figure 3)*. It indicated that the higher kinesiophobia, the lower PA. Subgroup analysis was conducted following measurements of kinesiophobia, including Tampa Scale for Kinesiophobia Heart (TSK-Heart) and Fear of Activity in Situations-Heart Failure (FActS-HF). Kinesiophobia measured by TSK-Heart had a moderate association with PA (pooled correlation coefficient = - 0.30 (95%CI: -0.45 to -0.14) (Figure S2-Supplementary 3). Kinesiophobia, measured by FactS-HF, also had a moderate association with PA (pooled correlation coefficient = - 0.37 (95%CI: -0.59 to -0.15). (Figure S3-Supplementary 3)

The publication bias: The publication bias was tested by Egger's test and Begg's test. No publication bias was detected in the analysis of the relationship between kinesiophobia, self-efficacy, and PA (Table 5).

Sensitivity analysis: Between-study heterogeneity was moderate to high (I^2 >50%), and the sensitivity analysis was performed in the relationship between kinesiophobia and PA. After that, the pooled effect size of kinesiophobia changed significantly, from -0.33 to -0.46 (Table 6). The forest plot of the relationship between kinesiophobia and PA after sensitivity analysis was shown in Figure S4- Supplementary 3.

Table 5: Publication bias

Correlated factors	Studies	Heterogeneity I^2 (%)	p	Effect size (r)	95%CI	P (effect size)	P (Egger's test)	Begg test
Self-efficacy	6	30.71	0.205	0.29	0.22, 0.36	<0.001	0.208	0.272
Kinesiophobia	6	78.34	0.00	-0.33	-0.45, -0.21	<0.001	0.560	0.469

Table 6: Results of raw meta-analysis before and after sensitivity analysis

Variables	Before sensitivity analysis			After sensitivity analysis		
	Studies	I^2 (%)	Effect size (95%CI)	Studies	I^2 (%)	Effect size (95%CI)
Kinesiophobia	6	78.34%	-0.33 [-0.45, -0.21]	3	0	-0.46 [-0.54, -0.38]

DISCUSSION

This is the first study to investigate a synthesis of the relationship between self-efficacy, kinesiophobia and PA in people with HF. Although one previous systematic review showed the association between kinesiophobia and PA in cardiac disease, the synthesis included only one article related to HF patients. Among cardiac diseases, each diagnosis of each disease has different symptoms[43] which may affect kinesiophobia[44]. This review concentrated on exploring insights of HF patients which no previous studies reported. The findings from this review showed that while higher self-efficacy was moderately associated with higher PA levels, higher kinesiophobia was associated with lower PA. In subgroup analysis, exercise self-efficacy was reported to have a higher association with PA, than the other type of self-efficacy. Kinesiophobia measured by FActS-HF was the strongest association with PA compared to kinesiophobia measured by TSK-H. These results demonstrated that self-efficacy is known as an enabler and kinesiophobia as a barrier to PA among HF patients.

The positive association between self-efficacy and PA in this study is similar to previous findings in other chronic conditions.[45] In another systematic review in COPD, Selzler et al reported that the pooled correlation coefficient in the relationship between self-efficacy and PA was weak-to-moderate (weighted $r = 0.25$, 95% CI [0.17, 0.34]).[19] Self-efficacy was demonstrated as a strong predictor of PA behavior and adherence to PA recommendations. An individual's exercise self-efficacy leads to their thoughts, effort, and commitment to PA engagement, which may translate into higher daily PA.[46] In subgroup analyses, the subgroup of exercise-specific self-efficacy showed a slightly stronger association with PA (r = 0.31; 95% CI 0.23-0.39), indicating that measures directly focused on exercise-related confidence may be more sensitive to behavioral engagement than broader or barrier-oriented self-efficacy scales.

The magnitude of the pooled association between kinesiophobia and PA in HF is also consistent with previous studies in cardiac diseases, where kinesiophobia has been identified as a psychological barrier to PA.[18] Kinesiophobia may be related to the fear of symptom exacerbation, which leads to avoidance of low to moderate-intensity activity. The prior studies demonstrated that a high degree of kinesiophobia had a significant correlation with lower PA level and functional exercise capacity in chronic diseases such as COPD.[47] It was thought that diseases symptoms may cause kinesiophobia, and the increase in kinesiophobia leads to decrease in PA level. For instance, one of the typical symptoms of HF is fatigue, which explained 41% of the variability in kinesiophobia.[48] Subgroup analyses by measurement instrument provided additional nuance. Both TSK-H and FActS-HF15 showed moderate associations with PA (pooled r = -0.30 and -0.37, respectively), suggesting that these tools capture a similar underlying construct despite differences in item content and format.

The results of the pooled correlation in the association of PA and self-efficacy, kinesiophobia reported 0.29, -0.33, respectively, represented a moderate effect size.[49] In chronic cardiac diseases, especially HF, physical health may be influenced by poor psychological health.[50] These findings of moderate correlation made a big contribution in a practical perspective. They support the integration of self-efficacy improvement and kinesiophobia reduction strategies into PA promotion programs for people with HF.

Further, knowledge from this analysis will assist healthcare providers in their choice of measurement. Knowing that exercise self-efficacy had a stronger relationship to PA would have made it a more frequently chosen outcome rather than barrier self-efficacy in HF. The relationship between kinesiophobia and HF had slight differences. Despite a moderate association in kinesiophobia measured by TSK-H and FActS-HF, FActS-HF showed a higher association with PA than TSK-H. It may support clinicians for selecting an appropriate scale to measure concept of kinesiophobia.

From a clinical perspective, these findings support the integration of psychological constructs into the assessment and management of PA in HF. The current evidence indicates that patients who are confident in their ability to exercise and do not fear movement are more likely to engage in PA. Structured strategies to strengthen self-efficacy and to reduce kinesiophobia should be developed because their strong associations with PA.

This systematic review and meta-analysis had a few important limitations. First, the number of available

studies was small for both self-efficacy and kinesiophobia, and most had cross-sectional designs, which limit causal inference and the ability to conduct more detailed subgroup or meta-regression analyses. Secondly, despite attempts to minimize bias through a comprehensive search, restricting inclusion to peer-reviewed articles in English or Thai may have introduced language and publication bias. Next, the small number of included studies (5-6 per analysis) limits the power of subgroup analyses and the meaningfulness of publication bias tests. Moreover, this review is inability to adjust for potential confounders (e.g., age, NYHA class, HF etiology) at the meta-analytic level. Finally, the presence of potential publication bias in the self-efficacy analysis suggests that the pooled estimate for this construct may be overestimate.

Implications

The findings of this study have implications for clinical practice, and future research. Clinically, routine assessment of both exercise self-efficacy and kinesiophobia may help clinicians identify patients who are at higher risk of physical inactivity. Findings about the association between self-efficacy, kinesiophobia, and PA may benefit healthcare providers in developing targeted interventions such as structured education about the benefits of exercise in HF, symptom management, and behaviour change techniques that explicitly build confidence and address fear of exertion.

From a research perspective, future studies should develop other study designs, such as longitudinal and experimental designs, which may help to clarify directionality and causality in these relationships. Researchers should use the standardized instruments for self-efficacy, kinesiophobia, and PA to reduce heterogeneity and allow more robust pooling of evidence.

Conclusion

In HF, both self-efficacy and kinesiophobia are moderately associated with PA. Self-efficacy is positively associated with PA, whereas kinesiophobia is negatively associated with PA. These findings reinforce the importance of psychological factors in PA of people living with HF. When considering these relationships, there were only slight differences between kinesiophia measured by TSK-H and FActS-HF. The use of both instruments to measure kinesiophobia in HF people should be acceptable. The prospective studies should tackle self-efficacy and kinesiophobia as integral components of comprehensive HF care and rehabilitation.

Acknowledgement: This study was conducted to partially fulfil the requirements for a PhD degree in Nursing. The authors express their gratitude to the Faculty of Nursing, Chulalongkorn University, for the valuable insights shared during this research project.

Individual Authors' Contributions: TNAH contributed to the study through conceptualization, data curation, formal analysis, investigation, and methodology development, and was involved in writing both the original draft and the review and editing of the manuscript. **SS** contributed to conceptualization, data curation, formal analysis, and writing of the original draft, and additionally played key roles in visualization, supervision, resource provision, project administration, and funding acquisition.

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

Declaration of Non-use of Generative AI Tools: This article was prepared without the use of generative AI tools for content creation, analysis, or data generation. All findings and interpretations are based solely on the authors' independent work and expertise.

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