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REVIEW

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# Why don't women engage in muscle strength exercise? An integrative review

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## Abstract

**Issue Addressed:** Women are 'at-risk' population for failing to meet muscle strengthening guidelines. Health benefits specific to this exercise mode include maintenance of muscle mass, which is associated with reduced risk of chronic disease and falls. Of significance is the progressive decline in muscle strength exercise participation in women aged 35–54 in Australia. This period is critical for maintaining muscle strength as it establishes foundations for older women's engagement. This integrative review examined available evidence regarding factors influencing muscle strength exercise participation, specifically in women aged 35–54.

**Methods:** Seven databases were searched. Study inclusion criteria were: (1) peer reviewed, (2) English language, (3) sample populations of healthy female adults or general adult sample population differentiating females from males, (4) mean age between 35 and 54 years, (5) focused on muscle strength exercise and measured as the primary outcome factors of participation in muscle strength exercise.

**Findings:** Five of 1895 studies met inclusion criteria. Five key factors were associated with participation in muscle strength exercise of women aged 35–54 years: perceived time constraints; knowledge and education; modality and intensity; social support and behavioural strategies.

**Conclusions:** Focused education on strength exercise and guidelines, plus initiatives and strategies that suit the needs of this cohort, are necessary to achieve health and wellbeing benefits. Responsive approaches by health professionals to these women's circumstances can potentially address current low participation levels.

**So What?** Creating conditions where health professionals respect a woman's exercise preferences can positively impact these women's musculoskeletal health into older age.

KEYWORDS
factors, female, middle-aged, muscle strength exercise, participation

## 1 | BACKGROUND

Muscle strength exercise is essential to general health and wellbeing.[1,2] Levels of participation among both women and men continue to be insufficient to meet physical activity guidelines[3] despite current public health initiatives and an increase in targeted stakeholder engagement. Stakeholder engagement generally includes the fitness industry, government, health sector, health professionals, and

consumers. Women are a population of particular concern as their engagement in muscle strength exercise is low.[4] Approximately 21% of women aged 35–54 years participate in a minimum of two muscle strength sessions per week.[5] These statistics decline in older age, where only 16% of women aged 65–74 years and 8.1% in women over 85 years meet strength-based activity guidelines.[i5]

### 1.1 | Participation in muscle strength exercise

Since 2012, the specific health benefits of muscle strength activity have become increasingly acknowledged.[6] The Physical Activity and Sedentary Guidelines—2014[7] recommended muscle-strengthening activities be performed a minimum of 2 days per week.[6] However, Australian figures indicate that only 28.2% of adults aged 18–64 years engage in recommended muscle strengthening activity.[8] Further to this, health survey data from England, United States and Scotland indicate that 24%–27% of women engage in recommended muscle strengthening activity[9–11] In England, data shows that only 4.1% of women relative to 7.3% of men participate in true muscle-strengthening exercise, as defined by muscle strength exercise guidelines.[9]

### 1.2 | Impact of muscle strength exercise

Muscle strengthening exercise, also known as resistance exercise training, strength training/exercise, or weight training, is exercise that increases skeletal muscle strength, power, endurance and mass. Examples of muscle strengthening exercise include lifting weights and body weighted exercise such as push-ups.[12] Muscle strength exercise is known to reduce the risks of developing chronic diseases such as breast, head and neck cancer,[13] osteosarcopenia,[14] and frailty syndrome,[15] cardiovascular illness,[16] metabolic syndrome,[15] and help to maintain brain health.[17] In Australia, from age 45, the top cause of hospitalisation is falls[18]; from age 65, 364 of hospital admissions per day are falls related.[19] Of concern, in those aged 65 years and older, female patients make up two in three fall-related hospitalisations, and a major contributing factor of these falls is a loss of bone density.[19] These statistics warrant critical consideration of initiatives and interventions that address improved strength and functional abilities, including improved balance, to minimise the risk of falls.[18]

### 1.3 | Significance of adult women involvement in muscle strength exercise

Muscle strength exercise can help mitigate accidental falls risk by increasing muscle strength and mass, which, in turn, maintains musculoskeletal health, functional abilities and quality of life.[20,21] While these benefits are understood, knowledge gaps remain regarding the factors that influence women's participation in strength exercise.[22] Public health and physical activity campaigns to date have rarely considered how factors distinctive to muscle strength exercise, such as inadequate social motivators, fit with shifting and competing priorities,[23] specifically those of perimenopausal and menopausal women.[24,25] Demands around caregiver responsibilities, both to dependent children and dependent parents can be especially onerous for this population.[23–25]

The implications are profound—when participation in muscle strengthening by middle-aged women declines, it negatively impacts functional outcomes into older age.[26,27] Improved understanding of factors that influence these women to participate in muscle strengthening is vital. There is considerably higher uptake of aerobic exercise compared to muscle strength exercise by middle-aged women.[28] This further emphasises the need for more understanding into the reasons behind women's uptake of muscle strength exercise.[29]

### 1.4 | Purpose of review

Understanding the distinct circumstances and situations influencing middle-aged women to engage in muscle strengthening activities can potentially facilitate more effective stakeholder engagement by health professionals, and, ultimately, impact long-term outcomes. Through an integrative review framework, this paper explores the factors that influence women, aged 35–54 years, to participate in muscle strength exercise, and advocates for the 'female voice' on this matter, which is currently under-represented in this space.[29]

## 2 | METHODS

### 2.1 | Research design

An integrative review of the literature on factors that contribute to women's, aged 35–54 years, participation in strength exercise was conducted. An integrative review framework was employed to present the existing state of knowledge on this topic and identify gaps in the literature which point to areas for future research.[30,31] Empirical studies adopting any methodological approaches were reviewed for this paper. The review preparation was guided by a five-stage process.[32]

The *first stage* was the formulation of the purpose—that is, factors influencing participation in muscle strength exercise for women aged 35–54 years. The literature search comprised the *second stage*. The PRISMA guidelines and PRISMA flowchart were used to report the search findings.[33] (see Figure 1. PRISMA flowchart of included studies). Studies eligible for inclusion in the review met the following criteria: (1) peer reviewed article; (2) published between 2012 and 2021, to align with the Australian Institute of Health and Welfare's formal recognition of the value of muscle strengthening exercise; (3) published in English; (4) studied a population that included and differentiated healthy female adults from men between the mean age of 35–54 years (in studies that reported on females and males, only studies that reported results separately for females and males were included); (5) focused primarily on muscle strength exercise (studies that reported on multiple modes of physical exercise were only included if the modes were reported in individually) and (6) measured

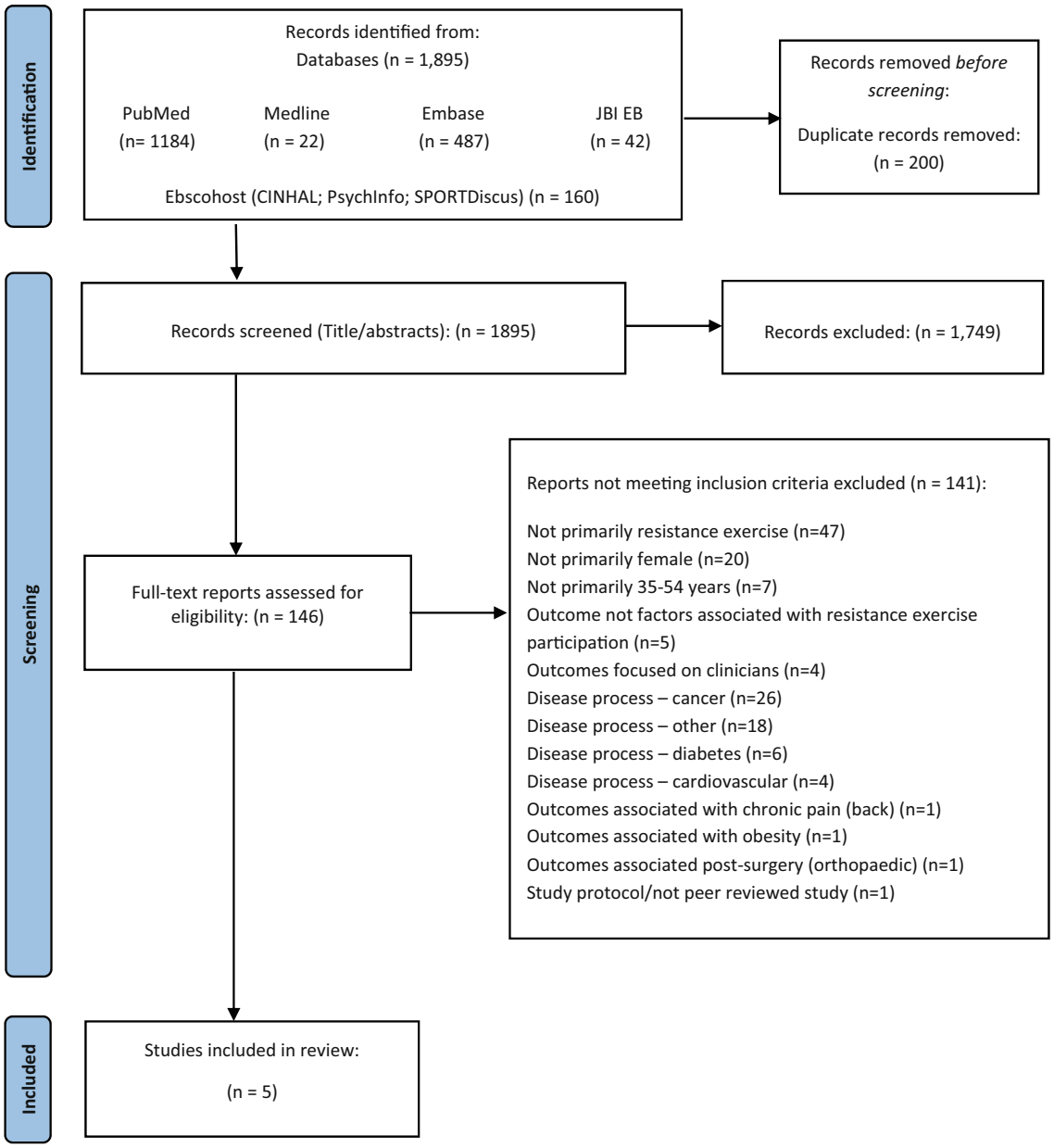


**FIGURE 1** PRISMA flowchart of included studies.

determinants of participation in muscle strength exercise as the primary outcome. Exclusion criteria included: (1) articles published pre-2012 (muscle strength exercise guideline recommendations were introduced in 2012 and therefore potentially influenced participation); (2) studies involving adults but not primarily female adults between the ages of 35 and 54 years; (3) did not report females and males separately; (4) focused on the impact of muscle strength exercise, physiological outcomes, and disease process as opposed to determinants of participation; (5) did not study muscle strength exercise; (6) were not published in peer reviewed journals and (7) were not original research studies.

The *third stage* consisted of data collection and analysis of papers. A librarian was consulted during the search process and provided advice on which databases should be included. Seven databases were searched for articles published up until the 24th of February 2023: EBSCOhost, including the Cumulative Index of Nursing and Allied Health Literature (CINAHL), PsycINFO, and SPORTDiscus; PubMed; Medline; Embase and JBI EBP. The reference management program Covidence systematic review software[34] was used to import the search results. Studies were screened by two authors (AS and AH), who also performed full text reviews of all queried papers. Conflicts were resolved by way of wider authorship team consensus. Key search terms included female/woman, resistance exercise, motivator/facilitator, and barrier/challenges, and associated Boolean and MeSH variants. While all search terms were entered into each database in the first instance, only working search terms for individual databases are represented in Table 1—Database search terms (see Appendix A). Quality appraisal of the final included studies was performed

**TABLE 1** Database search terms.

| Database | Search terms with MeSH and Boolean methods | | | | Results |
|---|---|---|---|---|---|
| Ebscohost (CINHAL; PsychInfo; SPORTDiscus with full text) | female OR women OR wom?n OR females | "resistance exercise training" OR "resistance training" OR "strength training" OR "weight training" OR "resistance exercise" | motivation OR engag* OR participat* OR facilitat* OR predict* | barrier OR challenges OR "health behavio?r OR behavio?r OR attitud* | 160 |
| Embase | 'female'/exp OR female | 'resistance exercise'/exp OR 'resistance exercise' OR 'resistance exercise training'/exp OR 'resistance exercise training' OR 'resistance training'/exp OR 'resistance training' OR 'weight training'/exp OR 'weight training' | motivator OR engagement OR 'facilitator' OR 'determinant' | 'barrier' OR 'challenge' OR 'attitude to health' OR 'attitude' OR 'health behaviors' OR 'behavior' | 487 |
| PubMed | Female[MeSH Terms] AND (adult[MeSH: noexp] OR middle age [MeSH]) | 'resistance exercise'/exp OR 'resistance exercise' OR 'resistance exercise training'/exp OR 'resistance exercise training' OR 'resistance training'/exp OR 'resistance training' OR 'weight training'/exp OR 'weight training' | motivation OR engag* OR participat* OR facilitat* OR predict* | barrier OR challenges OR "health behavio?r OR behavio?r OR attitud* | 1184 |
| Medline | Adult OR "middle aged" OR female OR wom?n | "resistance training" OR strength training OR weight training OR "resistance exercise" OR muscle strengthening OR strength exercise | motivation OR enabler OR facilitator OR predictor | barrier OR "health-behavior" OR behavior OR attitude or "drop-out | 22 |
| JBI EPB | Adult OR "middle aged" OR female OR woman | "resistance exercise training" OR "resistance training" OR "strength training" OR "weight training" OR "resistance exercise" | motivation OR facilitator | barrier OR "health behaviour" | 42 |

independently by three authors (AS, CA and A-MH) using the Mixed Methods Appraisal Tool.[35] Conflicts were resolved by additional discussion until authorship team consensus was reached.

Analysis of findings from the selected publications was conducted in the *fourth stage*. Analysis included deliberation of research aims, population age range, study inclusion criteria, strength training mode and outcome measures in relation to muscle strength exercise participation. Selected publications were scrutinised to identify research design (quantitative, qualitative, or mixed methods), location and setting.

The final and *fifth stage* discussed results of the integrative review. Findings were considered in relation to implications for practice and future research.

## 3 | RESULTS

The search returned 1895 papers. Five studies met all the inclusion criteria. Three studies were quantitative randomised controlled trials, one was a quantitative descriptive, and one was a qualitative study.

**TABLE 2** Quality assessment and characteristics of included studies.

| | MMAT quality rating | Research aim/question | Study design, duration & site | Analysis type | Participants | Inclusion/exclusion criteria | Resistance exercise mode | Outcomes measured | Significant results |
|---|---|---|---|---|---|---|---|---|---|
| Benitez et al.[37] | ***** | Identify sociodemographic and psychosocial correlates of self-reported muscle strengthening PA in churchgoing Latina women | Two-arm RCT<br>United States | Independent samples *t-tests*; *Chi-squared tests*; *Hierarchical binary logistic regression* associations of sociodemographic and psychosocial variables with meeting the national guidelines for muscle-strengthening PA; Results reported as *odds ratios* (*95% CIs*) | $n = 436$<br>Range = 35–54 years<br>Mean = 44.41 ± 9.59 years | Inclusion: self-identified Latina, 18–65 years, churchgoer<br>Exclusion: pregnancy identified pre-existing health condition/s | Sit-ups ($n = 56$, 12.9%), leg lifts ($n = 59$, 13.6%), squats ($n = 42$, 9.7%), and free weights ($n = 40$, 9.2%), and lunges ($n = 37$, 8.6%). Push-ups, chair lifts, weight machines and other | *Demographics*<br>*Bidimensional Acculturation Scale for Hispanics* (Marin & Gamba, 1996);<br>*San Diego Health and Exercise Questionnaire* (Sallis et al., 1989) adapted;<br>*Behavioral Strategies for PA scale* (adapted Saelens et al., 2000); *Perceived Efficacy for Group Exercise questionnaire*<br>*Social Network for Exercise* (Marquez et al., 2014)<br>*Global Physical Activity Questionnaire* (Armstrong & Bull, 2006) adapted adding items on muscle strengthening activities) | Participants performing muscle-strengthening physical activity 2+ days/week-significantly higher use of behavioural strategies for physical activity ($p < .001$), higher support for physical activity ($p < .001$) and lower barriers for physical activity ($p = .03$) than those not meeting guidelines.<br>Need for further investigation in Latinas |
| Heiestad et al.[38] | ***** | Evaluate the effects of three different types of resistance training. | Single-blinded RCT<br>12 weeks<br>45–60 min full body RET sessions three times per week<br>Norway | Data presented as numbers (*n*) with percentages/means and standard deviations (SD) ($p < .05$)<br>*Shapiro–Wilk test* analysed for normal distribution. Potential differences between groups outcomes (A– | $n = 143$<br>Range = 29–51 years<br>Mean = 39.9 +/− 10.5 years | Inclusion: BMI ≥25, 18 to 65 years of age, previously nonexercisers, speak and understand Norwegian.<br>Exclusion: pregnancy | Three interventions: (A) Body pump; (B) resistance training program (36 sessions) with one-on-one personal training; (C) same as group B but instruction only provided in sessions 1 and 18 and 18th of 36 sessions. | *Behavioural Regulation in Exercise Questionnaire-2* (*BREQ-2*); *SF-36 for self-perceived health*; *Satisfaction With Life Scale* (*SWLS*) | Resistance training in all training groups contributed to higher scores in variables related to exercise motivation and self-perceived health; best results in group B (personal trainer).<br>Highest attendance seen in group B |

(Continues)

**TABLE 2** (Continued)

| | MMAT quality rating | Research aim/question | Study design, duration & site | Analysis type | Participants | Inclusion/exclusion criteria | Resistance exercise mode | Outcomes measured | Significant results |
|---|---|---|---|---|---|---|---|---|---|
| | | | | D) analysed using *one-way ANOVA* *Tukey's* post-hoc *test* | | | | | Groups (A–C) had higher scores on exercise motivation compared to control group (D)<br>Further research needed to determine optimal dosage and mode of activity in different populations. |
| Luckin et al.[36] | ***** | Identify barriers preventing triathletes from strength exercise. | Cross-sectional semiquantitative survey<br>World-wide | Descriptive statistics and frequencies (percentages)<br>*Chi-squared* ($X^2$) *tests* and logistic regression | $n = 390$<br>Women = 224<br>Men = 166<br>Females and males reported separately<br>Range for women = 28.6–47.4 years<br>Mean = 38 ± 9.4 years | Global online survey | Any form of resistance band, mass or body mass–resisted exercises | *68-question survey*<br>Training characteristics for ST—perceived barriers; types of exercises included in ST | 57.4% of women completed strength training<br>Significantly less women completed at least 1 Heavy Strength exercise (31.8%) ($\chi^2 = 8.02$, $p = .005$)<br>Significantly less women believed strength training would not change their performance (3%) ($\chi^2 = 8.63$, $p = .003$)<br>Significantly less women believed strength training would make no difference to injury occurrence (3%) ($\chi^2 = 6.36$, $p = .0012$)<br>Strength training exercised reportedly used most by women; body mass (44%), heavy strength (41%), core (39%).<br>"Time restraints" most commonly reported barrier to strength training for women.<br>Focus on education on strength training benefits, individual types/preferences and time schedule of |

**TABLE 2** (Continued)

| | MMAT quality rating | Research aim/question | Study design, duration & site | Analysis type | Participants | Inclusion/exclusion criteria | Resistance exercise mode | Outcomes measured | Significant results |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | individuals to achieve maximum adherence to strength training program. |
| Martin et al.[41] | ***** | *Primary*: determine if HT or PT associated with EC results in better adherence to resistance training programs than training with neutral conditioning.<br>*Secondary*: determine if HT or PT combined with EC or NC leads to similar changes in body composition, neuromuscular, functional or psychosocial variables. | Four-armed, single-blinded RCT<br>Block randomisation<br>10 weeks<br>Social Cognitive Theory formed basis of the pre/post exercise efficacy assessment<br>United States | M*eans, standard deviations, confidence intervals*, *skewness*, and *kurtosis* analysis all dependent variables.<br>*ANCOVA* used to control for baseline differences in exercise self-efficacy.<br>*Alpha level of .05* used with post hoc *Bonferroni correction* for multiple comparisons. | $n = 231$ ($n = 145$ participants completed all pretests and post-tests) | Inclusion: English-speaking female Latinas 18–69 years of age<br>Exclusion: existing identified medical conditions. | Combinations of Hypertrophy training, evaluative conditioning, Power training and neural conditioning | Exercise Adherence<br>Body composition (BMI, % body fat, WC, Hip circumference)<br>Neuromuscular performance.<br>Tools used:<br>*Rosenberg Self-Esteem Scale* (*RSE*), *Exercise Self-efficacy scale* (*ESES*)<br>*Body Esteem scale* (*BES*)<br>*Functional capacity*<br>*Psychosocial self-reports* | Hypertrophy training ($F(1, 184) = 11.874$, $p < .001$, $\eta^2 = .061$).<br>Significant increases pre-test–post-test for self-esteem and body esteem variables by resistance training ($p < .05$).<br>Evaluative conditioning can positively impact exercise adherence in Latina women by associating healthy behaviours with positive words and images<br>Further research in physical exercise adherence |
| Petrov Fieril et al.[39] | | Describe experiences of exercise during pregnancy among women who performed regular resistance training. | Individual semi-structured face-to-face interviews<br>Sweden | *Inductive content analysis*<br>*Thematic analysis*—interviews transcribed verbatim, open-coding conducted to category saturation, similar codes grouped into subcategories. | $n = 17$ | Inclusion: single pregnancy, ongoing, regular highly repetitive strength exercise, absence of medical or obstetric diseases.<br>Exclusion: none identified | Highly repetitive resistance training | Individuals own experiences of practicing strength exercises during pregnancy | Four categories emerged from strength exercise participation:<br>1. positive impact on body and mind<br>2. expected benefits and facilitators<br>3. new exercise barriers<br>4. overcoming exercise barriers<br>5. Focus is needed on education of physical barriers and useful coping strategies, and continued support is needed to facilitate participation in resistance training in pregnant women. |

**TABLE 3** Factors measured.

| Factors measured | Tools used | Study reference |
|---|---|---|
| Motivation for resistance exercise | Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2) | 38 |
| Barriers/perceived barriers for resistance exercise | Newly developed 68-question survey | 35,36,39 |
| Behavioural strategies | Behavioural Strategies for PA scale | 36 |
| Self-efficacy | Perceived Efficacy for Group Exercise questionnaire | 36,40 |
| Self-esteem/body-esteem | Rosenberg Self-Esteem Scale (RSE)<br>Exercise Self-efficacy scale (ESES)<br>Body Esteem scale (BES) | 39,40 |
| Social support | Social Network for Exercise (Marquez et al., 2014) | 36,39 |
| Self-perceived health | SF-36 | 38 |
| Lack of knowledge of resistance exercise | Newly developed 68-question survey | 35,39 |
| Quality of life | Satisfaction With Life Scale (SWLS) | 38,39 |
| Exercise adherence | Self-reported | 38,40 |
| Acculturation | Bidimensional Acculturation Scale (BAS) for Hispanics (Marin & Gamba, 1996) | 36 |

All five studies met the quality criteria of the MMAT appraisal tool[35] (see Table 2 Quality assessment and characteristics of included studies). Two studies were conducted in the United States of America, one in Norway, one in Sweden and one world-wide (see Table 3 Psychosocial outcomes measured). One study performed the intervention in a clinical setting and four were community-based interventional studies. Intervention data for community-based studies were collected via semi-structured survey, face-to-face interviews, pre-/post-test, and randomised controlled trials.

While the mean participant age range across the five studies fit the inclusion criteria (35–54 years), actual study age ranges were between 20 and 54 years. Four studies focused solely on muscle strength exercise in women and one study reported results of females separately to males. Strength training was the sole focus for four of the studies, while one study measured multiple exercise modes but reported strength exercise separately. Only two studies used a theoretical framework to support their study intervention.

Across the five studies, participation in muscle strength exercise was measured albeit in different ways. Some studies used validated tools, while others used purposive tools developed within the study and/or self-reported responses collected through interviews (see Table 3 Psychosocial outcomes measured).

Examination of factors influencing muscle strength exercise participation of women, aged 34–54 years, identified consistent themes. Five key themes emerged from the studies that signalled whether women aged 35–54 years would be likely to participate in muscle strength exercise. These were: (1) perceived time constraints, (2) knowledge and education, (3) modality and intensity, (4) social support and (5) behavioural strategies.

## 3.1 | Perceived time constraints

Lifestyle time constraints such as work and family commitments were identified as a key issue for women.[36] These were reported as perceived rather than actual barriers preventing participation in strength exercise.[36] To reduce the perception of time as a barrier, strength training program design should reflect individual preferences in terms of type and scheduling of muscle strength exercises.[36] Similarly, lack of time is reported as a psychosocial barrier to meeting muscle strength exercise guidelines.[37]

## 3.2 | Knowledge and education

Knowledge and education were reported as impacting women's participation in strength training in four of the five papers. Specifically, these studies found a lack of education about the benefits of muscle strength exercise and a lack of knowledge on the correct use of equipment among women.[36,38,39] Knowledge of the required repetitions/sets needed for best outcomes and follow-up education on muscle strength exercise technique were important regardless of women's current exercise status.[36,38,39] For instance, understanding of muscle strength exercise modes increased self-confidence and confidence to participate in muscle strength exercises.[36,39] Experienced and knowledgeable health professionals who selected suitable types of exercises for strength training, facilitated choice of specific exercises using correct technique, fostered participation regardless of health status.[36,39] Finally, prior education to strength training alongside current provision of relevant information resulted in more strength training practice.[37]

## 3.3 | Modality and intensity

Women's expectations of modality and intensity of strength training increased their muscle strength exercise literacy, which directly influenced engagement.[40] Inadequate understanding of exercises, techniques and how to develop progression and intensity of muscle strength exercises were barriers to uptake and/or adherence in all five papers.[36–39,41] Accommodating lifestyle was also important. For instance, appeal of participation improved when exercises suited individual.[36,38,39,41] Tailoring strength training programs to lifestyle as well as individuals' preference regarding strength training environment and modality has the potential to increase adherence[36];

however, further research in this area is required.[36,41] Women who found their strength training programs stimulating and who received specific feedback from physical trainers about their exercise performance also reported higher motivation and adherence to muscle strength exercise.[36,38]

### 3.4 | Social support

Another theme that emerged in the literature was the influence of social support. Social factors can influence participation in strength-based activity both positively and negatively. Social support in the form of group exercising and encouragement from exercise professionals[37–39] and significant others/friends[39] was a positive influence. Social support acted to develop a woman's motivation for participation in strength exercise and increased their interest in self-perceived health.[37–39] Insufficient social support or poor acceptance into the strength training environment, fitness centre or training class was identified as a barrier in pregnant exercisers.[39]

### 3.5 | Behavioural strategies

Behavioural strategies also contributed to participation in muscle strength training. Meeting muscle-strengthening guidelines of two or more days per week was reported in women with greater use of behavioural strategies such as enrolling in programs/access to a fitness facility, and setting short-term goals.[36,37,39] Observed behavioural strategies across the five papers included use of designed program and/or fitness professionals overseeing or conducting programs.[36,37,39] Support from a fitness professional was included in the experimental design of two of the studies. Participants in intervention groups inclusive of tailored weight training programs and guidance from professionals demonstrated greater adherence and benefits.[38,41] However, in these studies, the contribution of fitness professionals on participation cannot be reliably determined. Furthermore, adjusting exercise goals to suit real-time lifestyle needs, plus a tailored program including personal likes and dislikes, increased likelihood of muscle strength exercise participation.[36,39] While targeted strategies can integrate social support, goal setting, and problem solving around barriers, further research is still needed into how such strategies may facilitate uptake of muscle strength exercise to the levels recommended in the guidelines.[37]

## 4 | DISCUSSION

To the authors' knowledge, this integrative review is the first to specifically focus on current literature on muscle strength training participation in women aged 35–54 years. This review found that five influential themes—perceived time constraints, knowledge and education, modality and intensity, social support, and behavioural strategies—serve as both motivators and barriers to women engaging in weight training. These findings enhance our understanding around issues important to women within this age range, and therefore can inform approaches to better engage these women in muscle strength training. Improved understanding from the perspective of women is also imperative given that women are under-represented, both as participants and authors, in consensus statements about muscle strength exercise (approximately 13% of all authors).[29]

The circumstances of women aged 35–54 years are fluid. Women in this cohort may have dependent children of varying ages, provide care or support to their parents, hold diverse work arrangements, or experience changing relationship commitments.[24,42,43] Generally, women of this age have multiple other commitments which may limit their time to acquire preparatory background in muscle strength exercise,[22] putting them at a disadvantage to other populations. Knowledge is incomplete, and in the absence of education, misconceptions, and misinformation around strength training increase.[22,44] Unlike other cohorts, women aged 35–54 years, due to time constraints and shifting life transitions, they are not well placed to improve their understanding. Furthermore, these competing demands make time for participation in muscle strength training difficult to organise.

A sense of autonomy over activity selection, social support, and increased knowledge are key factors in maintaining motivation for exercise in women aged 35 to 54 years, which, in turn, will achieve long-term lifestyle changes.[38] Mechanisms through which this can be achieved is discussed in the broader literature, which highlights the role of flexibility, scheduling,[43,45] behavioural strategies, time constraint,[22,24,42,46] competing demands[24] and motivation.[3,25,38,47] woman aged 35–54 years decision may be more vulnerable to the confluence of cognitive and emotive factors, and the excessive demands particular to this age can lead to self-sabotage towards participation in strength exercise.[46] Recognised initiatives need to be significantly augmented to support the successful engagement of these women to strength training.

Generally, for adult women over 18 years, self-efficacy and subjective norms, as well as sociodemographic factors such as lower education levels, low income, poor health, are correlated with lack of adherence to recommended levels of muscle strength exercise participation[1,7,47,48] It has been suggested that as women age these feelings may be amplified due to fear of being judged.[49] Such feelings, together with a low belief in their own competence, can result in women feeling less adept in their physical literacy. Feelings of intimidation may lead to less resilience of physical activity behaviours and therefore less engagement in physical activity.[49,50] As such, understanding the cultural context of exercise is needed.[51]

### 4.1 | Limitations of this review

It is acknowledged that studies outside of the five specifically discussed in this review identify useful strategies that could also be relevant. However, these other studies had samples that were unable to be differentiated relative to the focus cohort. Furthermore, evaluation

of the effect of each key factor on this specific population was not feasible, due to the small samples.

### 4.2 | Implications for future research and practice

Understanding the factors that are important when promoting muscle strength exercise for women aged 35–54 years provides a starting point to build knowledge around benefits of this activity.[22] This includes programs that encourage intrinsic enjoyment of the activity to improve participation levels. Reinforcing the idea that increasing strength conditioning incrementally with moderate effort to reach the same outcome is a productive strategy.[44]

Professionals providing fitness/exercise advice or training need be aware of the interplay between barriers, motivators, and sociocultural issues women, aged 35–54 years, experience when undertaking muscle strength exercise.[48] Scaffolding is a technique used in sports coaching that may be applied to muscle strength exercise training. It relies on guidance rather than direct instruction to progressively encourage the adoption and maintenance of muscle strength exercise.[51] Sports coaching employing scaffolding has been shown to facilitate a transformational relationship between the coach and player/learner that address factors such as individual capabilities and aptitude,[51] literacy about muscle strength exercise benefits, and an understanding of the cultural context of the participant.[51] Supervised virtual home-based muscle strength exercising (low load) has resulted in positive outcomes on fitness and mental health of middle-aged adult.[52] Given the importance of perceived time constraints and behavioural strategies on the level of muscle strength training participation in women aged 35–54 years, virtual home-based programs may be one strategy to employ moving forward. Research targeting women specifically is recommended to consolidate such a strategy. These strategies may contribute to improving confidence, enjoyment, skills, and techniques, which are identified as critical motivators for women.[36,47]

Public health approaches to date have been largely generic. Future research into participation in muscle-strengthening exercise for women should further investigate age and gender specific factors to strengthen current knowledge, understanding and prospective participation. Findings may then be used to construct scaffolded strategies that address known issues and increase future engagement.

## 5 | CONCLUSION

At present, strategies to promote participation in muscle strength exercise to recommended levels are mostly generic. Understanding of the most influential factors within gender and age brackets is limited. Compounding such gaps is a paucity of evidence, benefits, and development of individual strength training tools, as opposed to modified aerobic exercise training tools, for use by health professionals.[44] Five key factors emerged as impacting participation in strength training in women aged 35–54 years: perceived time constraints, knowledge and education, social support, modality and intensity, and behavioural strategies. A nuanced understanding of these factors and the degree to which each factor influences participation at any one time across this age range in women remains elusive. A challenge in this domain is how to navigate these five factors to accommodate potential and actual lifestyle fluxes impacting women's engagement in muscle-strengthening exercise to recommended levels. Focused education promoting resistance exercise and its guidelines, plus the use of specific tools targeted to assist women to participate in muscle strength exercise are necessary to improve health and wellbeing benefits for women aged 35–54 years. Scaffolding of both education and development of muscle-strengthening techniques may positively impact participation. Significantly, strategies aimed at increasing current low levels of engagement, and health professionals involved, must maintain flexibility in their approach.

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### DATA AVAILABILITY STATEMENT

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### ENDNOTE

[i] More recent National Survey data have been published in Australia (2020–2021); however, these data sets currently only show physical activity statistics for adults and physical activity generally (gender and MSE statistics are currently unavailable).[4]

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## APPENDIX A

### A.1 | FULL DATABASE SEARCH STRATEGIES

Ebscohost (CINHAL; PsychInfo; SPORTDiscus) (2012–2023), female, English, Full text

(female OR women OR wom?n OR females) AND ("resistance exercise training" OR "resistance training" OR "strength training" OR "weight training" OR "resistance exercise") AND (motivation OR engag* OR participat* OR facilitat* OR predict*) AND (barrier OR challenges OR "health behavio?r" OR behavio?r OR attitud*)

PsychInfo (2012–2023)

(female or women or wom?n or females).mp. [mp = title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh word] AND ("resistance exercise training" or "resistance training" or "strength training" or "weight training" or "resistance exercise").mp. [mp = title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh word] AND (motivation or engag* or participat* or facilitat* or predict*).mp. [mp = title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh word] AND(barrier or challenges or health behavio?r or behavio?r or attitud*).mp. [mp = title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh word]

PubMed (2012–2023), Full text

Search: Female[MeSH Terms] AND (adult[MeSH:noexp] OR middle age[MeSH])

"female"[MeSH Terms] AND ("adult"[MeSH Terms:noexp] OR "middle aged"[MeSH Terms]) AND Search: 'resistance exercise'/exp OR 'resistance exercise' OR 'resistance exercise training'/exp OR 'resistance exercise training' OR 'resistance training'/exp OR 'resistance training' OR 'weight training'/exp OR 'weight training'

(("resist"[All Fields] OR "resistance"[All Fields] OR "resistances"[All Fields] OR "resistant"[All Fields] OR "resistants"[All Fields] OR "resisted"[All Fields] OR "resistence"[All Fields] OR "resistences"[All Fields] OR "resistent"[All Fields] OR "resistibility"[All Fields] OR "resisting"[All Fields] OR "resistive"[All Fields] OR "resistively"[All Fields] OR "resistivities"[All Fields] OR "resistivity"[All Fields] OR "resists"[All Fields]) AND ("exercise"[MeSH Terms] OR "exercise"[All Fields] OR "exercises"[All Fields] OR "exercise therapy"[MeSH Terms] OR ("exercise"[All Fields] AND "therapy"[All Fields]) OR "exercise therapy"[All Fields] OR "exercise s"[All Fields] OR "exercised"[All Fields] OR "exerciser"[All Fields] OR "exercisers"[All Fields] OR "exercising"[All Fields]) AND "exp"[All Fields]) OR (("resist"[All Fields] OR "resistance"[All Fields] OR "resistances"[All Fields] OR "resistant"[All Fields] OR "resistants"[All Fields] OR "resisted"[All Fields] OR "resistence"[All Fields] OR "resistences"[All Fields] OR "resistent"[All Fields] OR "resistibility"[All Fields] OR "resisting"[All Fields] OR "resistive"[All Fields] OR "resistively"[All Fields] OR "resistivities"[All Fields] OR "resistivity"[All Fields] OR "resists"[All Fields]) AND ("exercise"[MeSH Terms] OR "exercise"[All Fields] OR "exercises"[All Fields] OR "exercise therapy"[MeSH Terms] OR ("exercise"[All Fields] AND "therapy"[All Fields]) OR "exercise therapy"[All Fields] OR "exercise s"[All Fields] OR "exercised"[All Fields] OR "exerciser"[All Fields] OR "exercisers"[All Fields] OR "exercising"[All Fields])) OR (("resist"[All Fields] OR "resistance"[All Fields] OR "resistances"[All Fields] OR "resistant"[All Fields] OR "resistants"[All Fields] OR "resisted"[All Fields] OR "resistence"[All Fields] OR "resistences"[All Fields] OR "resistent"[All

Fields] OR "resistibility"[All Fields] OR "resisting"[All Fields] OR "resistive"[All Fields] OR "resistively"[All Fields] OR "resistivities"[All Fields] OR "resistivity"[All Fields] OR "resists"[All Fields]) AND ("exercise"[MeSH Terms] OR "exercise"[All Fields] OR ("exercise"[All Fields] AND "training"[All Fields]) OR "exercise training"[All Fields]) AND "exp"[All Fields]) OR (("resist"[All Fields] OR "resistance"[All Fields] OR "resistances"[All Fields] OR "resistant"[All Fields] OR "resistants"[All Fields] OR "resisted"[All Fields] OR "resistence"[All Fields] OR "resistences"[All Fields] OR "resistent"[All Fields] OR "resistibility"[All Fields] OR "resisting"[All Fields] OR "resistive"[All Fields] OR "resistively"[All Fields] OR "resistivities"[All Fields] OR "resistivity"[All Fields] OR "resists"[All Fields]) AND ("exercise"[MeSH Terms] OR "exercise"[All Fields] OR ("exercise"[All Fields] AND "training"[All Fields]) OR "exercise training"[All Fields])) OR (("resistance training"[MeSH Terms] OR ("resistance"[All Fields] AND "training"[All Fields]) OR "resistance training"[All Fields]) AND "exp"[All Fields]) OR ("resistance training"[MeSH Terms] OR ("resistance"[All Fields] AND "training"[All Fields]) OR "resistance training"[All Fields]) OR (("weight lifting"[MeSH Terms] OR ("weight"[All Fields] AND "lifting"[All Fields]) OR "weight lifting"[All Fields] OR ("weight"[All Fields] AND "training"[All Fields]) OR "weight training"[All Fields]) AND "exp"[All Fields]) OR ("weight lifting"[MeSH Terms] OR ("weight"[All Fields] AND "lifting"[All Fields]) OR "weight lifting"[All Fields] OR ("weight"[All Fields] AND "training"[All Fields]) OR "weight training"[All Fields]) AND Search: motivation OR engag* OR participat* OR facilitat* OR predict*

"motivate"[All Fields] OR "motivated"[All Fields] OR "motivates"[All Fields] OR "motivating"[All Fields] OR "motivation"[MeSH Terms] OR "motivation"[All Fields] OR "motivations"[All Fields] OR "motive"[All Fields] OR "motivational"[All Fields] OR "motivator"[All Fields] OR "motivators"[All Fields] OR "motives"[All Fields] OR "engag*"[All Fields] OR "participat*"[All Fields] OR "facilitat*"[All Fields] OR "predict*"[All Fields] AND Search: barrier OR challenges OR "health behavio?r" OR behavio?r OR attitud*

"barrier"[All Fields] OR "barrier s"[All Fields] OR "barriers"[All Fields] OR ("challenge"[All Fields] OR "challenged"[All Fields] OR "challenges"[All Fields] OR "challenging"[All Fields]) OR (("health"[MeSH Terms] OR "health"[All Fields] OR "health s"[All Fields] OR "healthful"[All Fields] OR "healthfulness"[All Fields] OR "healths"[All Fields]) AND "behavio r"[All Fields]) OR "behavio r"[All Fields] OR "attitud*"[All Fields]

Medline (2012–2023), English, full text

(Adult or "middle aged" or female or wom?n).mp. [mp = title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word] AND ("resistance training" or strength training or weight training or "resistance exercise" or muscle strengthening or muscle strength exercise).mp. [mp = title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word] AND (motivation or enabler or facilitator or predictor).mp. [mp = title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word] AND (barrier or health-behavior or behavior or attitude or drop-out).mp. [mp = title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word]

JBI EBP (2012–2023), (Adult or "middle aged" or female or woman).mp. [mp = text, heading word, subject area node word, title] AND ("resistance exercise training" or "resistance training" or "strength training" or "weight training" or "resistance exercise").mp. [mp = text, heading word, subject area node word, title] AND (motivation or facilitator).mp. [mp = text, heading word, subject area node word, title] AND (motivation or facilitator).mp. [mp = text, heading word, subject area node word, title] AND (barrier or health behaviour).mp. [mp = text, heading word, subject area node word, title]