

# **Scoping review of adherence promotion theories in pelvic floor muscle training – 2011 ics state-of-the-science seminar research paper i of iv**

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## **Abstract**

### Aims

This paper, the first of four emanating from the International Continence Society's 2011 State-of-the-Science Seminar on pelvic-floor-muscle training (PFMT) adherence, aimed to summarize the literature on theoretical models to promote PFMT adherence, as identified in the research, or suggested by the seminar's expert panel, and recommends future directions for clinical practice and research.

### Methods

Existing literature on theories of health behavior were identified through a conventional subject search of electronic databases, reference-list checking, and input from the expert panel. A core eligibility criterion was that the study included a theoretical model to underpin adherence strategies used in an intervention to promote PFM training/exercise.

### Results

A brief critique of 12 theoretical models/theories is provided and, where appropriate, their use in PFMT adherence strategies identified or examples of possible uses in future studies outlined.

### Conclusion

A better theoretical-based understanding of interventions to promote PFMT adherence through changes in health behaviors is required. The results of this scoping review and expert opinions identified several promising models. Future research should explicitly map the theories behind interventions that are thought to improve adherence in various populations (e.g., perinatal

women to prevent or lessen urinary incontinence). In addition, identified behavioral theories applied to PFMT require a process whereby their impact can be evaluated.

## **INTRODUCTION**

This paper aims to summarize the literature on theoretical models of health behavior to promote pelvic floor muscle training (PFMT) adherence. It is the first of four papers, emanating from the State-of-the-Science Seminar “Improving Pelvic Floor Muscle Training Adherence Strategies: from theory to practice” held in Glasgow prior to the 41st ICS Conference in 2011. The seminar was instrumental in developing the “2014 Consensus Statement on PFMT Adherence”.

It is widely accepted that PFMT is both effective and cost-effective in treating patients with various pelvic floor dysfunctions.[1] Research also recognises that adherence to an exercise programme is key to its effectiveness[2, 3] and that poor adherence results in a decline in effect in the longer term.[4-7] Further, there are known differences in PFMT between short-term supervised adherence (i.e. during physiotherapy sessions) and long-term non-supervised adherence (i.e., post-therapy: the maintenance phase; patient trains alone). Clinicians estimate that 64% of patients adhere to PFMT regimens and health advice in the short term, but only 23% in the long term.[8, 9] Successful adherence to treatment usually requires a change in behavior, is often complex, and is influenced by many factors: over 200 variables correlate with exercise adherence alone.[8, 10] Examples of such variables/interventions to improve adherence include patient information, goal setting, technique efficacy, but few theoretical theories/models describe specifically the processes involved with the translating of using such variables to improving adherence. The use of such theories/models may assist in the design of behavior change interventions in various ways for example, by promoting an understanding of health behavior, directing research, and facilitating the transferability of an intervention from one health issue, geographical area, or healthcare setting to another. Adherence is a complex and dynamic phenomenon, which relates to consumers, providers, health systems, and broader socio-economic and political contexts. Although the theories chosen for this review focus mainly on providers and consumers, this is not the only area in which adherence can be promoted. The review is intended as an information source for those wishing to develop theory-based interventions focusing on intra- or interpersonal factors to increase adherence to PFMT.

Unless a specific term is used by the cited research this paper uses the term “adherence”, as opposed to “compliance”[11] or “concordance”,[11] and defines it as “the extent to which a patient's behavior matches agreed recommendations/instructions from the prescriber; it is intended to be non-judgmental, a statement of fact, rather than to ascribe blame to the patient, prescriber, or treatment method”. [12] The choice of terminology aligns with that recommended by the National Institute for Clinical Effectiveness[11] and World Health Organisation.[13]

Just as clinical history is inefficient without an appreciation of potential disease processes, attempts to understand behavior are also limited without knowledge of underlying health behavior theory. Thus, some researchers strongly recommend that interventions to change health behaviors, including those promoting treatment adherence, be based on theoretical models that provide an explanation of that behavior.[14, 15] Twelve models/theories were identified as relevant to PFMT adherence.

**MATERIALS AND METHODS**

Refer to the Materials and Method section of the “2014 Consensus Statement on Improving Pelvic-Floor-Muscle-Training Adherence” for details of the initial literature search.[16] Further, an initial core-eligibility criterion for the subsequent literature search was the inclusion, as an intervention strategy, of a health behavior theory, or model to underpin any PFMT adherence strategies. The secondary criterion was that the model specifically underpin exercise adherence. Thirty articles were identified; 12 were identified for detailed discussion based on models suggested by the panel experts.

**RESULTS**

Literature Research

The literature search identified six psychosocial models/theories used to inform PFMT research (Table I).

**Table I.** Theories That Have Been Used In Pfmt

Theory	Constructs/dimensions	Use in PFMT/exercise	Result of being used or potential use for PFMT
Health Belief Model (HBM); Rosenstock& Becker (1974)[16]	HBM was originally developed for preventative health behavior and public campaigns; it states that people are likely to take preventative action as they assess the threats of illness and the pros and cons of taking action. A cue to action or stimulus is required.	Chiarelli& Cockburn (1999, 2002)[17, 18] Used as conceptual framework in ante- and post-natalwomen for PFMT adherence. Gillard &Shamley (2010)[19] Interviewed those with perineal trauma to identify reasons for attending. Dolman and Chase (1996)[20] Predictive of PFM uptake. Sacomori et al. (2012)[21] Protocol based on HBM but little further	Identification of ways to increase adherence. Identification of most appropriate service to provide.

Theory	Constructs/dimensions	Use in PFMT/exercise	Result of being used or potential use for PFMT
<p>Theory of Planned behavior (TPB); Ajzen (1991)[22]</p>	<p>TPB refers to the intention to behave in a certain way to overcome a perceived threat; it stems from a more general theory of behavior: the Theory of Reasoned Action. Includes external variables, such as demographics and those not under a person's control; e.g., personality. Has 3 elements relevant to health care that are not specifically included in other models: subjective norm (social pressure to engage in the health behavior), self-efficacy/perceived behavioral control and intentions.</p>	<p>information.</p> <p>Whitford&amp; Jones (2011)[23] Used revised TPB, incorporating measure of past behavior, to develop a questionnaire that was disseminated to antenatal women with questions relating to undertaking PFMT during and after pregnancy.</p>	<p>Intentions primarily concerned with:</p> <p>Attitude,</p> <p>Subjective norm,</p> <p>Self-efficacy.</p> <p>Self-efficacy reliably predicting continuation.</p>
<p>Social Cognitive Theory (SCT) Bandura (1986)[24]</p>	<p>Self-efficacy is core to the Social Cognitive Theory and is about one's ability to control or perform specific behaviors, and about their effectiveness. Bandura (1986)<sup>24</sup>proposed these to be central determinants of health-related behaviors. 4 factors have been identified: belief in ability to attain goals (how we tend to use the term most often); modelling (of other people); social persuasion (other people convince you that you are capable of success) and physiological factors eg arousal / stress.</p>	<p>Chen (2004)[31] TheChen PFM exercise self-efficacy scale was developed to indicate two factors: (1) belief in PFM exercise execution and its benefits, and (2) belief in performing PFM exercise as scheduled and despite barriers. Broom (1999, 2001)[29, 30] The Broom PFM Self Efficacy Scale demonstrated utility for predicting success in behavioral interventions for women with incontinence. The factor structure of the scale comprises efficacy expectations and outcome expectations, in concordance with Bandura's theory Chen (2004; Lai 2008)[31, 33]PFMT, when assisted by biofeedback,</p>	<p>Development of 2 scales, Broom (1999; 2001)[29, 30] and Chen (2004)[31] Self-efficacy appears to encourage adherence to undertaking PFM exercises. Ways to improve self-efficacy need to be researched; e.g., biofeedback, patient information, methods of teaching the exercise and support.</p>

Theory	Constructs/dimensions	Use in PFMT/exercise	Result of being used or potential use for PFMT
<p>Transtheoretical Model (TTM); Prochaska&amp;DiClemente (1983)[35]</p>	<p>It has been suggested that health behavior may proceed in stages and that different cognitions may be more important in particular stages than in others: e.g., the thinking underlying initiation of a particular behavior may be qualitatively different from that involved in maintenance of the behavior. It is possible to enter the model at any stage and to move through the stages in either direction. The five stages described by the authors are pre-contemplation (before someone has considered behavioral change),</p>	<p>was shown to positively influence self-efficacy of PFM exercise in two studies with postpartum participants. Hallam (2012)[28] Biofeedback did not improve self-efficacy of undertaking PFM exercise significantly more than vaginal palpation. Hay-smith, Ryan and Dean 2007; Aliwijnse et al. 2003)[26, 27] Both highlighted the importance of self-efficacy in interviews with women undertaking PFMT for the treatment of urinary incontinence. Messer et al. (2007)[34] Also concluded that self-efficacy was very important in sustaining the behavioral change required to undertake PFMT in the longer term to prevent urinary incontinence.</p> <p>Alewinjse (2002; 2003)[36, 37] Development of a health education programme and protocol checklist.</p>	<p>It is important to discuss the benefits and difficulties of undertaking PFM exercises including the implementation of doing the exercises at home.</p>

Theory	Constructs/dimensions	Use in PFMT/exercise	Result of being used or potential use for PFMT
<p>Self-Regulatory Model (SRM); Leventhal, Meyer &amp; Nerenz (1980)[38]</p>	<p>contemplation (thinking about making a change), preparation (making plans to change), action (putting plans into action; i.e., actual behavioral change), and maintenance or relapse.</p> <p>At the heart of Leventhal's model is an individual's 'common-sense' beliefs about an illness and how to cope with it that may derive from past knowledge or experience, relevant consultations or conversations with family or friends. These beliefs (or illness perceptions) are usually generated in response to a particular episode of illness and may not be the same as the sufferer's beliefs prior to onset and may be grouped into five categories: identity, perceived cause, consequences, time line, and curability and controllability. There have been extensions to the model, including patients concerns about a treatment (e.g. side effects) and their belief in the necessity of the treatment.</p>	<p>Alewinjse (2002; 2003)[36, 37] Development of a health education programme and protocol checklist.</p>	<p>Possibly, develop an illness-perception questionnaire as for arthritis or diabetes or a necessity and concerns questionnaire as for medication adherence. These would identify the patient's perceptions of their condition and treatment, the prognosis and the likelihood of cure/improvement from undertaking PFMT.</p>
<p>Health Action Process Approach (HAPA); Schwarzer (1992)[39]</p>	<p>A very different stage-type model proposed by Schwarzer (1992),[39] the HAPA incorporates concepts from the HBM and TPB, as well as efficacy beliefs. It proposes two broad phases: (1) a motivational phase incorporating risk perceptions, self-efficacy beliefs and outcome expectancies, which act together to determine the strength of intention, and (2)</p>	<p>Hyland G. (2012)[40] HAPA and TTM was used in a master's thesis in women with pelvic organ prolapse who were undertaking PFMT. Key themes identified were (1) patterns of PFME behavior, (2) PFME maintenance cycles and (3) family priority.</p>	<p>Identified family priority as an additional important concept.</p>

Theory	Constructs/dimensions	Use PFMT/exercise	in Result of being used or potential use for PFMT
<p>a volitional phase, in which intentions are transformed into action through the use of action plans and control; also influenced by self-efficacy beliefs.</p>			

1. Health belief model

The Health Belief Model[17] (HBM) predicts that the likelihood of action is increased if the perceived disease threat is high and if the benefits of behavior are thought to outweigh the barriers.[17] Four studies[18-21] used the HBM as a conceptual framework to develop strategies to improve adherence. Chiarelli and Cockburn (1999)[22] used the findings from focus groups to underpin strategies to improve intervention adherence in a randomised controlled trial (RCT) targeting postpartum women at risk of developing urinary incontinence (UI).[18] Strategies introduced included tailoring the exercise programme to the functional abilities of each woman's PFM and negotiating with the woman about the most convenient times for her to carry out her exercises, giving stickers as reminders, and an information sheet for partners. The proportion of women reporting adequate levels of PFMT was 84% for the intervention group and 58% for the usual care group (P = 0.001). Gillard and Shamley (2010)[19] also used questions, based on the HBM framework, to interview women about factors motivating them to commence, and adhere to PFMT following a perineal tear during childbirth. They concluded that women who experience perineal tears will only seek and “comply” with PFMT under specific conditions—the information must be delivered at the right time and in the right way— and concurrent with three key motivating factors: (1) experience of UI or faecal incontinence (FI), (2) fear of experiencing incontinence, and (3) perceived level of self-efficacy. Information was gathered that could help to develop more effective physiotherapies through, for example, improved quality and timing of information, use of a validated assessment tool, and the provision of current and accurate information on the effectiveness of exercising the PFMs. Dolman and Chase (1996)[20], in a small study aimed at reducing post-partum UI, compared the HBM and Subjective Expected Utility Theory (see Table I) for their relative predictive power in PFMT uptake. They concluded that the HBM included more of the variables found to be important in explaining “compliance”—information and perceived “costs”, especially the cost of remembering to do the exercises. Sacomori et al. (2012)[21] also reported using the HBM for PFMT adherence. In this study, 38 women received one session of individual instruction in PFM exercises as a preventative measure; their adherence was monitored using an un-validated semi-structured questionnaire administered by telephone two months later. Approximately,

50% of women reported doing PFM exercises, albeit at a lesser intensity than recommended. The results indicated adherence was not influenced by severity or demographics and that further research is required to identify possible confounders such as self-efficacy and motivation.

## 2. Theory of planned behavior

The Theory of Planned Behavior[23] (TPB) describes the intention to behave in a certain way in order to overcome a perceived threat. Whitford and Jones (2011)[24] used a revised TPB incorporating measures of past behavior to explore PFMT motivation among pregnant women. A self-administered questionnaire was developed, using the revised TPB as a framework, and administered to 289 women attending antenatal clinics in Northeast Scotland in their third trimester and between 6 and 12 months post-natal. The TPB variables of attitude, subjective norm (social pressure to engage), and self-efficacy explained 53% of the variance in intention to practise PFMT during pregnancy whilst the possibility that pregnancy would cause incontinence did not appear to increase the intention to undertake PFMT.

## 3. Social cognitive theory

Self-efficacy Beliefs[25] is core to Bandura's Social Cognitive Theory and refers to the belief in one's ability to control or perform specific behaviors and in their effectiveness. Its use in PFMT adherence[26-29] has resulted in two scales: the Broome Pelvic Muscle Self-Efficacy (Brome 2001)[30, 31] and the Chen Pelvic Floor Muscle Exercise Self-Efficacy (Chen PFMSE) scales.[32]

In a self-efficacy impact-study, the Chen PFMSE scale showed PFMT self-efficacy improved adherence and mediated the effects of attitudes towards PFMT, spousal cohesion, and the perceived benefits of PFMT.[2]

Biofeedback-assisted PFMT positively influenced PFMT self-efficacy in two studies with postpartum participants;[33, 34] however, a recent thesis[29] reported that using internal biofeedback did not improve self-efficacy significantly more than vaginal palpation.

The importance of self-efficacy was highlighted in interviews with women undertaking PFMT for UI treatment[28] and was a significant predictor of the intention to adhere to PFMT in a study by Messer et al. (2007)[35] that concluded self-efficacy was important in sustaining the behavior changes required to maintain PFMT in the longer term.

## 4. Transtheoretical model

The Transtheoretical Model[36] (TTM) assesses an individual's readiness to act on a new healthier behavior and provides strategies to guide them through the change process. Accordingly, the model describes 5 phases of change, e.g., the first two phases are pre-contemplation and contemplation and could be the time a patient first starts to think they have a problem and then moves to seeking help. During these phases correct information about the condition and PFM exercises are important. The preparation and action phases include specific



and concrete plans which should provide the most successful outcome.[36] Thus, in order for patients to adopt a PFMT programme, the preparation phase should include precise expectations of when (e.g., every time you brush your teeth, see the red sticker), where (e.g., sitting on a chair/standing), and what (e.g., number of PFM exercises, length of hold, relaxation, repetitions, etc.), as agreed to by patient and therapist. If plans are less detailed (e.g., I'll do the home exercises daily as well as I can remember), there is less chance the action phase will be successful. Finally the maintenance and relapse prevention phases are crucial to long-term adherence and maintenance of improvement with re-enforcement of improved self-esteem and exercise self-efficacy. Alewijnse et al. (2002)[37] used the TTM and the Self-Regulatory Model (see below) as the theoretical rationale in developing a health-education programme to promote PFMT adherence for women with UI. This author's findings are discussed further in Paper 2 however a standardised clinician protocol-checklist, covering all PFMT treatment aspects, appeared to optimise long-term treatment outcome, and adherence.

## 5. Self-Regulatory model

The Self-Regulatory Model[38] (SRM) views patients as active problem solvers and health-related behavior as an attempt to close the perceived gap between current health status and a future goal/state. Threats to health and illness are the problem and patients' behavior an attempt to solve it.

The self-regulation theory can be used to provide insight in adherence as self-management and can influence self-care strategies and outcomes. As noted in the TTM section, Alewijnse et al. (2003)[39] used this model with targeted communication to further determine the barriers to continuing with PFM exercises and helping the patient to overcome them. For example the self-help guide that was developed promoted self-evaluation of the outcomes of adherence behavior in terms of the personal goals that are reached by looking back at the goal setting filling in task and by asking if women are satisfied with their own adherence behavior and the effect of that adherence behavior on self and body esteem.

## 6. Health action process approach

The Health Action Approach[40] (HAPA) suggests that the adoption, initiation, and maintenance of health behaviors must be explicitly conceived as a process consisting of a motivation phase, at least, and a volition phase (planning, action, and maintenance phases). In a master's thesis in which five women were interviewed about long-term adherence to PFMT three core themes were identified: (1) patterns of PFM exercise (PFME) behavior, (2) PFME maintenance cycles, and (3) family priorities.[41] The findings were mapped to the HAPA (and TTM). Primarily the authors noted there is a need to better understand family influences on individuals doing PFMT and concluded that the more health professionals understand the influences that drive women's actions, the more likely they are to encourage women to take charge of their own health, especially in relation to long-term PFME.

## Expert Panel Recommendations

In addition to the above, numerous other theory-driven techniques could be helpful in informing future research. Those considered by the expert panel, supported by a subsequent literature review, to be of interest for future PFMT research are discussed below and in Table II.

Table II. Theories That May Have Merit In Pfmt, Panel Consensus

Theory	Constructs /dimensions	Potential use for PFMT
<p><b>Information-Motivation-behavior (IMB) Skills Model</b>, Fisher &amp; Fisher (1992)[41]</p>	<p>The IMB model of health behavior change posits that performing a health promotion behavior is a function of the extent to which someone is well informed about the behavior, motivated to perform the behavior (e.g., has positive personal beliefs and attitudes towards the behavior or outcome, and social support for the behavior), has the requisite skills to execute the behavior, and confidence in their ability to do so across various situations.</p>	<p>Lots of work on self-care behavior. Potential for use of information for self-management; is being taken forward in the OPAL study.</p>
<p><b>behavior Change Techniques (BCTs)</b>, Abraham &amp; Michie (2008);[42] <b>behavior Change Taxonomy</b>, Michie et al. (2013)[43]</p>	<p>With so many psychological models attempting to explain behavior change, Michie and colleagues have taken a step back and instead classified the individual components, or active ingredients, of the models. By constructing this classification system, which they call the behavior Change Taxonomy, it is possible to deconstruct existing interventions and start to examine what were the likely effective strategies (the BCTs) for promoting behavior change or at least to report more accurately on what was used in the intervention.</p>	<p>BCTs are being used in a recently-funded study: OPAL.</p>
<p><b>Capability, Opportunity and Motivation behavior (COM-B) System; behavior Change Wheel</b> Michie et al. (2011)[43]</p>	<p>COM-B is an overarching framework of behavioral systems that identifies appropriate targets for enhancing adherence in practice and for testing future research through 3 interacting factors: capability, opportunity and motivation. The COM-B is at the centre of a behavior change wheel with a second circle comprising nine intervention functions that support behavior change: education, persuasion, incentivisation, coercion, training, enablement, modelling, environmental restructuring and restrictions.</p>	<p>Four of these have been shown to be important in PFMT: education, training, persuasion and enabling.</p>

Theory	Constructs /dimensions	Potential use for PFMT
<p><b>Normalization Process Theory (NPT)</b> May C &amp; Finch T, (2009)[46]</p>	<p>NPT is a relatively new sociological theory that aims to help improve understanding of how practices, be they self-care activities or complex interventions,[47, 48] become embedded and integrated into their social contexts. It describes the routine embedding of practices referencing four generative mechanisms: coherence, cognitive participation, collective action, and reflexive monitoring. It explains how the work (individual and collective) of implementing practices requires continuous investment in ensembles of action that carry forward in time and space, with which each of the four domains has four sub-constructs[46]</p>	<p>PFMT needs to be embedded as part of a person's routine.[56]</p>
<p><b>Motivational Interviewing (MI)</b> Miller and Rollnick[49]</p>	<p>Based on the TTM; systematic reviews show that in 80% of investigated studies, MI outperformed traditional advice given; there are no studies to date on MI specific to PFMT.</p>	<p>Clinician training would be important if MI is to be undertaken effectively.</p>
<p><b>Information / Satisfaction / Recall model</b> Ley (1982)[51]</p>	<p>Ley theorised that adherence stems from both an individual's recall of medical advice and their understanding of the content of a consultation, including the clinician's explanation of the clinical problem and treatment rationale. A simple model that has inherent appeal to clinicians wanting to 'educate' their patients, but the simplicity is also its potential weakness. It leaves unexplained the mechanisms by which understanding is derived; while both satisfaction and understanding may relate to a person's intentions, the actual act of undertaking an intervention is not necessarily a straightforward consequence.</p>	<p>Explanations must be simple, yet memorable.</p>

### 1. Information-motivation-behavioral skills model

The Information-Motivation-Behavioral Skills [42] (IMB) model assumes that information, motivation, and behavioral skills are the fundamental determinants of behavior. Research evaluating the IMB model with respect to the targeted behavior change could be developed to promote PFMT adherence. Using a hypothesis based on the theoretical underpinnings of the IMB model, it would be possible to test if information (e.g., PFM and exercise knowledge),

motivation (e.g., self-efficacy, social support), and clinician-supported muscle-contraction skills training were significantly predictive of improved PFMT adherence. The IMB model is currently being used as the theoretical basis of a PFMT intervention (the OPAL trial)[43]

## 2. Behavior change techniques taxonomy

The Behavior Change Techniques (BCTs) taxonomy[44] can be used to develop and select the best combination of BCTs for an intervention. In the most recent iteration of the Michie et al. BCTs Taxonomy[45], 93 BCTs are clustered into 16 groups. One example of a BCTs group familiar to clinicians and researchers is the Goals and Planning group, comprising nine BCTs: problem solving, goal setting behavior, goal setting outcome, action planning, review goals, and behavior, review goals, and outcome, behavioral contract (i.e., verbal or written), commitment, and discrepancy between current behavior and goals. All are aspects commonly used when prescribing and reviewing exercise programmes but by using such a taxonomy clinicians can more competently identify what needs to be implemented and how to replicate an effective intervention.[46] Michie's taxonomy is currently being used to inform the selection of behavior change techniques in the OPAL trial.

## 3. Capability, opportunity, and motivation behavior

The Capability, Opportunity, and Motivation Behavior (COM-B)[47] system is an overarching framework of behavior used to identify appropriate targets for enhancing adherence in clinical practice and for testing research based on three interacting factors: capability, opportunity, and motivation. The COM-B is at the centre of a behavior change wheel with a second circle, comprising nine intervention functions, supporting behavior change: education, persuasion, incentivisation, coercion, training, enablement, modelling, environmental restructuring, and restrictions. Four of these have been shown to be important in PFMT: education, training, persuasion, and enabling.[48]

## 4. Normalization process theory

Normalization Process Theory (NPT)[49] provides a conceptual framework for understanding and evaluating the processes (implementation) by which new health technologies and other complex interventions are routinely operationalized in everyday work (embedding) and sustained in practice (integration). It helps us to understand how new ways of thinking, acting, and organizing become embedded. To maintain improvement, or indeed to prevent the re-occurrence of pelvic floor dysfunction, PFMT must become embedded into a person's everyday behavior as part of a self-management process. Using NPT at this individual level would allow a better understanding of the work individuals need to undertake to operationalize PFMT in their daily lives and help clinicians to identify self-management barriers and facilitators by looking at the different aspects of the work undertaken by individuals and highlighting potential problem areas.

## 5. Motivational interviewing

Motivational Interviewing[50] (MI) is a behavioral technique used to increase a patient's engagement with treatment protocols. It engages and guides patients to “discover” and address their own ambivalence about changing a health behavior or to adopt new ones (e.g., PFMT). A systematic review in 2005[51] concluded that MI in scientific settings outperforms traditional advice-giving in the treatment of behavioral problems and diseases (e.g., diabetes, hypertension, physical activity). MI has been shown to help patients and practitioners talk about behavior change in less confrontational ways, using the patients' agenda, not the clinician's. Training clinicians in MI could enable them to understand and motivate patients better (e.g., discussing, in detail, when patients can do PFMT within their busy lifestyle may help patients adapt their routine to accommodate the exercises).

## 6. Information, satisfaction, recall model

The Information, Satisfaction, Recall Model[52] examines the association between patients' recall of information and satisfaction therewith. In a review of the effectiveness of educational interventions, Raynor reported that leaflets can increase both satisfaction and patient knowledge but may have little actual effect on adherence.[53] This may also be true of patient PFMT information-leaflets: frequently provided, we know very little about their actual adherence impact. Future research could explore whether such communication mechanisms should be integral to a consultation or whether printed leaflets are the most beneficial way to provide information in today's computer-literate society.

## **DISCUSSION**

Despite PFMT having Level 1 evidence of effect, albeit, patient-adherence dependent, there has been little research in the area of health behavior theories/models or behavior change techniques and PFMT adherence. We have attempted to place psychosocial models in context, highlighting their perceived potential in PFMT in terms of their usefulness for a specified task. Their usefulness seems to lie in their predictive ability, the effectiveness of interventions based on them, and even the extra empathy they may instil in clinicians during patient interactions. However, with over 200 possible modifiers of PFM adherence no over-arching behavioral change theory/model has been identified. We hope researchers and clinicians will find those that have been identified as a useful map to inform theory based discussions on ways to motivate patients to adhere better. Combined with the three other papers in this series, researchers may also find this paper useful as a starting point for developing future research.

These findings are also confirmed in a review by Palmer (2004),[54] who examined recent and historical UI research using health behavioral-change theories to identify knowledge gaps. Palmer identified two broad groups of health behavioral-change theories (a) operant conditioning and (b) a variety of cognitive theories (specifically, Social Cognitive Model Health Belief Model and Transtheoretical Model). The review called for new theories covering environmental factors, social influences, and physiological function and recognised that a

greater understanding of the differentiation between behavior initiation and maintenance would help drive this.[54] A review of musculoskeletal physiotherapy treatment by McClean et al. 2010[55] identified only five suitable studies investigating strategies for enhancing exercise adherence. According to the findings, there was moderate evidence that a motivational cognitive behavioral programme (aimed at increasing self-efficacy) is effective in improving attendance during exercise-based physiotherapy sessions, conflicting evidence that interventions designed to promote short-term exercise adherence were effective, and strong evidence that adherence strategies are not effective in improving long-term adherence to home exercise. Both of these reviews concluded that due to the multifactorial nature of non-adherence, single approach strategies may not be effective in increasing adherence.

Whilst undertaking this project it has also become evident that a “behavior change” process has to occur before patients reach the adherence phase and it would be beneficial if this could be recorded to aid recognition, we therefore recommend developing methods of documenting and recording behavior change; such as the “process of change phases” model used by Grol et al. 2013[56] in translational research, which includes (1) orientation (awareness of innovation, interest, and involvement), (2) insight (understanding, insight into own routine), (3) acceptance (positive attitude, motivation, positive intention of decision), (4) change (actual adoption in practice, confirmation of benefit, value), and maintenance (integration into routines, embedding in context).

While the 2011 Seminar and this review focused predominantly on PFMT adherence in treatment and post-treatment phases, further work is also required in the pre-treatment phases. The time from a person's awareness of a problem to seeking initial treatment can be many years whilst adherence is marked by significant attrition: between the pre- to long-term maintenance-adherence phase adherence can be as low as 23%.[9] We need to understand each phase and the required behavior change in order to maximise long-term adherence; otherwise, up to 80% of those who could potentially benefit remain untreated. Ultimately, without “buy-in” during each phase, there is no long-term adherence. The question of how future research could measure adherence across these phases was beyond the review's scope; nonetheless, the review underscores the lack of attention to the crucial early phases of behavior change that may serve to maximise long-term patient adherence.

## **CONCLUSION AND RECOMMENDATIONS**

From the review, it appears that the Social Cognitive Theory (self-efficacy) has undergone the most substantive research within the field of PFMT and is considered to be one of the main determinants of adherence. The Transtheoretical Theory has also been used and is based on transition from precontemplation to relapse prevention. behavioral Change Techniques from Michie's taxonomy could be used as required inserting them in to, for example, the Transtheoretical Theory, IMB or COMB-B providing clinicians with a step-wise process to encourage adherence. However, to address the complexities of non-adherence, we suggest

there is merit in future research encompassing additional theories, and approaches. The following recommendations were identified based on expert consensus:

Clinical: Educational institutions should (1) Raise clinicians' awareness of the importance of behavior change strategies in PFMT. (2) Provide/recommend appropriate behavior-change strategy training for clinicians.

Research: Researchers should investigate, in relation to PFMT uptake, and short/long-term adherence the utility of (i) specific behavior-change models and (ii) their stages and strategies. In addition (iii) to what degree improvements in PFMT adherence influences outcomes for different PFM dysfunctions and in different populations.

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