

RESEARCH REPORT

Can physical therapists counsel patients with lifestyle-related health conditions effectively? A systematic review and implications

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ABSTRACT

Objective: Healthcare professionals' competence in health behavior change has lagged behind other clinical competencies despite the well-established relationship between lifestyle behavior and health. We conducted a systematic review to examine whether physical therapists, given their unique practice pattern, can counsel effectively. **Methods:** Databases including MEDLINE, EMBASE, CINAHL, PsycINFO, and the Cochrane Database of Systematic Reviews were assessed from 1950 to July 2010. Studies were limited to the English, German, and Dutch languages. The methodological quality was evaluated (Downs and Black tool). **Results:** Seven source articles with a mean quality score of 16.57 ± 4.24 points (range: low = 0; high = 28) were retrieved. Given considerable methodological heterogeneity, the studies were compared in a narrative synthesis. The target populations, types and periods of interventions, outcome measures, and findings were analyzed. **Conclusion:** Physical therapists can effectively counsel patients with respect to lifestyle behavior change, at least in the short term. They can be effective health counselors individually or within an interprofessional team. **Practice implications:** Multiple health behavior change needs to be a primary twenty-first century clinical competence in physical therapy. Future studies will establish the degree to which effective health counseling augments physical therapy as well as health outcomes, in the long as well as short term.

INTRODUCTION

Given the prevalence of lifestyle-related conditions and the effectiveness of changing lifestyle behavior, health behavior change warrants being a clinical competence across healthcare professions (World Health Organization, 2008). Chronic lifestyle-related conditions including ischemic heart disease, smoking-related conditions, hypertension, stroke, cancer, type 2 diabetes mellitus, and obesity are among the leading causes of disability and premature death in middle-, low- as well as high-income countries, and contribute to substantial social and economic burdens (Dean et al, 2011).

Health behavior change interventions conducted by health professionals have become a research focus. Despite its inarguable necessity, physicians report barriers to effecting health behavior change in their patients, e.g., time (Abramson et al, 2000; Tulloch, Fortier, and Hogg, 2006), beliefs, and low self-efficacy (Sherman and Hershman, 1993), and knowledge and education (Abramson et al, 2000). Alternatively, practitioners may rely on assistants who have insufficient training (Bensing, Visser, and Saan, 2001). In contrast, physical therapists tend to be confident about counseling, particularly related to promoting physical activity compared with physicians and nurses (Laitakari, Miilunpalo, and Vuori, 1997), but less confident with respect to counseling for smoking cessation (Bodner, Rhodes, Miller, and Dean, 2011). They use various methods for health counseling enabling them to provide a tailored program and individualized

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motivational strategies. In contrast to entry-level medical education (Clark et al, 1995), patient counseling skills and strategies to effect behavior change are recommended to be addressed early in entry-level physical therapy curricula (American Physical Therapy Association, 2010) in that they are considered fundamental to contemporary practice (World Confederation for Physical Therapy, 2007).

Physical therapy is the third largest healthcare profession (Mulcahy, Jones, Strauss, and Cooper, 2010) and the leading established healthcare profession that primarily exploits non-drug interventions including patient counseling. Although some studies have examined the role of health counseling in physical therapy (Rindfleisch, 2009) and how often physical therapists counsel their patients (Miilunpalo, Laitakari, and Vuori, 1995; Sluijs, 1991), little is known about their effectiveness (Morris, Kitchin, and Clark, 2009).

Physical therapy has been associated largely with orthopedic conditions, however the profession's distinguishing characteristic historically is that it exploits non-invasive (non-drug and non-surgical) interventions such as patient counseling and exercise. Comparable to other health professions, physical therapy has largely adopted the WHO's definition of health and its associated construct, International Classification of Functioning, Disability and Health (World Health Organization, 2008). This century, physical therapists and other health professionals need to address (either directly or by referring to another professional) lifestyle-related risk factors and manifestations in every patient irrespective of presenting diagnosis (Dean, 2009).

The purpose of this systematic review was to examine whether physical therapists can counsel and change lifestyle behavior effectively. Our findings could help elucidate the parameters of such counseling as well as have relevance to the practices of other healthcare providers.

METHODS

Search strategy

The electronic databases (Figure 1) were searched within the accessible time frame from 1950 to July 2010. A search history was established in MEDLINE and adapted to the databases of EMBASE and CINAHL. The search was conducted in three waves based on the specific research question. In each wave, per search term, thesaurus-based keywords were coupled with their analog MeSH terms. The first wave consisted of three sub-blocks combined with the search operator 'OR'. The first sub-block

entailed synonyms of the seven lifestyle-related conditions of interest including the term 'lifestyle (related) condition' itself. Second, a sub-block related to 'lifestyle counseling' and third, a sub-block including synonyms for each of the four goals of behavior intervention was established. The second wave was the intervention, whereas the third wave was the profession of physical therapy. Eventually, the three waves were combined with the operator 'AND'. Searches were limited to the English, Dutch, and German languages. To refine the results, Cochrane and PsychINFO were searched with thesaurus-based keywords only: 'physical therap*', 'physiotherapy*', 'counsel*', 'advice*', and 'advis*' combined with the operators 'OR' and 'AND', respectively. The citation manager RefWorks® was used for de-duplication.

Definitions

Heterogeneity among the studies in terms of study types, settings, participants, interventions, and outcome measures was anticipated. Several terms were defined to ensure search terms and inclusion and exclusion criteria for the source studies were unambiguous.

'Lifestyle conditions' refers to the non-communicable conditions contributing to premature morbidity (Dean, 2009). These conditions include ischemic heart disease, hypertension, cerebrovascular disease, cancer, smoking-related conditions, type 2 diabetes mellitus, and obesity. For precision, this term was refined to 'lifestyle-related conditions'.

'Counseling' refers to patient consultation aimed at health behavior change (e.g., exercise promotion, advice about smoking cessation, and nutritional advice), as non-invasive means of primary or secondary prevention of lifestyle-related conditions.

Selection process

Inclusion criteria

Studies were included in the review if they examined health behavior change interventions provided by physical therapists or other members of the interprofessional team in which the physical therapist contributed to the health behavior change component of the intervention. The intervention could be aimed at a single or a combination of intervention goals. The presentation of risk factors of lifestyle-related conditions need not have been the reason for referral. Patients being treated for orthopedic conditions were

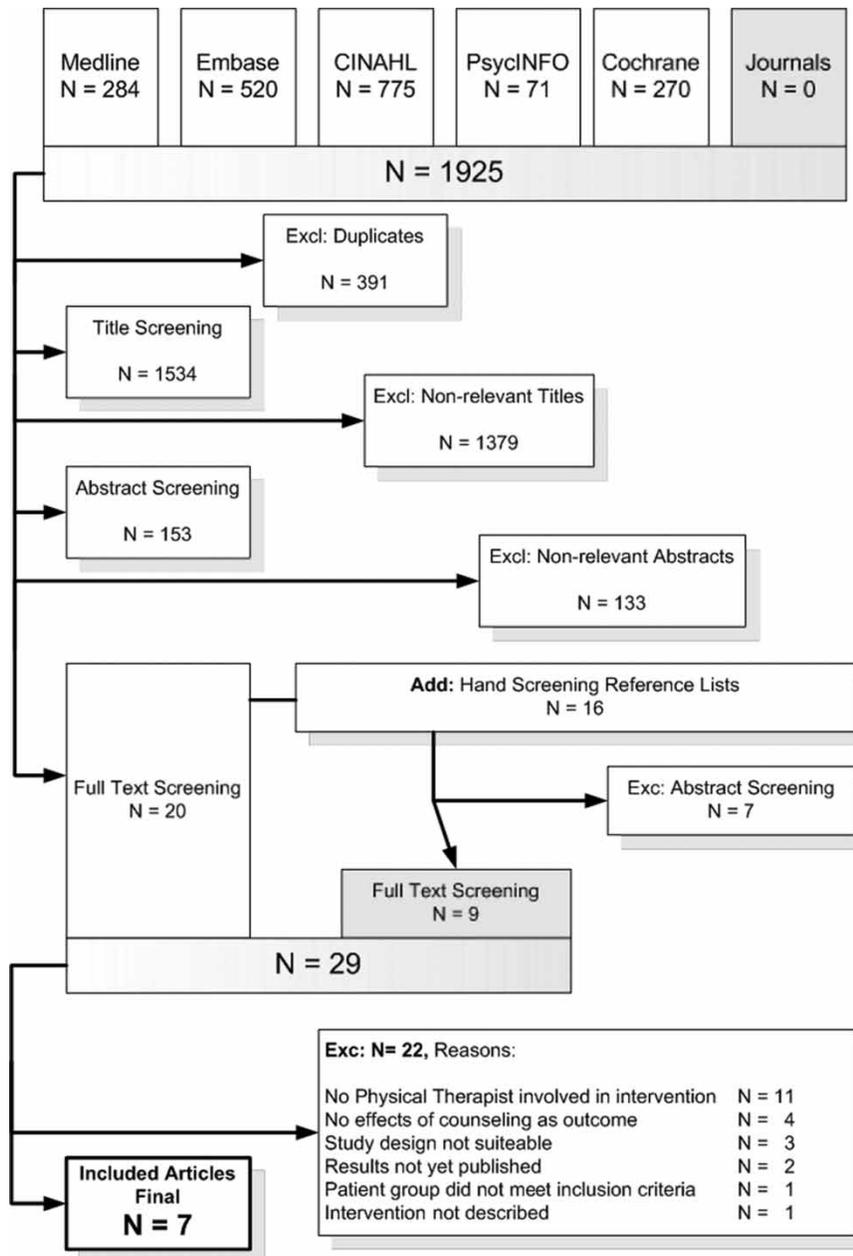


FIGURE 1 Study selection process.

included if the health behavior intervention was aimed at lifestyle change with the goal of primary prevention irrespective of referral diagnosis. Subjects in the studies could be either patients or physical therapists. However, there had to be an intervention provided to patients that were being evaluated. Studies evaluating perceived effects (i.e., based on questionnaires) were included. The effects of interest were those related to the prescribed lifestyle interventions. These effects could be presented in qualitative (e.g., perception of change) or quantitative (e.g., increased physical activity time) outcome measures. Follow-up was not

required for inclusion. Pilot studies were included. Studies were limited to the English, Dutch and German languages. Studies had to be peer-reviewed and published in full-text.

Exclusion criteria

Survey studies (Laitakari, Miilunpalo, and Vuori, 1997; Rea, Marshak, Neish, and Davis, 2004; Schmid et al, 2008) or study protocols were excluded. Reports discussing the development of health behavior interventions or providing practice recommendations

without evaluating effectiveness were excluded. Studies were also excluded if counseling or health education was related to teaching a patient strategies for independent activities of daily living or preventing complications (e.g., pressure ulcers in patients with diabetes (Rindfleisch, 2009)) as well as studies where physical therapists were not involved in health behavior counseling (e.g., if fitness testing was the only physical therapist contribution (Aittasalo, Miilunpalo, and Suni, 2004)). Studies evaluating treatment outcome in in-patient settings, on children, or pregnant women were excluded.

Study selection

Based on the inclusion and exclusion criteria, one investigator screened titles of articles retrieved in the initial search. Two investigators independently evaluated abstracts. Discrepancies for retaining full-text articles were discussed until agreement was achieved. Full-text review data were abstracted by the two investigators and results compared for inclusion. If they disagreed, a third investigator was consulted. Decisions were based on agreement among the investigators.

Quality assessment

Since non-randomized studies were included, we used the Modified Downs and Black tool (Downs and Black, 1998; Eng et al, 2007) developed to assess methodological quality of randomized and non-randomized studies. The tool consists of 27 questions and includes four dimensions: (1) 'reporting'; (2) 'external validity'; (3) 'internal validity – bias'; and (4) 'internal validity – confounding' (selection bias). The tool's validity and reliability are reasonably high, except for the three items on external validity (Deeks et al, 2003). Established criteria to quantify a score for the Downs and Black (1998) tool could not be found, therefore a narrative comparison of the scores for each dimension was conducted. For the quality assessment of studies in which physical therapists were (primary or secondary) subjects of the interventions, that is, they completed questionnaires regarding their counseling practices, only the patients were considered as participants when the individual components were scored, as they constituted the group that actually received the counseling intervention.

Synthesis

Given heterogeneity across studies, a narrative synthesis was conducted by cross-analyzing the results based on the research question. First, the target

groups addressed in each study were analyzed. Second, the relationships among the degrees of involvement of physical therapists, the types and goals of interventions, and duration of interventions and follow-ups were evaluated. Third, studies were compared based on evaluation of outcomes (i.e., if the outcomes of the intervention group were compared to the control group or to another intervention group with a different intervention, or both).

RESULTS

Selection of articles

The search results appear in Figure 1. The search yielded 1,925 articles. After de-duplication, title screening, and abstract review, 20 articles remained for full-text screening. Reasons for exclusion after full-text screening included no physical therapist involved in the intervention or a focus on patients with orthopedic conditions where the counseling was not aimed at lifestyle changes, or studies investigating the effects of invasive interventions. Also, we observed that studies on tertiary prevention referred to mobilizing patients as physical therapy interventions instead of lifestyle behavior counseling.

Citation review of the remaining full-text articles resulted in 9 additional studies that met full-text inclusion criteria, hence, a total of 29. After data abstraction, 22 articles were excluded. Two of these were study protocols of ongoing trials (Claes and Jacobs, 2007; Helmink et al, 2010). The investigators were contacted and reported that their results were to be published by year-end 2010. Of the remaining eight full-text articles there was agreement on inclusion of five. After discussion with the third investigator, seven articles were retained for review.

Study characteristics

Table 1 summarizes the seven source articles published between 1987 and 2009. In two studies, patients served as secondary subjects, whereas physical therapists (Gahimer and Domholdt, 1996) and physicians (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006) were primary subjects. One study included physical therapists as secondary subjects (Sheedy et al, 2000). A total of 818 'patient subjects' were included (range: 24–265; mean: 116.9; age range: 16–76 years).

The studies showed substantial heterogeneity regarding interventions and outcome measures. One

TABLE 1 Study characteristics.

Author	Country	Study design	Lifestyle-related condition/subjects	Intervention provider	Type of intervention	Score quality assessment ^a
Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006)	Finland	Randomized Controlled Trial (RCT)	Inactivity, primary health care Patients: <i>n</i> = 265 Physicians: <i>n</i> = 67 Inclusion criteria: Primary healthcare patients 20–65 years 30 minutes of moderate activity on <4 days/week	Team: PCP (PREX and non-PREX), PCP's receptionist, 1 PT Role of PT: Provider of mailed feedback + physical activity recommendations in MON-group (patients with usual care + self-monitoring (pedometer))	PREX-group: prescription-based PA counseling (5 A's ^b) MON-group: self-monitoring (pedometer) feedback per mail: personal PA recommendations for frequency, duration and intensity of PA sessions and number of daily steps	17
Eriksson, Westborg, and Eliasson (2006)	Sweden	RCT	Cardiovascular disease; moderate to high risk Primary healthcare <i>n</i> = 123 Inclusion criteria: Patients with diagnosis of hypertension, dyslipidemia, type 2 diabetes, obesity, or any combination thereof 18–65 years Exclusion criteria: Diagnosis of coronary heart disease, stroke, transient ischemic attack, BP >180/> 105 mmHg, dementia, or severe psychiatric disease	Team: 3 PTs, 2 PT-assistants, 1 D, 1 PCP, 1 LN Role of PTs: Assessment: Interviews, anthropometric and blood pressure measurements Intervention: Supervision of progressive exercise training Leadership of follow-up meetings	Supervised exercise training (3 × /week) Dietary counseling Six follow-up counseling sessions (Stage of Change model ^c)	21
Gahimer and Domholdt (1996)	USA	Observational exploratory study	General health, orthopedic clientele, outpatient physical therapy Patients: <i>n</i> = 37 PTs: <i>n</i> = 37 Supervisors: <i>n</i> = 9 Inclusion criteria: No age limit (16–76 years)	PTs only Counseling behavior of physical therapists in everyday practice was observed by audiotape.	Observation, analysis of five dimensions of health behavior counseling: Information about illness Home exercise Advice and information	11

Continued

TABLE 1 *Continued*

Author	Country	Study design	Lifestyle-related condition/subjects	Intervention provider	Type of intervention	Score quality assessment ^a
Griffiths and Holliday (1987)	Australia	Descriptive case series	Intact cognition, Orthopedic diagnosis (lower-extremity dysfunction, spinal dysfunction, or upper-extremity dysfunction) Obesity, Group Obesity Program participants <i>n</i> = 31 Inclusion criteria: 15 years and older (29–72 years) Mild – moderate obesity Free of major personal problems (other than weight and its consequences) which might require extensive psychological consultation Necessary time available to attend program Primarily internally motivated to lose weight rather than be responding to external pressure or requests from spouses, relatives or doctors Free of medication	Team: 1 PT, 2 D, 1 PSY Role of PT: Teaching forms of exercise suitable with mild to moderate obesity Tailoring activities to each individual Checking exercise logs	Health education Stress counseling 10 group sessions of 1.5–2 hours with PT, D, and PSY; content: Nutrition education Behavior modification and cognitive change (i.e., self-monitoring, cognitive restructuring, relaxation and meditation) Physical activity and exercise Food logs	11
Molenaar et al (2009)	Nether-lands	RCT	Obesity, interprofessional primary care <i>n</i> = 134 Inclusion criteria: Men and non-pregnant women 18–65 years BMI 28–35 kg/m ² Exclusion criteria: Inability to speak Dutch Already being treated for overweight Diagnosis of mental health problems Known plans to move out of residential area shortly	Team: 1 PCP, 1 D, 1 PT Role of PT: Exercise counseling sessions	Diet: Individual face-to-face counseling sessions with dietitian: 3-day food record Information about health gains Individual attainable goal-setting, strategy development Exercise: Astrand test Individual goal-setting, strategy development Advice on exercise and building PA into daily life Information about possibility for voluntary exercise at reduced costs Support and encouragement One-time brief PA counseling (5 minutes) Components: History of PA Barriers & difficulties in regard to activity Goal-setting & strategy development (Stage of Change model ^c)	19
Sheedy et al (2000)	Australia	Pilot study, quasi-experimental study	Physical activity for general health, orthopedic clientele, outpatient physical therapy <i>n</i> = 204 Inclusion criteria: New patients 18 years and older Exclusion criteria:	PTs only: Provision of educational intervention as part of normal course of treatment (first treatment session)	16	

Taylor, Fletcher, and Tiarks (2009)	USA, Arkansas RCT	<p>Inability of reading and speaking English Inability to walk 10 minutes Physical condition that prevented an improvement in PA participation (i.e., recent joint replacement surgery) Participating in other education groups (i.e., back rehabilitation) within 6 weeks of initial assessment No home telephone</p> <p>Type 2 diabetes, voluntary sample $n = 24$</p> <p>Inclusion: American Diabetes Association diagnostic criteria for type 2 diabetes^d</p> <p>Exclusion: History of a medical condition identified by American Heart Association as an absolute contraindication to exercise testing^e Uncontrolled hypertension, proliferative retinopathy, severe peripheral neuropathy, nephropathy, or autonomic neuropathy, or unable to participate due to physical impairment Fasting plasma glucose levels >250 mg/dl^f Involvement in resistance or aerobic training on ≥ 2 days/week at the time of investigation</p>	<p>and up to two subsequent sessions for PA counseling only)</p> <p>PTs only: Physical therapist-directed exercise counseling on exercise program</p>	<p>Information brochure & PA diary (based on stage of change)</p> <p>Prescribed exercise program for muscle strength (ROM-limiting-equipment) and endurance (treadmill) Free access to fitness center Exercise counseling Two face-to-face sessions (30 minutes) Weekly exercise counseling telephone calls (10 minutes) (5 A's^b and Stage of Change model^c)</p>	21
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^aHighest attainable score: 28 (Source: Downs and Black, 1998).

^bEstabrooks, Glasgow, and Dziewaltowski (2003). <http://www.who.int/diabetesactiononline/about/fiveAs/en/index.html>; retrieved July 2010.

^cProchaska, Johnson, and Lee (1998).

^dAmerican Diabetes Association (2005).

^eFletcher et al (2001).

^fZinman et al (2003).

^gAittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006).

PT, physical therapist; LN, laboratory nurse; D, dietitian; PCP, primary care physician; PSY, psychologist; ROM, range of motion; PA, physical activity, PREX, prescription-based PA-counseling, Figure 1^g

article described an observational study evaluating perceived effects only (Gahimer and Domholdt, 1996).

Quality assessment

The mean score of the Modified Downs and Black tool (Downs and Black, 1998; Eng et al, 2007) for methodological quality of the seven source studies was 16.57 SD 4.24. RCTs scored higher with a smaller standard deviation than the non-randomized studies (19.5 SD 1.91 vs. 12.67 SD 2.87).

Reporting

All source studies except one (Gahimer and Domholdt, 1996), where this was not applicable, described the intervention procedures. In none was this done sufficiently to replicate the intervention. Main findings were described as means across source studies. Two studies (Eriksson, Westborg, and Eliasson, 2006; Taylor, Fletcher, and Tiarks, 2009) demonstrated the equality of the two groups at baseline. Two studies measured adverse events. Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) alluded to potential adverse effects associated with physical activity, whereas Taylor, Fletcher, and Tiarks (2009) reported that no adverse effects occurred during their exercise counseling intervention. Three studies did not report losses to follow-up (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Gahimer and Domholdt, 1996; Griffiths and Holliday, 1987). In one study, this item was not applicable (Gahimer and Domholdt, 1996). *p*-Values were calculated across studies. Only the study by Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) reported *p*-values for both significant and non-significant findings.

External validity

This dimension scored poorly overall because the samples from which the subjects were recruited were either not clearly described or not representative of their populations. Patients were often recruited from the same healthcare settings and subsequently treated by their personal physical therapists or physicians; this may invalidate generalization to the population (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Gahimer and Domholdt, 1996; Sheedy et al, 2000). Further, subjects participating in the interventions may be particularly motivated, thus, not representative of the population (Eriksson, Westborg, and Eliasson, 2006; Griffiths and Holliday, 1987; Taylor, Fletcher, and Tiarks, 2009).

Internal validity – bias

None of the studies applied blinding, except one (Gahimer and Domholdt, 1996) in which an attempt was made to blind the intervention providers (physical therapists). All studies that conducted a follow-up, except one (Molenaar et al, 2009), controlled for time to follow-up(s). In three studies (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Griffiths and Holliday, 1987; Sheedy et al, 2000), whether treatment compliance was reliable is unclear given this was not considered in the analysis. The study by Griffiths and Holliday (1987) scored ‘0’ on compliance because not all subjects were assessed at each follow-up. Four studies (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Gahimer and Domholdt, 1996; Griffiths and Holliday, 1987; Sheedy et al, 2000) did not provide accurate outcome measures because they used modified questionnaires with unknown reliability and validity.

Internal validity – confounding variables

Three studies did not recruit their participants from comparable populations (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Gahimer and Domholdt, 1996; Sheedy et al, 2000). No study recruited its participants at the same time. In four studies (Eriksson, Westborg, and Eliasson, 2006; Gahimer and Domholdt, 1996; Griffiths and Holliday, 1987; Taylor, Fletcher, and Tiarks, 2009), this item could not be established because the period of recruitment was unreported. Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) recruited physicians at the same time, however, the treatment for each patient started with the recruitment of each individual patient, which made the recruitment period indeterminable. The remaining two studies (Molenaar et al, 2009; Sheedy et al, 2000) did not recruit the intervention group at the same time as the control group. Randomization was reported in three studies (Eriksson, Westborg, and Eliasson, 2006; Molenaar et al, 2009; Taylor, Fletcher, and Tiarks, 2009). Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) randomized the intervention-providing physicians, however, this was not so for the intervention and control group.

Control for confounders was accomplished by either intention-to-treat analysis (Eriksson, Westborg, and Eliasson, 2006; Molenaar et al, 2009; Taylor, Fletcher, and Tiarks, 2009) or multiple imputations (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006). Losses to follow-up were considered in four studies (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Molenaar et al, 2009; Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009). Only two

studies (Molenaar et al, 2009; Sheedy et al, 2000) however explained how this could have affected overall outcomes. Both studies that conducted a power calculation (Eriksson, Westborg, and Eliasson, 2006; Taylor, Fletcher, and Tiarks, 2009) had sufficient power to detect clinically important effects.

Synthesis

Population

The target groups of six studies presented with one lifestyle-related condition or risk factor, respectively. In one study (Gahimer and Domholdt, 1996), this categorization was not applicable. Six studies aimed at primary whereas the remaining study (Taylor, Fletcher, and Tiarks, 2009) aimed at secondary prevention of lifestyle-related conditions. Four studies provided primary prevention to patients who already presented with risk factors such as inactivity (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006), moderate-to-high risk of cardiovascular disease (Eriksson, Westborg, and Eliasson, 2006), and obesity (Griffiths and Holliday, 1987; Molenaar et al, 2009). Two studies (Gahimer and Domholdt, 1996; Sheedy et al, 2000) randomly recruited patients in outpatient physical therapy who were not at risk of lifestyle-related conditions or this risk was not a factor for inclusion. Sheedy et al (2000) aimed at increasing physical activity for general health, whereas Gahimer and Domholdt (1996) observed the physical therapists' counseling behaviors and the patients' perceptions of these without conducting an intervention.

The single study that evaluated the effectiveness of a program aimed at secondary prevention (Taylor, Fletcher, and Tiarks, 2009) was conducted with people with type 2 diabetes.

Intervention

Involvement of physical therapists. Three studies evaluated interventions solely provided by physical therapists (Gahimer and Domholdt, 1996; Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009). In two studies, physical therapists were either primary (Gahimer and Domholdt, 1996) or secondary (Sheedy et al, 2000) subjects of the intervention to the extent that their perceptions in terms of counseling behaviors (Gahimer and Domholdt, 1996), confidence and knowledge (Sheedy et al, 2000) were assessed with questionnaires. In the remaining four studies, the physical therapist(s) constituted part of a multidisciplinary team. The roles of the physical therapists in each study appear in Table 1. In

general, if physical activity promotion was part of the intervention, physical therapists were the primary providers of that component. The extent to which physical therapists were involved in other intervention components varied across studies. In Eriksson, Westborg, and Eliasson (2006), for example, a physical therapist was in charge of the follow-up consultations in which the components of the multidisciplinary intervention were subject of discussion.

Goal of intervention. Three studies (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009) had increased physical activity as their single intervention goal, whereas the intervention goals of the remaining four studies were more complex. In all studies except one (Gahimer and Domholdt, 1996), improved physical activity was combined with improved anthropometric risk factors (i.e., weight, waist circumference, waist-hip ratio, and body mass index (BMI)), nutritional habits, psychological well-being, metabolic measures, blood pressure, muscle strength and exercise capacity, or some combination. The observational study by Gahimer and Domholdt (1996) stood apart; its goal of intervention was improved general health.

Types of intervention. The source studies reported a variety of interventions. Both the interventions and the health professional that delivered each component differed from one study to another. In general, physical activity and nutrition counseling were the primary interventions across all studies. Counseling included information about the influence of lifestyle behavior on health, goal setting, strategy development, support and encouragement, identifying barriers, and feedback. Counseling was conducted in various ways. Three studies (Eriksson, Westborg, and Eliasson, 2006; Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009) used the stages of change (SOC) model (Prochaska, Johnson, and Lee, 1998); two studies (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Taylor, Fletcher, and Tiarks, 2009) applied the concept of the five A's (Estabrooks, Glasgow, and Dzewaltowski, 2003); and one (Taylor, Fletcher, and Tiarks, 2009) applied both approaches. Whether these approaches are applied as an assessment tool (Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009) or an intervention (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Eriksson, Westborg, and Eliasson, 2006) warrants consideration. A common strategy incorporated into the health behavior change intervention was self-monitoring (i.e., diarizing physical activity and food records) (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Griffiths and Holliday, 1987; Molenaar et al, 2009; Sheedy et al,

2000). In all studies except one (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006), counseling was conducted face-to-face only or combined with telephone calls (Taylor, Fletcher, and Tiarks, 2009). One study (Griffiths and Holliday, 1987) examined cognitive restructuring, relaxation, and meditation techniques.

Length of intervention/follow-up. The intervention periods and intensity of delivery (excluding initial assessment and follow-up questionnaires) ranged from a single session of as little as 5 minutes (Sheedy et al, 2000) to 47 sessions of unspecified duration, over 6 months (Eriksson, Westborg, and Eliasson, 2006). The average number of sessions could not be determined given that three studies (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Gahimer and Domholdt, 1996; Sheedy et al, 2000) did not indicate the number of sessions. A further distinction was whether contact took place one-on-one (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Gahimer and Domholdt, 1996; Molenaar et al, 2009; Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009) or in a group (Eriksson, Westborg, and Eliasson, 2006; Griffiths and Holliday, 1987).

Across all studies, the number of follow-ups ranged from none to two; the shortest follow-up time was 6 weeks (Sheedy et al, 2000) and the longest was 2 years (Griffiths and Holliday, 1987). In one study (Eriksson, Westborg, and Eliasson, 2006), whether the follow-up sessions (performed monthly over 6–9 months) constituted part of the intervention was unclear. For this systematic review, these contacts were considered part of the intervention period.

Comparison

All studies, except two (Gahimer and Domholdt, 1996; Griffiths and Holliday, 1987) compared the outcome of their intervention(s) to a control group. In studies with two intervention groups (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Molenaar et al, 2009), physical therapists were involved in the intervention of only one of the two groups.

Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) conducted a different treatment with the physical therapist-involved group than with the ‘actual’ treatment group (PREX – prescription-based exercise counseling), while Molenaar et al (2009) administered the same treatment to both groups but added a ‘physical therapist-conducted’ component to one of the groups. Molenaar et al (2009) compared the outcomes of the intervention groups whereas Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) rather compared the outcomes of each

intervention group with the control group only. In two studies, the intervention groups were subdivided into three (Griffiths and Holliday, 1987) and six (Eriksson, Westborg, and Eliasson, 2006) groups, respectively. This division did not contribute to the evaluation of outcomes between groups since the interventions were similar for both groups. In the single-group study of Griffiths and Holliday (1987) the lack of a control group allowed within-group comparisons only.

Outcomes

The outcome measures and the results appear in Table 2. The columns ‘outcome measures’ and ‘significant outcomes achieved by physical therapists (or their involvement)’ show the specific outcomes that were evaluated. The table shows within- and between-group differences, and those at follow-up. The studies’ conclusions are summarized.

DISCUSSION

Given non-invasive interventions (health counseling and exercise), the basis of physical therapy practice, can prevent, reverse in some cases as well as manage lifestyle-related conditions over the short- and long-term (Dornelas de Andrade and Dean, 2008), the physical therapy profession has a major role in addressing these global priorities (Moffat, 2010). This century, physical therapists can expect patients to have one or more risk factors for lifestyle-related conditions, the manifestations of these conditions, or a combination (Stout, 2009). Thus, the goal is to maximize health as well as to address presenting complaints.

Although the efficacy of lifestyle behavior counseling has been firmly established, its effectiveness in practice has fallen short. Such counseling provided by physicians and nurses, for example, has been reported to have marginal benefits on reducing cardiovascular risk factors (Fleming and Godwin, 2008). Counseling patients has been a component of physical therapy practice since its emergence as a health profession, yet little is known about its effectiveness and its parameters with respect to lifestyle behavior change (Brooks, 2005). Although studies have been published on counseling patients, including exercise, in areas closely related to physical therapy (Brooks, 2005; Calfas et al, 2002; Nisbeth, Klausen, and Andersen, 2000), the present study, to the best of our knowledge, is the first that has systematically studied the effectiveness of counseling conducted by physical therapists. Such information is needed to

TABLE 2 Outcome measures and outcomes.

Author	Outcome measures	Significant outcome achieved by PT (or their involvement), (comparison)	In values	Total follow-up period/point of time significant finding ^a	Conclusion (of study author)
Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006)	(1) No. of overall weekly PA sessions (2) No. of at least mod. intensity weekly PA sessions (3) Duration of overall weekly PA (only sign. result) (4) Duration of at least mod. weekly PA	(3) Duration of overall weekly PA (compared to control group)	3) MON (self-monitoring group) > CON (control group), difference: 217 minutes (95% CI 23–411); $p = 0.029$	6 months/2 months	(1) Self-monitoring of PA using a pedometer and a PA log increased weekly duration of overall PA in short term (2) Self-monitoring of PA with expert (physical therapist) feedback can be a useful and a cheaper way of increasing especially the duration of overall weekly PA in the short term
Eriksson, Westborg, and Eliasson (2006)	(1) Weight (2) Waist circumference (3) Waist-hip ratio (4) Blood pressure (5) VO ₂ max (6) Metabolic measures (7) QoL (quality of life) (8) Anxiety/depression	Decreases in (2) Waist circumference (3) Waist-hip ratio (4) Diastolic blood pressure (compared to control group)	(2) 1.9 cm; $p < 0.001$ (3) 2.3 mmHg; $p < 0.05$ (4) 0.01; $p < 0.01$	12 months/12 months	Favorable effects on several cardiovascular risk-factors. Level of PA increased and health-related quality of life improved. Note: Decrease in waist circumference but not total body weight indicates changes in body composition with an increase in muscle mass and increased metabolism à positive correlated with changes in fasting triglyceride, HDL cholesterol
Gahimer and Domholdt (1996)	(1) Amount of statements → proportion of five categories of education (2) Relationship perception vs. actual teaching behavior (3) Pattern of teaching across course (4) Perceived effects of patients	Outcome of main interest related to effectiveness: (4) Changes of behavior (patients' perceived effects) in: (A) Information illness (B) Home exercise (C) Advice and information (D) Health education (E) Stress counseling (within-group comparison)	Note: (D) and (E): 27% of all patients reported that these categories were not applicable to their care (A) 83.8% (B) 86.5% (C) 83.8% (D) 29.7% (E) 18.9%	N/A (study design)	PTs rarely provide global information about general health topics and stress counseling information that may often be important to long-term management of chief complaint. → This explains the rather unsatisfactory outcome on patients' perceptions of success in general health education and stress counseling
Griffiths and Holliday (1987)	(1) Psychological questionnaires (A) Beck Depression Inventory (B) STAI (C) Locus of control of behavior	(1) B. Improvement of trait anxiety (STAI) (2) Weight loss compared to pre-treatment	(1) STAI2 (F = 5.443; d.f. = 1, 21; $p < 0.05$) (2) - 8.85 kg (F = 6.469; d.f. = 1.9; $p < 0.05$)	26.5 months/ (1) 6 months (2) 3 months	Subjects lose weight during treatment and continue to loose weight up to 3 months thereafter but regain some (but not all) at 2 years.

Continued

TABLE 2 *Continued*

Author	Outcome measures	Significant outcome achieved by PT (or their involvement), (comparison)	In values	Total follow-up period/point of time significant finding ^a	Conclusion (of study author)
	(D) Eysenck Personality Inventory (2) Weight loss in kg (3) Correlation between percentage of changes in eating habits (eating habits questionnaire-questionnaire) and weight change after 2 years (4) Follow-up questionnaire (qualitative)	(within-group comparison)			
Molenaar et al (2009)	(1) Adherence (2) Weight loss (in kg) (3) Weight loss > 5% (percentage of participants) (4) Waist circumference (5) Comparison between intervention groups and intervention groups to control group.	(2) Weight loss (within-group comparison) (3) Weight loss; >5% (4) Decrease in waist circumference (D + E-group vs. D-group) (5) Any weight loss (Both intervention groups compared to control group)	(2) D + E: -3.0 (-4.0 to -2.0) Diet: -2.2 (-3.1 to -1.4) (3) D + E > D: RR: 1.6(95 CI; 0.8 to 3.2) (4) -1.6 (-3.5 to 0.2) -2.2 (-4.4 to 0.06), P _{interaction} = 0.14 (5) D + E > Diet; D + E > Control: -3.5 (-5.1 to -1.8); P < 0.05	12 months/ (2) 6 months (3) 12 months (4) 6 months (5) 6 months	Adding exercise counseling by PT did not significantly enhance effect on weight loss. However: small beneficial effect on waist circumference. Note: Abdominal obesity in particular conveys an increased health risk Recommendation for further research: Long-term effects might be different (D + E most probably more efficient)
Sheedy et al (2000)	(1) Any increase in PA compared to baseline (2) Increase of average PA weekly of ≥60 minutes/week (3) Proportion of inactive people at baseline who reached threshold of adequate activity at follow up (4) Time spent active over last 6 months (discover if in maintenance- stage)	(2) Increase of average PA weekly of ≥60 minutes/week (Compared to control group)	(2) 2.97× more likely to increase; 95% CI for odds ratio (1.36–6.46), not including 1.0	6 weeks/6 weeks	Results do not indicate significant effectiveness of brief education intervention in improving PA participation of outpatient physiotherapy patients. However, confirmation that physical therapists are a capable and ready group to engage in PA promotion of this type.
Taylor, Fletcher, and Tiarks (2009)	Primary: (1) Muscle strength (in kg) (2) Exercise capacity Secondary: (3) Adherence (4) Adverse events	Increase in: (1) Muscle strength (2) Exercise capacity (within-group comparison)	(1) Chest: 9.6 (3.4–15.8) Row: 11.00 (3.6–18.3) Leg: 17.4 (8.0–26.7) (2) 0.8 (0.1–1.6) Overall: p < 0.05	2 months/2 months	Either exercise counseling or description of exercise supervision can be used as an evidence-based approach by PTs. Depending on time and costs.

D + E, Diet + Exercise-group; STAI, State-Trait Anxiety Inventory.

^aNote: Follow-up period defined by time from baseline (pre-treatment) until follow-up

refine the elements of effective health counseling suitable for integration into physical therapy practice.

Effectiveness of physical therapists as counselors

The relatively few studies that we retrieved have evaluated the effectiveness of lifestyle counseling by physical therapists, however they were methodologically heterogeneous and differed with respect to the rigor of outcome evaluation. With cross-analyzing the outcomes of the source studies, we observed that physical therapists can effect positive changes in their patients' lifestyle behaviors. The heterogeneity of the study designs precluded establishing whether physical therapists were more effective in health behavior change as a sole intervention provider or as an adjunct to an inter-professional team.

Within-group comparisons showed improved outcomes across studies whereas comparisons between intervention and control groups were less clear. These outcomes could be explained by comparing the 'interventions' provided to the control groups of each study. In the study by Eriksson, Westborg, and Eliasson (2006), for example, the control group was counseled about healthy living in an initial meeting with a physician, physical therapist, and dietician. Taylor, Fletcher, and Tiarks (2009) provided a 2-month supervised exercise program to the control group whereas in most other studies the control subjects received 'usual care' (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Eriksson, Westborg, and Eliasson, 2006; Molenaar et al, 2009); the components however were not detailed and it was unclear whether general counseling occurred during those interventions. Sheedy et al (2000) did not describe the 'intervention' of the control group. Nonetheless, many control participants became more active compared to participants in the intervention group. Thus, even an initial assessment of the participants' lifestyles followed by a 'usual care' intervention can be sufficient to raise awareness and change lifestyle choices.

Studies that evaluated physical therapists as sole intervention providers (Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009) used physical activity counseling based on psychological or motivational strategies. Taylor, Fletcher, and Tiarks (2009) initially used the SOC model (Prochaska, Johnson, and Lee, 1998). In the subsequent exercise counseling sessions, the individual's stage was considered and counseling was provided based on the 5 A's approach (Estabrooks, Glasgow, and Dzewaltowski, 2003). The inclusion of an index of readiness to change could provide important supplementary information by ruling out this potential confounding variable.

Sheedy et al (2000) based their study on this approach. They used a baseline survey to establish each patient's stage of change to increase his or her physical activity level. Comparable to the study by Taylor, Fletcher, and Tiarks (2009), the subsequent counseling intervention was based on each individual's stage of change. Sheedy et al (2000) in contrast to Taylor, Fletcher, and Tiarks (2009) incorporated each individual's readiness to change behavior (Prochaska, Johnson, and Lee, 1998) as a follow-up outcome measure. They reported improved readiness to change behavior at the end of the intervention period. However it remained unclear whether 5 minutes was sufficient to provide the counseling as described in the study. Physical therapists could use one or two subsequent treatment sessions for further counseling, however counseling opportunities could have been included in sessions in which the patient was being treated based on the initial referral (mainly orthopedic injuries). Sheedy et al (2000) did not consider this potential limitation to their findings. Regardless of the lack of an objective effect in the study by Gahimer and Domholdt (1996), the intention of their study group was to advance the findings of Sluijs (1991). However, Gahimer and Domholdt (1996) did not appear to incorporate Sluijs's suggestions for a comprehensive approach in the study protocol. For instance, Sluijs (1991) suggested investigating whether the type and amount of patient counseling differs based on the acuity of the patient's condition. This could be an interesting extension given the primary thrust of this systematic review was the outcome of counseling groups at risk or with manifestations of chronic lifestyle-related conditions.

In studies where physical therapists were members of an interprofessional team (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Eriksson, Westborg, and Eliasson, 2006; Griffiths and Holliday, 1987; Molenaar et al, 2009) which in reality they often are, only Eriksson, Westborg, and Eliasson (2006) and Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) used specific motivational or psychological models. Eriksson, Westborg, and Eliasson (2006) applied the SOC model (Prochaska, Johnson, and Lee, 1998). However, it is not clear if the model has been used for the initial assessment and, therefore if the intervention approach was tailored to the individual's stage of change. Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) used the 5 A's (Estabrooks, Glasgow, and Dzewaltowski, 2003) as a counseling strategy for the intervention group (PREX) that did not involve a physical therapist. Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen (2006) drew comparisons between the intervention and the control groups, and separately, between the monitoring (MON) and

the control groups. It would have been interesting if they had compared the PREX and MON groups to establish whether the counseling intervention of the PREX physicians was more effective than the self-monitoring intervention where physical therapists contributed with feedback. When interpreting the outcomes, one could speculate whether the physical therapist's feedback was more specifically tailored to the patient's physical activity behavior and whether the physical therapist's feedback interventions may have been improved by including the 5 A's (Estabrooks, Glasgow, and Dzewaltowski, 2003).

Across all studies, interventions were methodologically heterogeneous. Regarding the intervention delivery, group counseling sessions (Eriksson, Westborg, and Eliasson, 2006; Griffiths and Holliday, 1987) need to be distinguished from individual sessions (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Molenaar et al, 2009; Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009). On comparison of the intervention goals, dietary counseling was combined with physical activity counseling (Eriksson, Westborg, and Eliasson, 2006; Griffiths and Holliday, 1987; Molenaar et al, 2009) or physical activity counseling occurred alone (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Sheedy et al, 2000; Taylor, Fletcher, and Tiarks, 2009). Most studies incorporated a diary or log as a complementary intervention component (Aittasalo, Miilunpalo, Kukkonen-Harjula, and Pasanen, 2006; Griffiths and Holliday, 1987; Molenaar et al, 2009; Sheedy et al, 2000). Such record-keeping was an effective basis for tailoring feedback and personalizing patient goals as well as raising the patient's awareness about health and lifestyle.

In contrast, brochures did not appear to be effective (Eriksson, Westborg, and Eliasson, 2006; Griffiths and Holliday, 1987; Sheedy et al, 2000). For example, Sheedy et al (2000) reported half of the patients who received a brochure recalled having received it, whereas 80% of those who received a diary recalled making use of it. Patients with diary prescriptions completed these only over a few weeks. A log book combined with feedback and discussion throughout the intervention period such as in the study by Griffiths and Holliday (1987), may increase adherence, hence intervention effectiveness. Although the study by Griffiths and Holliday (1987) scored lowest on quality assessment, the combined intervention components were the most suitable to target lifestyle behavior change compared with other studies. Participants were actively involved in discussions, role-playing and quizzes. Also, this study (Griffiths and Holliday, 1987) was the only one incorporating family members and friends indicating an appreciation of the influence of interpersonal relationships on health behavior. Long-term lifestyle

behavior change may require more than simply providing exercise prescription or (single) counseling sessions. The environment of the individual at risk may need to be incorporated into counseling such that it can be adapted to the changes and support the person as he or she goes through this process. Some 90% of people advised to improve their health habits expect their family and friends to provide support (Zimmerman and Connor, 1989; Zimmerman, Finley, Rabins, and McMahon, 2007). The types of interventions across the studies were too diverse to conclude which types of intervention are most effective.

Limitations

Our limited number of source studies barred detailed meta-analysis to establish intervention effect size. Variation of study populations, interventions, and outcome measures contributed to the heterogeneity of relevant studies and limited our source base. Narrowing our research to a single lifestyle-related condition may have enabled us to retrieve more homogeneous studies. However, this was not consistent with the purpose of our review as in real-world practice physical therapists typically see patients each day with a range of co-morbidity, specifically, risk factors and manifestations of multiple lifestyle-related conditions irrespective of the presenting complaint or reason for referral.

That little research has been conducted related to health behavior change by physical therapists precluded our limiting the inclusion criteria to controlled trials.

IMPLICATIONS FOR PRACTICE

Competency in initiating or supporting lifestyle behavior change is a priority of health professionals this century. Physical therapists are well positioned to take a leadership role within the established health professions given their unique practice patterns, specifically, treating patients for prolonged periods within treatment sessions over prolonged episodes of care. This practice pattern provides the opportunity for multiple patient-therapist interactions and teachable moments, which is a potential for effecting sustained health behavior change given time for building rapport and trust with the patient and the possibility for essential follow up. Based on our results, physical therapists could readily extend their skills in counseling to being effective health counselors, given they counsel patients routinely for the remediation of impairments, and their prevention. As a clinical competency that warrants being a priority in daily physical therapy practice however, health

behavior change needs to be instructed, evaluated and practiced as stringently and systematically as other clinical competencies in physical therapy.

IMPLICATIONS FOR RESEARCH

Although the professional-related literature does not necessarily reflect clinical practice, the findings of this limited systematic review suggest that patient counseling at least with respect to health behavior change in the context of lifestyle-related conditions warrants increased attention in research. That health counseling delivered by physical therapists at least in the short term can be effective is encouraging and paves the way for long-term studies. Studies are needed to examine behavior change interventions that are both effective and can be expediently integrated into the reality of any physical therapy practice.

The most promising areas of future research are likely to focus on the learner–physical therapist interface. The health requirements of the learner (i.e., the patient or client), need to be clearly identified for each health behavior to be targeted. Other important factors include the patient’s literacy and learning style; these need to provide the basis for the teaching mode, incentive strategies, and follow-up, and the patient’s readiness to change which may differ for various health behaviors (Prochaska, Johnson, and Lee, 1998). To date, the 5A’s approach has been the most compelling, thus, worthy of further study in the context of physical therapy practice.

In terms of cost effectiveness, brief advice delivered systematically is practical, thus, has been of interest clinically. Because brief advice has been shown to be beneficial in assisting patients to quit smoking (Bodner and Dean, 2009), it holds some promise as an adjunct to changing other health behaviors such as eating nutritiously, losing weight, reducing inactivity, and increasing moderately intense exercise.

Finally, health behavior change is likely to be more easily effected over the short term such as in the face of the proverbial wake-up call (i.e., diagnosis of a lifestyle-related condition). Periods of at least 2–3 years (Claes and Jacobs, 2007; Helmink et al, 2010) are needed to ensure that long-term benefits are sustained. The overall long-term objective is to effect life-long health behavior change and maximal health.

CONCLUSION

Physical therapists have the potential to effectively counsel patients with respect to lifestyle behavior changes (specifically, quitting smoking, improving

nutrition, reducing weight, and increasing physical activity; and improving cognitive-behavioral outcomes in general), at least in the short term. Given this review’s stringent methodology, our findings support that physical therapists can be effective health counselors alone or as supporters of health counseling initiated by other healthcare team members. Our findings have drawn attention to patient counseling as a clinical competency in its own right (comparable to other physical therapy competencies), one that is warranted in the twenty-first century. Studies are needed to refine this competency in the physical therapy context and parameters of health counseling interventions have to be defined to augment health and physical therapy outcomes in the long- as well as the short term.

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REFERENCES

- Abramson S, Stein J, Schaufele M, Frates E, Rogan S 2000 Personal exercise habits and counseling practices of primary care physicians: A national survey. *Clinical Journal of Sport Medicine* 10: 40–48
- Aittasalo M, Miilunpalo S, Suni J 2004 The effectiveness of physical activity counseling in a work-site setting. A randomized, controlled trial. *Patient Education and Counseling* 55: 193–202
- Aittasalo M, Miilunpalo S, Kukkonen-Harjula K, Pasanen M 2006 A randomized intervention of physical activity promotion and patient self-monitoring in primary health care. *Preventive Medicine* 42: 40–46
- American Diabetes Association 2005 Standards of medical care in diabetes. *Diabetes Care* 28 (Suppl. 1): S4–S36
- American Physical Therapy Association 2010 The Role of Physical Therapists in National Health Care Reform. http://www.apta.org/uploadedFiles/APTAorg/Advocacy/Federal/Health_Care_Reform/APTA_Position/RoleofPTinHealthCareReform.pdf
- Bensing JM, Visser A, Saan H 2001 Patient education in the Netherlands. *Patient Education and Counseling* 44: 15–22
- Bodner ME, Dean E 2009 Advice as a smoking cessation strategy: A systematic review and implications for physical therapists. *Physiotherapy Theory and Practice* 25: 369–407
- Bodner ME, Rhodes RE, Miller WC, Dean E 2011 Smoking cessation and counseling: Practices of Canadian physical therapists. *Physical Therapy* 91: 1051–1062
- Brooks G 2005 Physical activity counseling: Beyond the workout. *Cardiopulmonary Physical Therapy Journal* 16: 5–9

- Calfas KJ, Sallis JF, Zabinski MF, Wilfley DE, Rupp J, Prochaska JJ, Thompson S, Pratt M, Patrick K 2002 Preliminary evaluation of a multicomponent program for nutrition and physical activity change in primary care: PACE+ for adults. *Preventive Medicine* 34: 153–161
- Claes N, Jacobs N 2007 The PreCardio-study protocol – a randomized clinical trial of a multidisciplinary electronic cardiovascular prevention programme. *BioMed Central Cardiovascular Disorders* 7: 27
- Clark NM, Nothwehr F, Gong M, Evans D, Maiman LA, Hurwitz ME, Roloff D, Mellins RB 1995 Physician-patient partnership in managing chronic illness. *Academic Medicine* 70: 957–959
- Dean E 2009 Foreword from the Special Issue Editor. *Physiotherapy Theory and Practice* 25: 328–329
- Dean E, Al-Obadidi S, Dornelas de Andrade A, Gosselink R, Umerah G, Al-Abdelwahab S, Anthony J, Bhise A, Bruno S, Butcher S, Fagevi Olsen M, Frownfelter D, Gappmeier E, Gylfaddotir S, Habibi M, Hasson S, Jones A, Lapier T, Lomi C, Mackay L, Mathur S, O'Donoghue G, Playford K, Sangroula K, Scherer S, Skinner M, Wong WP 2011 The First Physical Therapy Summit on Global Health: Implications and recommendations for the 21st century. *Physiotherapy Theory and Practice* 27: 531–547
- Deeks JJ, Dinnes J, D'Amico R, Sowden AJ, Sakarovich C, Song F, Petticrew M, Altman DG, International Stroke Trial Collaborative Group, European Carotid Surgery Trial Collaborative Group 2003 Evaluating non-randomised intervention studies. *Health Technology Assessment* 7: 1–179
- Dornelas de Andrade A, Dean E 2008 Aligning physical therapy practice with Brazil's leading health priorities: A 'call to action' in the 21st century. *Revista Brasileira de Fisioterapia* 12: 260–267
- Downs SH, Black N 1998 The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology and Community Health* 52: 377–384
- Eng J, Teasell R, Miller W, Wolfe D, Townson A, Aubut J, Abramson C, Hsieh J, Connolly S, Konnyu K 2007 Spinal cord injury rehabilitation evidence: Methods of the SCIRE systematic review. *Topics in Spinal Cord Injury Rehabilitation* 13: 1–10
- Eriksson KM, Westborg C, Eliasson M 2006 A randomized trial of lifestyle intervention in primary healthcare for the modification of cardiovascular risk factors. *Scandinavian Journal of Public Health* 34: 453–461
- Estabrooks PA, Glasgow RE, Dzewaltowski DA 2003 Physical activity promotion through primary care. *Journal of the American Medical Association*. 289: 2913–2916.
- Fleming P, Balady M 2008 Lifestyle interventions in primary care: Systematic review of randomized controlled trials. *Canadian Family Physician* 54: 1706–1713
- Fletcher GF, Balady GJ, Amsterdam EA, Chaitman B, Eckel R, Fleg J, Froelicher VF, Leon AS, Pina IL, Rodney R, Simons-Morton DA, Williams MA, Bazzare T 2001 Exercise testing and training: A statement for healthcare professionals from the American Medical Association. *Circulation* 104: 1694–1740
- Gahimer JE, Domholdt E 1996 Amount of patient education in physical therapy practice and perceived effects. *Physical Therapy* 76: 1089–1096
- Griffiths RA, Holliday J 1987 An evaluation and follow-up investigation of a behavioral group treatment programme for obesity. *Psychotherapy and Psychosomatics* 48: 157–164
- Helmink J, Meis J, de Weerd I, Visser F, de Vries N, Kremers S 2010 Development and implementation of a lifestyle intervention to promote physical activity and healthy diet in the Dutch general practice setting: The BeweegKuur programme. *International Journal of Behavioral Nutrition and Physical Activity* 7: 49–58
- Laitakari J, Miilunpalo S, Vuori I 1997 The process and methods of health counseling by primary health care personnel in Finland: A national survey. *Patient Education and Counseling* 30: 61–70
- Miilunpalo S, Laitakari J, Vuori I 1995 Strengths and weaknesses in health counseling in Finnish primary health care. *Patient Education and Counseling* 25: 317–328
- Moffat M 2010 Policy Statement: Physical therapists as exercise experts across the life span. World Confederation for Physical Therapy. http://www.wcpt.org/sites/wcpt.org/files/files/PS_Exercise_experts_Sept2011.pdf; retrieved November 2011
- Molenaar EA, van Ameijden EJ, Vergouwe Y, Grobbee DE, Numans ME 2009 Effect of nutritional counseling and nutritional plus exercise counseling in overweight adults: A randomized trial in multidisciplinary primary care practice. *Family Practice* 27: 143–150
- Morris DM, Kitchin EM, Clark DE 2009 Strategies for optimizing nutrition and weight reduction in physical therapy practice: The evidence. *Physiotherapy Theory and Practice* 25: 408–423
- Mulcahy A, Jones S, Strauss G, Cooper I 2010 The impact of recent physiotherapy graduates in the workforce: A study of Curtin University entry-level physiotherapists. *Australian Health Review* 2000–2004 34: 252–259
- Nisbeth O, Klausen K, Andersen LB 2000 Effectiveness of counseling over 1 year on changes in lifestyle and coronary heart disease risk factors. *Patient Education and Counseling* 40: 121–131
- Prochaska JO, Johnson SS, Lee P 1998 The transtheoretical model of behavior change. In: Schron E, Ockene J, Schumaker S, and Exum WM (eds) *The Handbook of Behavioral Change*, pp 159–184. New York, Springer
- Rea BL, Marshak HH, Neish C, Davis N 2004 The role of health promotion in physical therapy in California, New York, and Tennessee. *Physical Therapy* 84: 510–523
- Rindfleisch AB 2009 A grounded-theory investigation of patient education in physical therapy practice. *Physiotherapy Theory and Practice* 25: 193–202
- Schmid AA, Butterbaugh L, Eglolf C, Richards V, Williams L 2008 Prevention of secondary stroke in VA: Role of occupational therapists and physical therapists. *Journal of Rehabilitation Research and Development* 45: 1019–1026
- Sheedy J, Smith B, Bauman A, Barnett A, Calderan A, Culbert J, Jacka J 2000 A controlled trial of behavioral education to promote exercise among physiotherapy outpatients. *Australian Journal of Physiotherapy* 46: 281–289
- Sherman SE, Hershman WY 1993 Exercise counseling. How do general internists do? *Journal of General Internal Medicine* 8: 243–248
- Sluijs EM 1991 Patient education in physiotherapy: Towards a planned approach. *Physiotherapy* 77: 503–508
- Stout NL 2009 Cancer prevention in physical therapist practice. *Physical Therapy* 89: 1119–1122
- Taylor JD, Fletcher JP, Tiarks J 2009 Impact of physical therapist – directed exercise counseling combined with fitness center – based exercise training on muscular strength and exercise capacity in people with type 2 diabetes: A randomized clinical trial. *Physical Therapy* 89: 884–892
- Tulloch H, Fortier M, Hogg W 2006 Physical activity counseling in primary care: Who has and who should be counseling? *Patient Education and Counseling* 64: 6–20
- World Confederation for Physical Therapy 2007 Position Statement: WCPT Guidelines for Physical Therapist Professional Entry-Level Education

World Health Organization 2008 World Health Statistics: 18–20. <http://www.who.int/whosis/whostat/2008/en/index.html>

Zimmerman R, Connor C 1989 Health promotion in context: The effects of significant others on health behavior change. *Health Education and Behavior* 16: 57–75

Zimmerman R, Finley C, Rabins C, McMahon K 2007 Integrating viral hepatitis prevention into STD clinics in Illinois (excluding Chicago), 1999–2005. *Public Health Reports* 122: 18–23

Zinman H, Ruderman N, Campaigne BN, Devlin JT, Schneider SH, 2003 Physical activity/exercise and diabetes. *Diabetes Care* 26 (Suppl 1.): 73–77.