

Lifestyle risk factor modification in midlife women with type 2 diabetes: theoretical modelling of perceived barriers

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KEY WORDS

Barriers, diabetes, risk factors, health promotion, women

ABSTRACT

Objective

The aim of this paper is to highlight the importance of the concept of *perceived barriers* in health promotion for risk factor reduction, and to describe a 'Perceived barriers and lifestyle risk factor modification model' which could potentially be incorporated into existing frameworks for diabetes education to enhance lifestyle risk factor education in women with type 2 diabetes.

Setting

Diabetes education, community health

Primary argument

'Perceived barriers' is a health promotion concept that has been found to be a significant predictor of health promotion behaviour. There is evidence that women face a range of perceived barriers that prevent them from engaging in healthy lifestyle activities.

Despite this evidence, current Australian and international evidence based frameworks for diabetes education do not explicitly incorporate the concept of perceived barriers to action. Building on existing frameworks for diabetes education and elements of Pender's Health Promotion Model (1982, 2006, 2010), a model of risk factor reduction which incorporates 'perceived barriers' is described.

Conclusion

Although further research is required, it is argued that current approaches to risk factor reduction in type 2 diabetes could be enhanced by assessment and goal setting to reduce an individual's perceived barriers to lifestyle behaviour change. A 'Lifestyle risk factor modification and perceived barriers model' could potentially provide an innovative approach to support this.

INTRODUCTION

Type 2 diabetes is a significant cause of morbidity and mortality in Australian women (AIHW 2010). An important part of diabetes education includes providing information and goal setting to address lifestyle risk factors including smoking, nutrition, alcohol and physical activity (Colagiuri et al 2009).

'Perceived barriers' is a theoretical construct that is described in a number of health promotion models and social-cognitive theories including the health belief model (Becker et al 1977) and the health promotion model (Pender 1982). There is substantial evidence from research conducted over a number of decades that 'perceived barriers' are a significant predictor of health promoting behaviour (Pender 2006) and that women face a range of environmental, social and barriers that prevent them from engaging in healthy lifestyle activities (Gatewood et al 2008; Osuji et al 2006; Perry, Rosenfeld, and Kendall 2008; Wilcox et al 2003; Williams et al 2006). Despite this evidence, current evidence based guidelines for lifestyle risk factor modification in type 2 diabetes (Diabetes Australia 2007; 2009; 2011/12; International Diabetes Federation 2003) do not explicitly incorporate the concept of barriers or how to overcome barriers to action.

Building on elements of Pender's health promotion model (HPM) (1982, 2006, 2010), this paper proposes that the concept of perceived barriers to lifestyle risk factor modification could be incorporated into existing frameworks for diabetes education to enhance lifestyle risk factor education in type 2 diabetes. The development of a 'Lifestyle risk factor modification and perceived barriers model' is described with clinical practice applications suggested.

BACKGROUND

Type 2 diabetes

Type 2 diabetes poses a significant health issue for the international and Australian community and has been identified as a priority area for prevention and management policies and strategies (National Health Priority Action Council 2006; WHO 2008). In 2005 an estimated 1.1 million people worldwide died from diabetes and in 2009, there were around 200 million people with type 2 diabetes (WHO 2009). Recent data from the Australian Institute of Health and Welfare (AIHW) indicates that the prevalence of diabetes in Australia has trebled since 1989 – 90, however current figures do not represent the real prevalence as the illness often remains undiagnosed (2010). In women, the prevalence of type 2 diabetes increases markedly after the age of 45 years (AIHW 2008) and in 2007 was the seventh highest cause of death in women over 65 years of age (AIHW 2010). In 2007, a total of 13,101 (9.5%) of all Australian deaths were attributable to diabetes, with predictions that type 2 diabetes will be the leading cause of disease burden by 2023 (AIHW 2010). Diabetes, as an underlying cause of death, is strongly associated with other causes of death including coronary heart disease, kidney disease, heart failure and stroke (AIHW 2010).

It is estimated that 80% of type 2 diabetes is preventable primarily through a healthy diet and regular moderate exercise (WHO 2009). There is evidence that interventions to target these modifiable risk factors can reduce the relative risk of developing type 2 diabetes in at risk individuals (Lindström et al 2003; Lindström et al 2006; The Diabetes Prevention Program Research Group 2002; Tuomilehto et al 2001). There is also evidence that risk factor reduction in type 2 diabetes improves diabetic control and reduces short and long term complications (Colagiuri et al 2009; Eigenmann and Colagiuri 2007). So on diagnosis of type 2 diabetes, an essential component of diabetes care and education should include assessment of non-modifiable and modifiable risk factors especially smoking, nutrition, alcohol intake and physical activity.

PERCEIVED BARRIERS

Health promotion models and perceived barriers

Health promotion has been described by WHO as “the process of enabling people to increase control over the determinants of health and thereby improve their health” (1986). WHO’s *Global strategy on diet, physical activity and health* (WHO 2005) targets chronic diseases such as type 2 diabetes, and recommends health promotion activities and strategies should focus not only on social and environmental risk factors but also individual behaviour change to address risk factors. In this context, lifestyle risk factor modification in type 2 diabetes education can be described as health promotion.

Perceived barriers is a health promotion concept first clearly described in the health belief model (HBM) (Becker 1974) developed in the 1950s and 1960s by social psychologists to explain the failure of people to participate in public health programs such as immunisation and tuberculosis screening in the United States of America (USA). In the HBM perceived barriers are obstacles or impediments to taking action in response to a perceived threat of illness which influence whether or not action is taken (Becker et al 1977). In a review of studies conducted in the 1970s and 1980s that used the HBM, of all the concepts measured, perceived barriers were reported to be the single most powerful predictor of health promoting behaviour across all studies and behaviours (Janz and Becker 1984). Pender’s health promotion model (HPM) was developed in the early 1980s with the aim of integrating nursing and behavioural science theory to promote high level personal health and well-being (Pender 1982, 2006; Pender, Murdaugh, and Parsons 2010). The HPM is multidimensional and reflects WHO principles of health promotion and also incorporates constructs from social-cognitive theory such as self-efficacy, and from the health belief model the concept of perceived barriers. *Perceived barriers* have been defined by Pender and colleagues as:

“real or imagined...perceptions concerning the unavailability, inconvenience, expense, difficulty, or time consuming nature of a particular action...often viewed as mental blocks, hurdles, and personal costs of undertaking a given behaviour...loss of satisfaction from giving up health-damaging behaviours...may also constitute a barrier” (Pender 2006, p. 53).

In a review of studies using the HPM as a theoretical construct, 79% provided evidence that perceived barriers are important determinants of health promoting behaviour (Pender 2006). In particular there are a number of studies where barriers to action have been found to be significant predictors of health promoting behaviour especially exercise behaviour (Jones and Nies 1996; Kaewthummanukul et al 2006; Moore et al 2003; Osuji et al 2006; Stuifbergen, Seraphine, and Roberts 2000).

Perceived barriers in women

In the context of a study investigating perceived barriers to healthy lifestyle activities in midlife and older Australian women with a chronic disease (McGuire 2011), a literature search was undertaken using electronic databases with a range of search terms used including: ‘perceived barriers’, ‘women’, ‘chronic disease’, ‘diabetes’, ‘health promotion’ and ‘risk factors’.

A review of this literature revealed substantial evidence that women face a range of barriers that prevent them from engaging in healthy lifestyle activities. Much of the research has been conducted in the USA, where studies have explored the perceived barriers for well African American women with evidence that barriers of time, fatigue, family responsibilities, physical exertion, and motivation are significant (Jones and Nies 1996; Wilcox et al 2003; Wilcox et al 2005; Wilcox et al 2002; Williams et al 2006). Other studies in the USA have explored the barriers to exercise in minority group women such as Latina and American Indian women, with similar themes emerging with the most common barriers being time, fatigue, lack of energy, role responsibilities and personal health factors (Heesch et al 2000; Juarbe et al 2002). Perceived personal

and environmental barriers to physical activity and health promoting activity in rural women have been found to include fatigue, lack of time, bad weather, no energy and no motivation (Osuji et al 2006; Paluck et al 2006). Barriers to risk factor modification in women without a history of coronary heart disease have been explored with a sub-sample of women in the 'Wisewoman' project, with women who fully participated in a health promotion program having significantly fewer barriers to attendance than other participants who had minimum or no program participation (Gatewood et al 2008). Perceived barriers to health promotion, smoking history, family history of coronary heart disease and knowledge of coronary heart disease were predictors of health promotion behaviour in a group of women who had low risk factors for coronary heart disease (Thanavaro et al 2006).

In the Australian context, a recent mixed method Queensland study used questionnaire and interviews to investigate exercise and dietary behaviour change in rural and urban midlife women (Anderson 2008). In this study, which focused on self-efficacy, 29 participants were interviewed about facilitators and obstacles to change. The main obstacles identified were work commitments, care giving commitments, illness, and injury.

Studies that have explored the perceived barriers for women with a chronic disease are fewer in number than those exploring barriers in well women. However, most reported barriers are similar: time, cost, lack of energy, safety, and social support (Crane and McSweeney 2003; Mosca et al 1998; Perry et al 2008). Other barriers, reported by women with a chronic disease, relate to specific diseases such as osteoarthritis, multiple sclerosis, and cardiovascular disease. They include: pain, other medical illnesses, fear of falling, and cardiac symptoms (Crane and McSweeney 2003; Pierce 2005; Shin et al 2006).

A recent study of African American women with type 2 diabetes found evidence that physical environmental barriers were negatively correlated with exercise self-efficacy and a decreased sense of community (Komar-Samardizija et al 2012). In Australian indigenous women with type 2 diabetes attending a diabetes cooking course, barriers to dietary change included lack of family support, social isolation caused by dietary change, poor oral health, depression, cost of food and generational food preferences (Abbott et al 2010). Some similar results emerged in a study of dietary behaviours in women with gestational diabetes with the barriers of confidence and skills in cooking healthy foods, family food preferences and time pressures reported (Zehle, 2008).

Work by Becker and colleagues in the early 1990's led to the development of a scale to measure barriers to health promotion activities in people with disabilities (Becker et al 1991; Stuifbergen and Becker 1994). More recently, research has investigated perceived barriers to health promotion activities in women with multiple sclerosis, polio, post-polio syndrome, and fibromyalgia, with a number of these studies reporting perceived barriers as a significant predictor of health promoting behaviour (Beal et al 2009; Becker and Stuifbergen 2004; Stuifbergen et al 2003; Stuifbergen et al 2000).

In Australia, a recent study explored the level and type of perceived barriers to healthy lifestyle activities in a sample of 46 midlife and older women with type 2 diabetes attending community health clinics with an average age of 66 years (McGuire 2011). In this study barriers were measured using the *Barriers to Health Promotion Activities among Disabled Persons* scale (BHADP) developed by Becker and colleagues (Becker et al 1991; Stuifbergen and Becker 1994). The leading barriers reported by the women were: lack of interest; concern about safety; fatigue; lack of money; feeling what they do doesn't help and lack of time. The average total barriers score for this group of women with type 2 diabetes was similar to the level of barriers reported in women with physical disabilities such as multiple sclerosis and post-polio syndrome (Becker and Stuifbergen 2004). While this was a small study it provides some evidence that midlife and older women with type 2 diabetes report a level and range of perceived barriers which impact on their ability to lead a healthy lifestyle.

DIABETES AND LIFESTYLE RISK FACTOR MODIFICATION

In Australia, the Australian Diabetes Educators Association is involved in training and credentialing of Diabetes Educators and recommends the use of a number of evidence based guidelines (Australian Diabetes Educators Association 2011), in particular the *Outcomes and indicators for diabetes education: A national consensus position* (Eigenmann and Colagiuri 2007) and *Diabetes management in general practice guidelines for type 2 diabetes* (Diabetes Australia 2009).

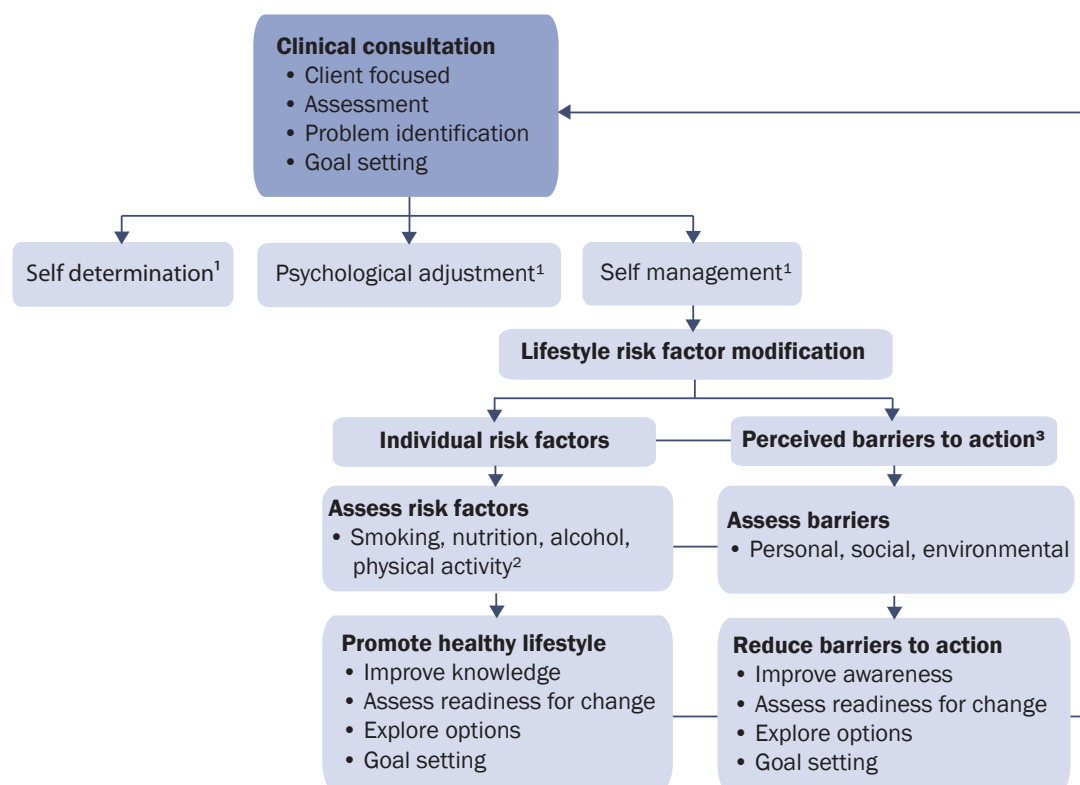
The *Outcomes and indicators for diabetes education: A national consensus position* incorporates best available evidence into a framework specifically for diabetes education (Eigenmann and Colagiuri 2007). The *Penultimate framework of outcomes and indicators for diabetes education* includes indicators that contribute to promoting the outcomes of optimal adjustment to living with diabetes, physical health and cost effective care under the four domains of *knowledge, self-determination, psychological adjustment, and self-management*. 'Physical activity' and 'appropriate eating' are listed as indicator areas in the *self-management* domain of the framework, alongside 'practical skills' (self-monitoring blood glucose; foot care, insulin injections), 'medication taking' and 'problem solving skills'. While this evidenced-based consensus framework has been developed through extensive consultation with stakeholders, it is interesting to note that risk factor reduction falls under the broad domain of *self-management*, with lifestyle factors such as smoking and alcohol consumption not included in the model (Eigenmann and Colagiuri 2007, p.36).

In contrast, the *Diabetes management in general practice guidelines for type 2 diabetes* developed for general practitioners, explicitly refer to the assessment of 'SNAP risk factors (smoking, nutrition, alcohol and physical activity)'. The guidelines emphasise the importance of establishing of a long-term lifestyle plan with for risk factor reduction (Diabetes Australia 2009).

There is no doubt that these frameworks and guidelines provide an approach to diabetes education that reflects the best available evidence about the key components of diabetes education. However, in terms of risk factor reduction in type 2 diabetes, what does not seem to be explicitly emphasised is the importance of identifying perceived barriers that prevent an individual from engaging in healthy lifestyle activities. Given the evidence from studies using the health belief model and health promotion model that perceived barriers are an important determinant of health promoting behaviours, it is argued that risk factor modification could potentially be enhanced by formal assessment and goal setting explicitly targeting perceived barriers.

Building on theoretical ideas developed following a study of perceived barriers to action in midlife and older Australian women with type 2 diabetes (McGuire 2010), effort was made to conceptualise how perceived barriers could be assessed and addressed in clinical practice. The resulting 'Lifestyle risk factor modification and perceived barriers model' incorporates the perceived barriers to action construct from Pender's health promotion model and expands the domain of *self-management* described and illustrated in the *Penultimate framework of outcomes and indicators for diabetes education* (Eigenmann and Colagiuri 2007, p.36).

The proposed model (figure 1) illustrates how in the clinical context of diabetes education where individual lifestyle risk factors such as smoking, nutrition, alcohol intake and physical activity are assessed, perceived barriers are also assessed. While education and information about healthy lifestyle behaviours is encouraged through realistic goal setting, perceived barriers are also identified and discussed. For example, if a client has a low level of physical activity then education is provided about the benefits of regular exercise with personal goal setting to promote an increase in physical activity. A client may identify lack of time or concerns about safety as barriers to increasing physical activity, and once factors are identified a clinician can explore options for overcoming those specific barriers.

Figure 1: Lifestyle risk factor modification and perceived barriers model

Notes: This model illustrates how assessment of perceived barriers can be undertaken in clinical practice. The model incorporates elements from:

¹ Penultimate framework of outcomes and indicators for diabetes education (Eigenmann and Colagiuri 2007, p. 36);

² Diabetes management in general practice guidelines for type 2 diabetes (Diabetes Australia 2009); and

³ Health Promotion Model (Pender 1982, 2006, 2010).

This model aims to provide a framework for lifestyle risk factor modification not only to improve client knowledge and commitment to reducing individual risk factors but to also improve awareness and commitment to overcoming perceived barriers that prevent women reducing risk factors. While further research is needed to investigate the validity of the model and the impact on risk factor reduction, there are a number of potential applications for the model. Diabetes educators working in acute and community health services could use the model as a prompt to discuss perceived barriers with clients. The model could also be incorporated into clinical pathways or care plans, with barriers and goals clearly documented to enhance continuity of care. There are a number of valid and reliable barriers risk assessment tools such as the *Barriers to Health Promotion Activities among Disabled Persons* scale (Becker et al 1991; Stuifbergen and Becker 1994) and the *Exercise Benefits and Barriers* scale (Sechrist et al 1987). While these assessment tools are commonly used in barriers research, they could readily be applied in clinical practice to facilitate the process of identifying and addressing perceived personal, social and environmental barriers to healthy lifestyle behaviour.

Under the current national framework for diabetes education (Eigenmann and Colagiuri 2007) physical activity and appropriate eating are currently subsumed under the *self management* domain along with practical skills, medication taking and problem solving skills. Given the evidence that women with type 2 diabetes, and no doubt other individuals, face significant barriers to healthy lifestyle activities including healthy eating and increasing physical activity it is argued that policy documents and frameworks for diabetes education could be improved by the addition of the health promotion concept of perceived barriers. Further, in the national framework lifestyle risk factor reduction in general could be better emphasised and include smoking and alcohol in addition to physical activity and appropriate eating.

CONCLUSION

At a global and national level, type 2 diabetes poses a considerable and growing challenge placing a significant burden on the individual, community and health systems. Lifestyle risk factor reduction is an important component of diabetes education that aims to improve diabetes control and reduce short and long term complications such as heart disease and renal failure. This paper has highlighted how the health promotion concept of 'perceived barriers' is a strong predictor of healthy lifestyle behaviour in women. Despite this, current frameworks for diabetes education do not include the concept of perceived barriers in relation to risk factor reduction. The 'Lifestyle risk factor modification and perceived barriers model' described could potentially enhance identification and goal setting in clinical practice to reduce an individual's perceived barriers and promote healthy lifestyle behaviours. While further research is needed to establish the efficacy of this model, it may provide an innovative contribution to lifestyle risk factor reduction in type 2 diabetes.

REFERENCES

- Abbott, P., Davison, J., Moore, L. and Rubinstein, R. 2010. Barriers and enhancers to dietary behaviour change for Aboriginal people attending a diabetes cooking course. *Health Promotion Journal of Australia*, 21(1):33-38.
- Anderson, R.L. 2008. *Exercise and dietary behaviour change in a sample of midlife Australian women*. PhD thesis, Faculty of Health, Queensland University of Technology Brisbane.
- Australian Diabetes Educators Association. 2011. *International and national guidelines*. Available from <http://www.adea.com.au/main/forhealthprofessionals/guidelinesandstandards/internationalandnationalguidelines> (accessed 04.04.11).
- Australian Institute of Health and Welfare (AIHW). 2008. *Australia's Health 2008*. Canberra: AIHW.
- Australian Institute of Health and Welfare (AIHW). 2010. *Australia's Health 2010*. Canberra: AIHW.
- Beal, C.C., Stuifbergen, A.K. and Brown, A. 2009. Predictors of a health promoting lifestyle in women with fibromyalgia syndrome. *Psychology, Health & Medicine*, 14(3):343-353.
- Becker, H. and Stuifbergen, A. 2004. What makes it so hard? Barriers to health promotion experienced by people with multiple sclerosis and polio. *Family & Community Health*, 27(1):75-85.
- Becker, H., Stuifbergen, A.K. and Sands, D. 1991. Development of a scale to measure barriers to health promotion activities among persons with disabilities. *American Journal of Health Promotion*, 5(6):449-454.
- Becker, M. 1974. *The Health Belief Model and Personal Health Behaviour*. Thorofare, New Jersey: Charles B. Slack.
- Becker, M.H., Maiman, L.A., Kirscht, J.P., Don, P.H. and Drachman, R.H. 1977. The Health Belief Model and Prediction of Dietary Compliance: A Field Experiment. *Journal of Health and Social Behavior*, 18(4):348-366.
- Colagiuri, R., Girgis, C., Eigenmann, C., Gomez, M. and Griffiths, R. 2009. *National Evidence Based Guideline for Patient Education in Type 2 Diabetes*. Canberra: Diabetes Australia and the NHMRC.
- Crane, P.B. and McSweeney, J.C. 2003. Exploring older women's lifestyle changes after myocardial infarction. *Medsurg Nursing: Official Journal Of The Academy Of Medical-Surgical Nurses*, 12(3):170-176.
- Diabetes Australia. 2011. *Diabetes Management in General Practice 2011/12*. Gorokan NSW: Diabetes Australia.
- Eigenmann, C. and Colagiuri, R. 2007. *Outcomes and Indicators for Diabetes Education - A National Consensus Position*. Canberra: Diabetes Australia.
- Gatewood, J.G., Litchfield, R.E., Ryan, S.J., Myers Geadelmann, J.D., Perdergast, J.F. and Ullom, K.K. 2008. Perceived barriers to community-based health promotion program. *American Journal of Health Behavior*, 32(3):260-271.
- Heesch, K.C., Brown, D.R. and Blanton, C.J. 2000. Perceived barriers to exercise and stage of exercise adoption in older women of different racial/ethnic groups. *Women & Health*, 30(4):61-76.
- International Diabetes Federation. 2003. *International Standards for Diabetes Education*. From http://www.msc.es/organizacion/sns/planCalidadSNS/pdf/excelencia/cuidadospaliativos-diabetes/DIABETES/opsc_est12.pdf
- Janz, N.K. and Becker, M.H. 1984. The Health Belief Model: a decade later. *Health Education Quarterly*, 11(1):1-47.
- Jones, M. and Nies, M.A. 1996. The relationship of perceived benefits of and barriers to reported exercise in older African American women. *Public Health Nursing (Boston, Mass.)*, 13(2):151-158.
- Juarbe, T., Turok, X.P. and Perez-Stable, E.J. 2002. Perceived benefits and barriers to physical activity among older Latina women. *Western Journal of Nursing Research*, 24(8):868-886.
- Kaewthummanukul, T., Brown, K.C., Weaver, M.T. and Thomas, R.R. 2006. Predictors of exercise participation in female hospital nurses. *Journal of Advanced Nursing*, 54(6):663-675.

- Komar-Samardzija, M., Braun, L.T., Keithley, J.K. and Quinn, L.T. 2011. Factors associated with physical activity levels in African-American women with type 2 diabetes. *Journal of the American Academy of Nurse Practitioners*, 24(4):209-217.
- Lindström, J., Eriksson, J.G., Valle, T.T., Aunola, S., Cepaitis, Z., Härkönen, M., Hämäläinen, H., Ilanne-Parikka, P., Keinänen-Kiukaanniemi, S., Laakso, M., Louheranta, A., Mannelin, M., Martikkala, V., Moltchanov, V., Rastas, M., Salminen, V., Sundvall, J., Uusitupa, M. and Tuomilehto, J. 2003. Prevention of diabetes mellitus in subjects with impaired glucose tolerance in the Finnish Diabetes Prevention Study: results from a randomized clinical trial. *Journal Of The American Society Of Nephrology*, 14(7 Suppl 2):S108-S113.
- Lindström, J., Ilanne-Parikka, P., Peltonen, M., Aunola, S., Eriksson, J.G., Hemiö, K., Hämäläinen, H., Härkönen, P., Keinänen-Kiukaanniemi, S., Laakso, M., Louheranta, A., Mannelin, M., Paturi, M., Sundvall, J., Valle, T.T., Uusitupa, M. and Tuomilehto, J. 2006. Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention Study. *Lancet*, 368(9548):1673-1679.
- McGuire, A.M. 2011. Factors influencing health promotion activities in midlife and older women with a chronic disease. Masters Thesis, Queensland University of Technology, Brisbane.
- Moore, S. M., Dolansky, M. A., Ruland, C. M., Pashkow, F. J. and Blackburn, G. G. 2003. Predictors of Women's Exercise Maintenance After Cardiac Rehabilitation. *Journal of Cardiopulmonary Rehabilitation*, 23(1):40-49.
- Mosca, L., McGillen, C. and Rubenfire, M. 1998. Gender differences in barriers to lifestyle change for cardiovascular disease prevention. *Journal Of Women's Health / The Official Publication Of The Society For The Advancement Of Women's Health Research*, 7(6):711-715.
- National Health Priority Action Council. 2006. *National Chronic Disease Strategy*. Canberra: Australian Government Department of Health and Ageing.
- Osuji, T., Lovegreen, S.L., Elliott, M. and Brownson, R.C. 2006. Barriers to physical activity among women in the rural midwest. *Women & Health*, 44(1):41-55.
- Paluck, E.C., Allerdings, M., Kealy, K. and Dorgan, H. 2006. Health promotion needs of women living in rural areas: an exploratory study. *Canadian Journal Of Rural Medicine*, 11(2):111-116.
- Pender, N.J. 1982. *Health Promotion in Nursing Practice*. Norwalk, CT: Appleton-Crofts.
- Pender, N.J. 2006. *Health Promotion in Nursing Practice*. 5th ed. New Jersey: Pearson Prentice Hall.
- Pender, N.J., Murdaugh, C., and Parsons, M. 2010. *Health Promotion in Nursing Practice*. 6th ed. New Jersey: Pearson Education.
- Perry, C. K., Rosenfeld, A. G. and Kendall, J. 2008. Rural women walking for health. *Western Journal of Nursing Research*, 30(3):295-316.
- Pierce, C. 2005. Health promotion behaviors of rural women with heart failure. *Online Journal of Rural Nursing & Health Care*, 5(2):13p.
- Sechrist, K.R., Walker, S.N. and Pender, N.J. 1987. Development and psychometric testing of the exercise benefits/barriers scale. *Research in Nursing and Health*, 10(6):357-365.
- Shin, Y.H., Hur, H.K., Pender, N.J., Jang, H.J. and Kim, M.S. 2006. Exercise self-efficacy, exercise benefits and barriers, and commitment to a plan for exercise among Korean women with osteoporosis and osteoarthritis. *International Journal of Nursing Studies*, 43(1):3-10.
- Stuifbergen, A.K. and Becker, H.A. 1994. Predictors of health-promoting lifestyles in persons with disabilities. *Research in Nursing & Health*, 17(1):3-13.
- Stuifbergen, A.K., Becker, H., Blozis, S., Timmerman, G. and Kullberg, V. 2003. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. *Archives of Physical Medicine And Rehabilitation*, 84(4):467-476.
- Stuifbergen, A.K., Seraphine, A. and Roberts, G. 2000. An explanatory model of health promotion and quality of life in chronic disabling conditions. *Nursing Research*, 49(3):122-129.
- Thanavaro, J.L., Moore, S.M., Anthony, M., Narsavage, G. and Delicath, T. 2006. Predictors of health promotion behavior in women without prior history of coronary heart disease. *Applied Nursing Research: ANR*, 19(3):149-155.
- The Diabetes Prevention Program Research Group. 2002. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine*, 346(6):393-403.
- Tuomilehto, J., Lindström, J., Eriksson, J.G., Valle, T., Hämäläinen, H., Ilanne-Parikka, P., Keinänen-Kiukaanniemi, S., Laakso, M., Louheranta, A., Rastas, M., Salminen, V. and Uusitupa, M. 2001. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine*, 344(18):1343-1350.
- Wilcox, S., Bopp, M., Oberrecht, L., Kammermann, S.K. and McElmurray, C.T. 2003. Psychosocial and perceived environmental correlates of physical activity in rural and older african american and white women. *The Journals Of Gerontology. Series B, Psychological Sciences And Social Sciences*, 58(6):329-37.
- Wilcox, S., Oberrecht, L., Bopp, M., Kammermann S.K. and McElmurray, C.T. 2005. A qualitative study of exercise in older African American and white women in rural South Carolina: perceptions, barriers, and motivations. *Journal of Women & Aging*, 17(1-2):37-53.
- Wilcox, S., Richter, D.L., Henderson, K.A., Greaney, M.L. and Ainsworth, B.E. 2002. Perceptions of physical activity and personal barriers and enablers in African-American women. *Ethnicity & Disease*, 12(3):353-362.
- Williams, B.R., Bezner, J., Chesbro, S.B., and Leavitt, R. 2006. The effect of a walking program on perceived benefits and barriers to exercise in postmenopausal African American women. *Journal Of Geriatric Physical Therapy*, 29(2):43-49.
- World Health Organization (WHO). 2008. *The Global Burden of Disease 2004 update: Part 3 Disease incidence, prevalence and disability*. Geneva: WHO.

World Health Organization (WHO). 2009. *Diabetes Fact sheet No. 312*. Available from <http://www.who.int/mediacentre/factsheets/fs312/en/print.html> (accessed 08.11.10).

World Health Organization (WHO). 1986. *Ottawa charter for health promotion*. Geneva: WHO.

World Health Organization (WHO). *Preventing chronic diseases: a vital investment 2005*. Available from http://www.who.int/chp/chronic_disease_report/contents/en/index.html (accessed 10.11.10).

Zehle, K., Smith, B.J., Chey, T., McLean, M., Baumann, A.E. and Cheung, N.W. 2008. Psychosocial factors related to diet among women with recent gestational diabetes: opportunities for intervention. *The Diabetes Educator*, 34(5):807-814.