

PERSPECTIVES

Life-change events and participation in physical activity: a systematic review

STEVEN ALLENDER*, LAUREN HUTCHINSON and CHARLES FOSTER

Division of Public Health and Primary Health Care, University of Oxford, Rosemary Rue Building, Oxford OX3 7LF, UK

**Corresponding author. E-mail: steven.allender@dphpc.ox.ac.uk*

SUMMARY

Physical inactivity and related diseases are of global public health concern. In many developing countries, levels of health promoting physical activity (PA) are falling despite government initiatives. Previous work has identified that periods of transition across a life course, or 'life-change events' have implications for drop out from PA. As yet, there has been little work to understand the life course as a whole and to furnish a complete list of possible life changes that might affect participation in PA. Our paper presents a review of the published literature in which life events have been studied in relation to their effect on participation in PA. A literature search was conducted for papers published between 1977 and April 2007 and referenced in Pubmed. Papers were reviewed if they; reported the effect of a

life-change event; had PA as an outcome; reported results in English; and reported results from observational studies. The references for studies identified during this first phase were searched for further papers. Eighty-seven papers were identified as potentially relevant on the basis of title, of which 19 papers met the inclusion criteria on the basis of full text. Five life changes were identified; change in employment status; change in residence; change in physical status; change in relationships; and change in family structure. It was noted that few longitudinal studies examined PA both before and after a life event. A list of possible life events which might effect participation in PA is presented. This paper represents a first step towards a detailed programme of work on life-change events and PA.

Key words: physical activity; life events; systematic review

INTRODUCTION

The importance of physical activity (PA) to a healthy, balanced lifestyle is generally well accepted. These benefits include improved psychosocial health, functional ability and general quality of life (Powell and Pratt, 1996), reduction in risk of coronary artery disease (Batty and Lee, 2004) and some cancers (Batty and Thune, 2000). Conditions which are known to be associated with decreased PA include obesity, hypertension, diabetes, back pain, poor joint mobility and psychosocial problems (Francis, 1996; World Health Organization, 1997; Kiess *et al.*, 2001; Department of Health, 2004).

For developed countries, physical inactivity is a major public health challenge. Within the USA, the rate of childhood obesity is expected to reach 40% in the next two decades (Kopelman, 2000) and type 2 diabetes is expected to affect 300 million people worldwide within the same time (Zimmet, 2003). The Chief Medical Officer for the UK described physical inactivity within developed countries as both a major public health challenge and as an epidemic (Department of Health, 2004).

In the UK, the government has set a target for '70% of the population to be reasonably active (for example, 30 min of moderate exercise five times a week) by 2020', p. 15

(Department for Culture Media and Sport Strategy Unit, 2002; Department of Health, 2004). Given that only 37% of men and 24% of women in the UK currently meet this benchmark; this target might be considered quite ambitious (Allender *et al.*, 2006b). Further, evidence from the Health Survey for England (Joint Health Surveys Unit, 2004) shows that the number of physically inactive people (less than one occasion of 30 minutes activity per week) was increasing and that this trend was consistent for both genders and across all age groups (Allender *et al.*, 2006c).

Using cross-sectional data, Allender *et al.* (in press) found, at particular times of life, large reductions in PA among people living in the UK. Among men, there was a large reduction in PA around the time of retirement, with those of retirement age (65–74) 23% less likely to meet the PA target than those men aged 55–64. For women, 69% of those aged 15 were meeting government PA guidelines but for women aged 16–24 only 25% met the guideline (Allender *et al.*, 2006c). Although ageing is likely to have some effect on the physiological ability to participate in some forms of activity (Slingerland *et al.*, 2007) there are social factors which may mediate this relationship. One hypothesis is that there are particular times of life, or life events, which have an adverse effect on participation in PA.

A systematic review of qualitative research into barriers and motivations to PA found that life circumstances have an effect on people's participation in PA (Allender *et al.*, 2006a). This review found that among teenagers and young women these changes include the transition from childhood to adulthood, changing schools, first time employment and changing tastes for types of activity with age. Generally life changes were found to have a negative effect on participation in PA. Among adults and older adults these changes in life circumstances included becoming disabled and the death of a spouse or partner (Cooper and Thomas, 2002).

In developed countries such as the UK or Australia, levels of PA have been low and it is important to understand how life events may impact on participation in PA. The first step is to identify previous studies which have examined this relationship. This paper reports on a review of the published literature reporting studies on the effects of life events on

participation in PA. In this paper, we summarized the findings of previous studies which have a life event as the exposure and PA as an outcome to develop a list of the life events covered in the peer-reviewed literature.

The research question informing this review was: 'What different life events have been studied in the peer-review literature with participation in PA as the outcome?'

METHODS

The MeSH dictionary in Pubmed was used to identify search terms for this review (Table 1). The search terms were truncated and wild cards were used to remove the necessity for Americanized spelling and the likelihood of typing errors in keywords, reducing the number of hits.

The QUORUM statement in Figure 1 summarizes the review process. The literature search was conducted in two phases. In the first phase, a full PubMed (1977 to April 2007) search was conducted and papers were excluded from the review if the reported study:

- (i) did not report the effect of a 'life-change event' or change in life circumstance.
- (ii) did not include participation in PA as one of the measured outcomes.
- (iii) did not report results in English (for pragmatic reasons).
- (iv) did not report results from observational or descriptive studies.

In the second phase, the references of studies included in the first phase were

Table 1: MeSH terms for review

MeSH term	Description	Year introduced
Life-change event	Those occurrences, including social, psychological and environmental, which require an adjustment or effect a change in an individual's pattern of living	1977
Motor activity	The PA of a human or an animal as a behavioural phenomenon	1968
PA	NB: Included, although not a MeSH term quite often used by authors as a key word	—

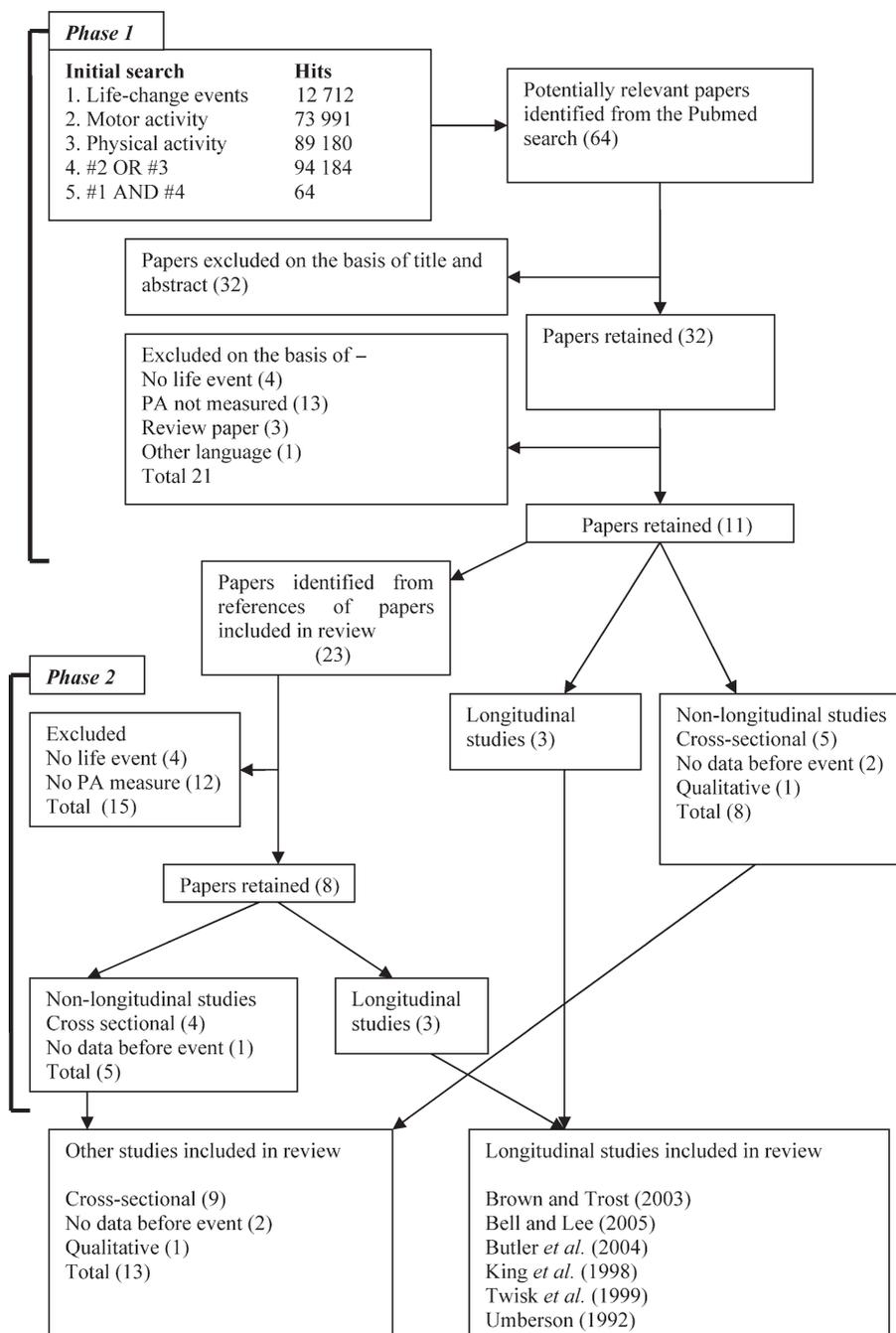


Fig. 1: QUORUM statement.

searched for potentially relevant papers. Potentially relevant papers were sourced and subject to the same inclusion criteria as those detailed above.

The final data corpus for review thus comprised all papers meeting the inclusion criteria either from the initial Pubmed search or referenced in this initial batch.

A data extraction tool was adapted from previous systematic reviews (Foster and Hillsdon, 2004). This tool collected information from each study included in the review on; study aim; research question; participants; target group; methods; main findings; references to check; notes; quality; and life events covered.

Phase one. The initial Pubmed search identified 64 potentially relevant papers, of which 11 were retained (Figure 1). The majority of those rejected at this step either did not include PA as a measure or did not report on a life-change event.

Phase two. A further 23 potentially relevant papers were identified from the references of the 11 papers included in phase one of the review (Figure 1). Of these eight were retained with the majority excluded because they did not include PA as a measure.

After both phases of the selection process, a total of 19 papers met the inclusion criteria for the review. This number included six review studies.

RESULTS

It became clear over the course of the review that a number of observational cross-sectional studies examined the relationship between PA and life course events at one point in time. These papers would typically take the form of recall either of PA status or life-change events or both over a long period of time (e.g. Courneya and Friedenreich, 1997; Mooy *et al.*, 2000).

We identified five broad areas of life event within the papers reviewed. These were: change in employment status; change in residence; change in physical status; change in relationships; and change in family structure. Detailed results are presented in Table 2.

Change in employment status

Three studies examined change in employment status and subsequent participation in PA. Participants in all three studies were Australian women; two studies (Brown and Trost, 2003; Bell and Lee, 2005) reported different analysis of the same dataset while the third analysed a subset of this data (Bell and Lee, 2006). In a 4-year follow-up study, Brown and Trost (2003) found that levels of PA decreased in women who had begun paid work during the study

period. This result was not affected by age, income, educational attainment, language spoken at home, BMI at follow-up or baseline PA. Bell and Lee (2006) supported this finding and also found that employment was a factor in PA participation. In Bell's study of 853 Australian females aged between 22 and 27, females who began work at an earlier age (e.g. at age 18) were less likely to be physically active than those women who begun paid employment later in life (e.g. at age 23). In a cross-sectional study of 8454 Australian 20–27 year old females, Bell and Lee (2005) found an association between unemployment and low PA. It should be noted that this association was not observed in the longitudinal data collected from the same women. These authors identified a relationship between unemployment, and moving from unemployment to employment at a young age, and physical inactivity. It is important to note that these studies all focus on Australian younger women.

Change in residence, place and circumstance

Two studies investigated change in residential status and PA among women (Bell and Lee, 2005; Butler *et al.*, 2004). Neither study examined residential change alone; Bell investigated residential change to cohabiting live-in relationships whereas Butler studied diet, PA and prevalence of obesity associated with residential change during the transition from secondary school to university. Both studies found that a change in residential status was associated with a decrease in PA. Through analysis of longitudinal data over 4 years from a study of Australian women Bell and Lee (2005) found that moving to a live-in relationship was associated with a decrease in PA. Butler *et al.* (2004) undertook a 5-month follow-up study which concluded that relocation from home to university led to a decrease in PA. Although the decrease in PA observed by Butler *et al.* did not reach statistical significance, the authors argue that an observed significant increase in weight was likely to be related to a decrease in PA. Both studies suggest that change in residence may lead to a decrease in PA among young women.

Change in physical status

A number of studies examined the relationship between particular changes in physical status

Table 2: Findings from longitudinal and cross-sectional studies

Study	Country	Design	Sample	Study aim	Life event covered	Findings
Longitudinal studies Bell and Lee (2005)	Australia	Four-year follow-up study	8545 Australian women aged 18–23 at baseline	To explore the relationship between PA status and change and status in four life domains	Residential independence, employment status, relationship status and motherhood	Longitudinally, decreases in PA were most strongly associated with moving into a live-in relationship, with getting married, and with becoming a mother
Brown and Trost (2003)	Australia	Four-year follow-up study	7281 Australian women aged 18–23 at baseline	To ascertain whether key life events experienced by young women in their early twenties are associated with increasing levels of inactivity	Getting married, birth of first child, birth of second or later child, divorce or separation, becoming a single parent, returning to study, beginning/resuming work and changing work patterns	Women who reported getting married, having a first or subsequent child or beginning paid work were more likely to be inactive at follow-up than those who did not report these events
Butler <i>et al.</i> (2004)	USA	Five-month follow-up study	54 freshmen women upon entry to college at baseline	To examine diet, PA and body-weight changes associated with relocation from home to university	Relocation from home to university	Relocation from home to university led to an observed but non-significant decrease in PA at follow-up
King <i>et al.</i> (1998)	USA	Five time points throughout a 10-year period	558 subjects aged 25–75 years	To evaluate the effects of making a marriage transition on subsequent PA	Marriage transition	No overall significant difference between groups, however, individuals who became married during the 10-year period showed a significantly different pattern of PA change compared with individuals who remained single throughout the study period

Twisk <i>et al.</i> (1999)	The Netherlands	Two-year follow-up study	166 subjects aged 27 at baseline	To investigate the relationship between changes in daily hassles and life events and biological and lifestyle risk factors for coronary heart disease	89 possible life events, each scored to give the participant a single measure for life events experienced	No significant relationship between extent of impact of life events and subsequent PA participation
Umberson (1992)	USA	Three-year follow-up study	2867 participants aged 24 or older at baseline	To test the hypothesis that marriage may be beneficial to health because many spouses monitor and attempt to control their spouse's health behaviours. Further to test whether the provision, receipt and consequences of these social control efforts vary for men and women	Marriage transitions	Among divorced men there was a likeliness to decrease PA levels, but this was not significant for women. Cross-sectional analysis found among men, widowhood led to a decrease in PA, but this was not significant for women
Cross-sectional and other studies Barnekow-Bergkvist <i>et al.</i> (1996)	Sweden	18-year follow-up	435 students aged 16 at baseline with an 88% participation in second wave	To investigate gender-related differences in PA patterns at the ages of 16 and 34 and to analyse those factors that might contribute to an explanation of PA habits in adulthood	Having children	Having children increased likeliness of inactivity, particularly for women
Bell and Lee (2006)	Australia	Cross-sectional	853 Australian females aged 22–27 years	To examine the relations between the timing and sequencing of life transitions and stress and health-related behaviours, focusing on the transition to young adulthood among Australian women	Moving out of home, stopping full-time education, starting full-time work, having the first live-in relationship, marriage and motherhood	Association between age at which life event occurs and subsequent effect upon PA; low PA was related to stopping education younger and starting work earlier

Continued

Table 2: *Continued*

Study	Country	Design	Sample	Study aim	Life event covered	Findings
Blanchard <i>et al.</i> (2003)	Canada	Cross-sectional (with a retrospective questionnaire)	352 adult cancer survivors	To examine changes in lifestyle behaviours after cancer diagnosis and medical demographic influences on such changes	Cancer diagnosis	Almost a third of cancer survivors exercised less since diagnosis
Caputo <i>et al.</i> (1998)	USA	Cross-sectional	69 sixth graders with a mean age of 11.7 years	To examine the relationship between self-reported positive life events and blood pressure in sixth graders	Positive life events (from the Adolescent Perceived Events Scale) in the preceding 3 months	Found no association between frequency of life events in the previous 3 months and participation in PA
Courneya and Freidenreich (1997)	Canada	Cross-sectional (with a retrospective questionnaire)	130 colorectal cancer survivors who had been diagnosed within the previous 4 years	To identify the main exercise patterns of colorectal cancer survivors across the cancer experience and determine their relationship with current quality of life	Colorectal cancer survival	Exercise levels decreased from pre-diagnosis to active treatment and then increased from active treatment to post-treatment but not back to pre-diagnosis levels
Devine <i>et al.</i> (2000)	USA	Longitudinal ^a prospective beginning at pregnancy through to 6 months postpartum	36 women aged between 18 and 41	To develop an in-depth understanding of women's experiences of pregnancy and postpartum, the strategies that women used to deal with weight changes, and patterns in their attitudes and strategies across pregnancy and the postpartum period	Pregnancy through to postpartum	Pre-pregnancy attitudes towards body weight were the primary influence on women's PA patterns of PA, weight and diet after the birth of their child
Gottlieb and Green (1984)	USA	Cross-sectional	3025 participants aged 20–64 who were involved in the National Survey of Personal Health Practices	To explore the relationship among social structure, stress, social support, lifestyle health behaviour and health status	Negative life events measured and weighted	The presence of life events has slight a negative effect for females and slight positive effect for males

Grace <i>et al.</i> (2006)	USA	Longitudinal ^a prospective beginning in pregnancy and following to return to work	42 participants were recruited while pregnant and re-assessed during maternity leave and upon return to work, and compared with 201 non-pregnant participants	(1) To investigate women's health-promoting behaviours in several realms, including nutrition, stress management and particularly PA, across the transitions from pregnancy to maternity leave and return to work; (2) to compare health-promoting behaviours in maternity and non-maternity samples and (3) to assess the relations of demographic and psychosocial factors to these health-promoting behaviours	Pregnancy, maternity leave and return to work	No significant change in the mean score of PA from pregnancy through to postpartum period. Also found that PA did not differ between the maternity group and control group
Kuh and Cooper (1992)	England, Wales and Scotland	Data collected at childhood, adolescence and 36 years	3500 men and women	To describe the sex and socioeconomic differences in patterns of PA at work and in leisure time of men and women aged 36 years, and to investigate factors in childhood and adolescence which predict high rates of participation in sports and recreational activities in later life	Illness or disability in childhood or adolescence	Negative predictors of high sporting PA in later life included physical disability at 13 years and, for women only, serious illness in childhood or adolescence.
Melamed <i>et al.</i> (1997)	Israel	Cross-sectional	1859 men without cardiovascular disease	To test the association between reported intensity of life events and blood pressure and serum lipid levels, risk behaviours and psychological distress symptoms	Used the Israeli PERI life event scale which assesses the frequency and intensity of 15 stressors experienced over the past year	Found an association between increased numbers of life events experienced and a decrease in PA participation

Continued

Table 2: *Continued*

Study	Country	Design	Sample	Study aim	Life event covered	Findings
Mooy <i>et al.</i> (2000)	Holland	Cross-sectional	2262 participants aged 50–74 years without a history of diabetes	To test whether chronic psychological stress is associated: (1) with prevalence of type 2 diabetes; (2) with visceral adiposity; and to test whether the relationship between stress and diabetes is mainly mediated by visceral diabetes	Major life events over the past 5 years from the questionnaire 'serious life events'	Suggests no significant correlation between number of life events experienced and subsequent PA participation
Pinto <i>et al.</i> (2002)	USA	Longitudinal ^a prospective over 12 months	69 women who had completed treatment for stage 0–2 breast cancer	To investigate mood, quality of life, cancer-related symptoms and exercise behaviour of breast cancer survivors	Completion of treatment of 0–2 stage breast cancer	Women did not increase their exercise participation over time and that overall mean minutes of exercise participation were below recommended levels.
Satia <i>et al.</i> (2004)	USA	Two-year follow-up since cancer diagnosis	278 Cancer survivors and 459 population-based controls	To describe longitudinal changes in lifestyle changes and health status among colon cancer survivors	Colon cancer	Found an increase in PA participation for both cancer survivors and control group

^aAlthough these studies are longitudinal data on PA were not collected before and after the life event of interest.

and PA. These included studies on the effects of pregnancy, disease (such as cancer) and illness and disability during childhood.

Pregnancy

Two studies identified in the review examined the effects of pregnancy upon PA participation; findings from these studies suggest that pregnancy has no major impact upon PA levels. It is important to note that neither study measured PA in participants before pregnancy but rather they relied on participant recall. Grace *et al.* (2006) followed 42 pregnant women through maternity leave and return to work and compared them with 201 non-pregnant co-workers. This study found no significant change in the mean PA score during pregnancy when compared with the postpartum period. There was no observed difference in mean PA between the maternity group and the control group. Devine *et al.* (2000), in a qualitative analysis of women from pregnancy through to 6 months postpartum, found that pre-pregnancy orientations towards bodyweight emerged as the primary influence on women's postpartum attitudes towards weight, on patterns of PA and diet and on postpartum weight outcomes among most study participants. As neither study measured pre-pregnancy PA participation, and both finished data collection in the postpartum period, it is difficult to draw any conclusions about the longitudinal impact of pregnancy upon PA.

Cancer

Four studies investigated the effect of cancer diagnosis or treatment on participation in PA. Two studies examined patient's perceived levels of physical exercise before and after a cancer (Courneya and Friedenreich, 1997; Blanchard *et al.*, 2003). Two more longitudinally examined the effect of cancer survival on participation in physical exercise (Pinto *et al.*, 2002; Satia *et al.*, 2004).

Both Blanchard *et al.* (2003) and Courneya and Friedenreich (1997) conducted retrospective studies of exercise participation among cancer survivors and both found that participants reported a decrease in exercise levels from pre- and post-diagnosis. Courneya and Friedenreich (1997) studied 130 survivors of colorectal cancer and while the participants reported an increase in exercise post-diagnosis

and a second increase post-treatment, objective measurement using the leisure score index of the Godin Leisure Time Exercise Questionnaire showed that exercise levels had remained the same or decreased since pre-diagnosis. Although the two studies show a decrease in PA post-diagnosis, they come from self-reported retrospective findings, which are often unreliable.

In a study of 69 women who had completed treatment for stage 0–2 breast cancer, Pinto *et al.* (2002) found no change in exercise participation over a 12-month follow-up post-treatment. In contrast, the study of 278 cancer survivors conducted by Satia *et al.* (2004) reported an increase in PA participation over a 2-year period of follow-up. The Satia study needs to be interpreted with caution, however, because the group of 459 population-based controls also increased their levels of PA, second there was no difference between PA levels between controls and cancer survivors, suggesting that the change in disease state among the cancer survivors may not be related to the change in PA status. A second caveat to interpreting these studies is that they did not measure PA pre-diagnosis. Because none of the studies identified in the review measured PA participation before cancer diagnosis as well as post-treatment no firm conclusions can be drawn on the effects of cancer diagnosis upon subsequent PA participation.

Childhood illness/disability

We identified one study which examined the relationship between childhood illness and subsequent effects on PA in adulthood. Kuh and Cooper (1992) reported results from a birth cohort study of 3500 men and women at age 36 and showed that for all adults who had suffered a physical disability by the age of 13 years, and for women who had suffered a serious illness during childhood or adolescence, there were reduced levels of PA when compared with their healthier counterparts.

Change in relationships

Four longitudinal studies were identified which examined the effect of relationship transitions upon PA participation. The relationship transitions examined in these studies included change from being single to married and from

being married to single (either by divorce, separation or widowhood) (Umberson, 1992; King *et al.*, 1998; Brown and Trost, 2003; Bell and Lee, 2005). Two of these studies (Brown and Trost, 2003; Bell and Lee, 2005) used data from the Australian Women's Longitudinal Health Survey (AWLHS). Umberson (1992) was the only study to examine the effect of widowhood on levels of PA.

Single to married

The AWLHS study involved more than 7000 women aged 18–23 years followed up over a period of 4 years. Both Bell and Lee (2005) and Brown and Trost (2003) rely on data from this study to show that marriage led to a decreased participation in PA among young Australian adult females. King *et al.* (1998) reported results from a 10-year study of 558 participants aged 25–75 which aimed to evaluate the effect of a marital transition on PA. This study found no difference between transition groups in terms of overall PA participation.

They did find that participants who became married displayed a unique pattern of behaviour; a decline in PA during the pre-marriage period, followed by a relative levelling off in the post-marriage period. It may be that Bell and Lee (2005) and Brown and Trost (2003), reporting data collected over a shorter period (4 years), were in fact observing this post-marital dip reported by King *et al.* (1998).

Married to single

There appeared to be either a small reduction or no change in PA when moving from being single to married. In a 3-year study of almost 2800 participants aged 24 or older at baseline, Umberson (1992) found that levels of PA among men were likely to be reduced after divorce. No such pattern was observed among women. The same study found cross-sectional associations between widowhood in men and decreased participation in PA.

Change in family structure

The only change in family structure studied in terms of subsequent effect on participation in physical exercise was becoming a parent. Three studies found that parenthood was associated with decreased PA participation. Bell and Lee (2005) and Brown and Trost (2003), both using

the AWLHS, found that becoming a mother for the first time led to decreased PA participation over a 4-year follow-up period. An 18-year follow-up of 435 students aged 16 at baseline in Sweden (Barnekow-Bergkvist *et al.*, 1996) found that having a first child before the age of 34 was associated with inactivity, particularly among women.

DISCUSSION

We set out to identify which life events had been studied in relation to participation in PA in the peer-review literature. We found 19 papers in the literature that covered a range of life events which we categorized under five broad categories; change in employment status; change in residence; change in physical status; change in relationships; and change in family structure.

Our study is the first of its kind to try and bring together the disparate literature on life-change events and PA status. Most studies reviewed examined one or two life-change events with relation to PA. Typically these are done as a secondary analysis with data that were collected as part of a larger study. Two of the three longitudinal studies and all three of the studies conducted in the past 10 years that focus on young adult females used the same dataset, the AWLHS (Brown and Trost, 2003; Bell and Lee, 2005). Although the AWLHS collects detailed information on the biological, psychological, environmental, social and economic factors relevant to women's health to determine their interactions and the determinants of physical and mental health (Bell and Lee, 2006), it remains one of the few data sources used in studies of life events (see <http://www.awlhs.org.au/>). We would argue that further studies involving a broader range of participants are required to expand our understanding of the influence of life events on subsequent PA status.

This review was limited to literature first identified in PubMed and second to studies identified in those papers returned by the PubMed search. A more thorough review might include other databases such as MEDLINE, EMBASE, PSYCINFO and SPORTDISCUS. Our intention was to provide a scoping review to get a feel for the state of the literature. We feel that we have achieved this and while a

more extensive search may identify more studies it is unlikely, with the exception of PSYCINFO and changes in mental status, that further life-change events have been studied than those reported here. A second weakness of the studies reviewed was that only 6 of the 19 reported data from longitudinal studies, and three of those from the same dataset.

This limits the generalizability of the findings considerably as does the reliance on self-reported recall of PA levels before the life-change event of interest in the 13 cross-sectional studies. This is a particular concern as there is some concern that participants over estimate their levels of PA in self-report studies (Ainsworth and Levy, 2004). In addition, measures of PA may not be specific to the types of PA, for example, undertaken by young parents.

We were surprised at the limited number of life events covered by this research. Potential areas for future study might include change from junior to secondary school and from secondary school to further and higher education; fatherhood; bereavement; and so on. A secondary aim of this study was to populate a list of all possible life events which may affect PA as a first step in developing future research. This exhaustive list can be found in the on-line appendix to this paper.

Many governments in developed countries have set ambitious targets for population PA. These targets reflect the increasing social, political and health policy importance of PA. Previous work with cross-sectional data has identified that there are differences in PA between differing age groups. (Allender *et al.*, in press). Any attempt to increase or even reverse trends in population PA must address the impact of changes in life events or life circumstance on PA participation.

CONCLUSIONS

Recent increased attention and importance attributed to PA by governments at local and national level is welcome. Recent trend data from the UK suggests that current interventions to promote sport and PA are inadequate (Allender *et al.*, 2006a, b, c). This review suggests that life change events *do* affect participation in PA and, in light of changing

participation rates, forms an important and neglected area of study.

Conflict of Interest: None declared.

FUNDING

SA and CF are supported by funding from the British Heart Foundation.

REFERENCES

- Ainsworth, B. E. and Levy, S. S. (2004) Assessment of health-enhancing physical activity: methodological issues. In Oja, P. and Borms, J. (eds), *Health Enhancing Physical Activity*. Meyer and Meyer, Oxford.
- Allender, S., Cowburn, G. and Foster, C. (2006a) Understanding participation in sport and physical activity among children and adults: a review of qualitative studies. *Health and Education Research*, **21**, 826–835.
- Allender, S., Peto, V., Scarborough, P., Boxer, A. and Rayner, M. (2006b) *Coronary heart disease statistics*. British Heart Foundation, London.
- Allender, S., Peto, V., Scarborough, P., Boxer, A. and Rayner, M. (2006c) *Diet, physical activity and obesity statistics*. British Heart Foundation, London.
- Allender, S., Foster, C. and Boxer, A. Occupational and non-occupational physical activity and the social determinants of physical activity: Results from the Health Survey for England. *Journal of Physical Activity and Health* (in press).
- Barnekow-Bergkvist, M., Hedberg, G., Janlert, U. and Jansson, E. (1996) Physical activity pattern in men and women at the ages of 16 and 34 and development of physical activity from adolescence to adulthood. *Scandinavian Journal of Medicine and Science in Sport*, **6**, 359–370.
- Batty, D. and Lee, I. M. (2004) Physical activity and coronary heart disease. *British Medical Journal*, **328**, 1089–1090.
- Batty, D. and Thune, I. (2000) Does physical activity prevent cancer? *British Medical Journal*, **321**, 1424–1425.
- Bell, S. and Lee, C. (2005) Emerging adulthood and patterns of physical activity among young Australian women. *International Journal of Behavioural Medicine*, **12**, 227–235.
- Bell, S. and Lee, C. (2006) Does timing and sequencing of transitions to adulthood make a difference? Stress, smoking, and physical activity among young Australian women. *International Journal of Behavioural Medicine*, **13**, 265–274.
- Blanchard, C. M., Denniston, M. M., Baker, F., Ainsworth, S., Courneya, K., Hann, D. *et al.* (2003) Do adults change their lifestyle behaviours after a cancer diagnosis? *American Journal of Health Behavior*, **27**, 246–256.
- Brown, W. and Trost, S. (2003) Life Transitions and Changing Physical Activity Patterns in Young Women. *American Journal of Preventative Medicine*, **2**, 140–143.
- Butler, S., Black, D., Blue, C. and Gretebeck, R. (2004) Change in Diet, Physical Activity, and Body Weight in

- Female College Freshman. *American Journal of Health Behaviour*, **28**, 24–32.
- Caputo, J., Rudolph, D. and Morgan, D. (1998) Influence of Positive Life Events on Blood Pressure in Adolescents. *Journal of Behavioural Medicine*, **21**, 115–129.
- Cooper, L. and Thomas, H. (2002) Growing old gracefully: social dance in the third age. *Ageing and Society*, **22**, 689–708.
- Courneya, K. S. and Friedenreich, C. M. (1997) Relationship between exercise pattern across the cancer experience and current quality of life in colorectal cancer survivors. *Journal of Alternative Complementary Medicine*, **3**, 215–226.
- Department of Culture Media and Sports Strategy Unit (2002) *Game Plan: a strategy for delivering Government's sport and physical activity objectives*. Cabinet Office, London.
- Department of Health (2004) *At least five a week: a report from the Chief Medical Officer*. Department of Health, London.
- Devine, C., Bove, C. and Olson, C. (2000) Continuity and change in women's weight orientations and lifestyle practices through pregnancy and the postpartum period: the influence of life course trajectories and transitional events. *Social Science and Medicine*, **50**, 567–582.
- Foster, C. and Hillsdon, M. (2004) Changing the environment to promote health-enhancing physical activity. *Journal of Sports Sciences*, **22**, 755–69.
- Francis, K. (1996) Physical activity in the prevention of cardiovascular disease. *Physical Therapy*, **76**, 456–468.
- Gottlieb, N. and Green, L. (1984) Life events, social network, life-style, and health: an analysis of the 1979 national survey of personal health practices and consequences. *Health Education Quarterly*, **11**, 91–105.
- Grace, S., Williams, A., Stewart, D. and Franche, R. (2006) Health-promoting behaviours though pregnancy, maternity leave, and return to work: Effects of role spillover and other correlates. *Women and Health*, **42**, 51–72.
- Joint Health Surveys Unit (2004) *Health Survey for England 1998*. HMOS, London.
- Kiess, W., Galler, A., Reich, A., Müller, G., Meyer, K., Galler, A., et al. (2001) Clinical aspects of obesity in childhood and adolescence. *Obesity Reviews*, **2**, 29–36.
- King, A. C., Kiernan, M., Ahn, D. and Wilcox, S. (1998) The effects of marital transitions on changes in physical activity: results from a 10-year community study. *Annals of Behavioural Medicine*, **20**, 64–69.
- Kopelman, P. G. (2000) Obesity as a medical problem. *Nature*, **404**, 635–643.
- Kuh, D. J. L. and Cooper, C. (1992) Physical activity at 36 years: Patterns and childhood predictors in a longitudinal study. *Journal of Epidemiology and Community Health*, **46**, 114–119.
- Melamed, M., Kushnir, T., Strauss, E. and Vigiser, D. (1997) Negative association between reported life events and cardiovascular disease risk factors in employed men: the CORDIS study. *Journal of Psychosomatic Research*, **43**, 247–258.
- Mooy, J., De Vries, H., Grootenhuys, P., Bouter, L. and Heine, R. (2000) Major Stressful Life Events in Relation to Prevalence of Undetected Type 2 Diabetes. *Diabetes Care*, **23**, 197–201.
- Pinto, B. M., Trunzo, J. J., Reiss, P. and Shiu, S. Y. (2002) Exercise participation after diagnosis of breast cancer: trends and effects on mood and quality of life. *Psycho-Oncology*, **11**, 389–400.
- Powell, K. E. and Pratt, M. (1996) Physical activity and health. *British Medical Journal*, **313**, 126–127.
- Satia, J., Campbell, M., Galanko, J., James, A., Carr, C. and Sandler, R. (2004) Longitudinal Changes in Lifestyle Behaviours and Health Status in Colon Cancer Survivors. *Cancer Epidemiology, Biomarkers and Prevention*, **16**, 1022–1031.
- Slingerland, A. S., van Lenthe, F. J., Jukema, J. W., Kamphuis, C. B. M., Looman, C., Giskes, K. et al. (2007) Aging, Retirement, and Changes in Physical Activity: Prospective Cohort Findings from the GLOBE Study. *American Journal of Epidemiology*, **165**, 1356–1363.
- Twisk, J., Snel, J., Kemper, H. and Mechelen, W. (1999) Changes in daily hassles and life events and the relationship with coronary heart disease risk factors: a two 2-year longitudinal study in 27-29-year-old males and females. *Journal of Psychosomatic Research*, **46**, 229–240.
- Umberson, S. (1992) Gender, marital status and the social control of health behaviour. *Social Science and Medicine*, **34**, 907–917.
- World Health Organization. (1997) *Obesity: preventing and managing the global epidemic*. WHO, Geneva.
- Zimmet, P. (2003) The burden of type 2 diabetes: are we doing enough? *Diabetes Metabolism*, **29**, S9–18.