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Exercise, physical activity and mental well-being in later life

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Summary

Exercise and physical activity are thought to be among the most important lifestyle factors for the maintenance of health and prevention of premature disease and mortality. Yet sedentary lifestyles are common. Many people avoid exercise, and have done so across their lifespan. Exercise and physical activity are also considered important for positive psychological functioning; however, this has received limited research attention. This mini-review discusses the effects of exercise and physical activity on mental health and well-being in later life. It draws on international peer reviewed research, summarized in systematic reviews and/or meta-anlaysis, and presents the key findings. Systematic reviews and meta-analyses generally confirm the importance of exercise for mental well-being; however, there is a lack of good quality research. The review discusses some of the barriers to exercise, and identifies strategies that may facilitate uptake and adherence in later life. Limitations in the current evidence are discussed. Based on the current evidence, it is recommended that health practitioners should encourage exercise or physical activity of low to moderate intensity, and leisure time activity such as walking, especially at retirement. Future intervention research would benefit by focusing on people who have not self-selected into studies so as to understand the causal direction, and include theory driven approaches to behaviour change.

Key words: exercise, physical activity, mental health, mental well-being, later life, older, review, elderly, psychological well-being

Introduction

The promotion of mental well-being in the older population is now recognized in public health policy to be an important factor for healthy, active ageing, and for preventing mental illness.[1] Mental well-being is a broad concept of positive psychological functioning encompassing life satisfaction, happiness, resilience, self-esteem, being in control and coping with life.[2] The more recent conceptualization of mental well-being reflect an earlier position on 'ideal mental health'.[3] Thus mental health or mental well-being is distinct from mental illness. Simply put, it can be described as 'feeling good and functioning well'.[4]

The UK Inquiry into Mental Health and Well-Being in Later Life[5] states that participation in meaningful activities or occupations and physical activity are key areas of importance for positive psychological functioning. Active engagement with life is also regarded as important for successful ageing.[6] Regular physical activity is thought to be among the most important lifestyle factors for the maintenance of health and prevention of premature disease and mortality. Yet across developed regions of the world, inactivity ranks alongside tobacco, alcohol and adiposity as a leading cause of reduced healthy life expectancy.[7]

A substantial amount of research has examined the topic of exercise and physical activity, focusing on a range of outcomes including preventing falls,[8] rehabilitation for heart failure[9] and the determinants of physical activity and exercise.[10] This mini-review focuses on an area that has received less attention, the effects of exercise on mental well-being in later life. It presents an overview of some of the key research findings identified in systematic reviews.

Search methods

A range of databases (Psychinfo, ASSIA, PsyArticles, the Cochrane library) were searched to identify systematic reviews and/or meta-analyses of relevant research (i.e. that have synthesized the relevant evidence examining the effects of exercise on mental health and mental well-being in later life). The inclusion criteria were peer-reviewed

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research papers, either a systematic review or meta-analysis published from 2000 onwards, the target population = age 50+ and the article being published in English. A combination of keywords were used to search the databases; either mood, psychological well-being, mental well-being, mental health, depression AND exercise OR physical activity. The reference lists of the reviews were used to identify further relevant papers to expand on and contextualize the results of the review. It should be noted that this paper adopted systematic principles for searching and retrieval; however, it is not a systematic review. It reviews the literature to present a discussion of some of the key factors in relation to exercise and mental well-being in later life.

Results

Is exercise effective in improving mental well-being?

One of the more recent systematic reviews of the literature is some of the author's previous work,[11] which undertook an extensive review of primary research examining the effects of exercise and physical activity interventions on mental well-being in later life. Mental well-being was broadly defined to capture a range of outcomes relating to positive psychological functioning. Evidence was restricted to randomized controlled trials (RCTs) and studies with either a comparison or control group. Qualitative evidence was included. Robust quality assessment criteria were applied, and poorer quality studies were excluded from the final analysis. A total of 13 papers satisfied the criteria for data synthesis. The types of interventions varied (e.g. walking, balance and strength, Tai Chi, light aerobic or combinations of each) and could be described as low to moderate intensity. Four studies with a total number of 909 participants were pooled in a meta-analysis. An overall significant effect of exercise on mental well-being was reported (standardized effect size = 0.27; confidence interval (CI): 0.14 to 0.40).

The 2010 review identified two other exercise and mental health meta-analyses. One evaluated the effects of exercise (cardiovascular exercise, resistance training or a combination of both) on mood (as measured by positive and negative effect) in older adults, drawing on 32 studies.[12] The review found that the mean of 61 effect sizes on mood was 0.34 ($P < 0.05$), showing that, compared with controls, exercise improves mood. However, no details of the individual studies included in the meta-analysis were provided and no quality assessments appear to have been performed; the review was based entirely on statistical analysis.

Another review, including 36 studies with 3118 participants,[13] evaluated the effects of organized physical activity (aerobic, callisthenics and resistance training) on psychological well-being (bodily well-being, emotions, self-perceptions and global well-being). This review found that aerobic exercise and resistance training had the greatest effects on psychological well-being, but these conditions did not differ significantly from each other (effect sizes of 0.29 and 0.23, respectively). Again, there is insufficient detail in this paper about the individual studies or any assessment of their methodological quality.

Whilst the findings of both Arent *et al.*[12] and Netz *et al.*[13] are compelling, in contrast to these previous meta-analyses, Windle *et al.*[11] sought to improve on this and applied quality assessment criteria to the included studies, excluding from the narrative those studies without a comparison group and those of low quality which could introduce considerable bias. Nevertheless, taken together, the three reviews generally confirm the importance of exercise for mental well-being.

More recently in 2009, Netz[14] reviewed 39 studies, which examined the effects of physical activity on mood of people aged 50+. These were synthesized according to aerobic activity, strength training and non-specific physical activity, such as yoga and Tai Chi. No conclusive evidence was found for aerobic exercise on mood, although strength training showed a stronger impact on mood. The variability within the results led Netz to recommend physical activity in later life for altering mood, but no specific recommendation for the type of activity or dose of exercise. Important to note is that Netz does not report undertaking any quality assessment of the included studies, consequently bias could be inadvertently influencing the findings. However these four reviews represent the only identified review evidence that have specifically focused on exercise and mental well-being in later life. Far more research has focused on clinical populations or used depression measures as outcomes. Of these, the following are noteworthy in the issues they raise.

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Bridle *et al.*[15] examined the effect of exercise on depression severity, synthesizing evidence from seven RCTs of mixed exercise (endurance and strength training) and undertaking a quality assessment of the included studies. Exercise was associated with significantly lower depression severity (standardized mean difference = –0.034, 95% CI: –0.052 to –0.17). In contrast, Forsman *et al.*[16] examined a range of psychosocial interventions on the prevention of depression. Most of the included studies were characterized as having unclear methodological quality, largely due to poor reporting. Three of the studies focused specifically on exercise, but the pooled analyses found no significant effect. The differences in results between these two studies may be methodological. Although both undertook extensive searching, Forsman *et al.* restricted their searching to articles published from 2006, whereas Bridle *et al.* placed no restrictions, and consequently identified more studies.

Potter *et al.*[17] examined the effects of physical activity on functioning, quality of life and depression in older people with dementia. Thirteen RCTs were included and subjected to a quality assessment. However, only four of those specifically examined depression, and three did not report any significant effects. The authors concluded from their analyses that there is no evidence on whether physical activity may impact on depression in people with dementia from RCTs, and more research is required to examine this area. This methodological aspect is important, and picked up later.

The systematic reviews demonstrate that whilst there is variability in the evidence for the effects of exercise on mental well-being, some of this reflects the lack of intervention research or different methodological approaches. However, when study quality is controlled for, there is evidence that exercise is important for mental well-being in the general population. However, in a sense this is not ground-breaking news; public health messages in Western societies all advocate good population health though a range of lifestyle factors such as diet and exercise. Pragmatically, we know it is important, yet sedentary lifestyles are common. Many people avoid exercise, and have done so across their lifespan. To help address this, there are a number of other factors that are highly salient when thinking about designing and delivering exercise programmes to support life-long health and well-being.

What are the barriers to exercise, and how can these be overcome?

Despite the importance of regular exercise and physical activity, many older people do little or none, and activity typically declines as people are ageing. Exercise and physical activity is often recommended to older adults with chronic diseases and functional limitations to prevent disease progression, maintaining independence and promoting health-related quality of life. Yet perception of poor health is consistently found to be a significant barrier to exercise. A German study[18] found that participants reported health conditions (such as heart problems, arthritis, knee or back problems) as the most important perceived barrier to impede activity, yet these conditions can strongly benefit from activity. (A number of international studies examining barriers to physical activity and exercise are summarized in Moschny *et al.* [18]) Fear of falling or injury and lack of confidence can be major barriers to activity. A qualitative study[19] explored the perceptions of 15 women aged 50 to 80, newly referred by their GPs to an exercise programme in the UK. They report that participants had experienced negative feelings towards exercise as a result of ageist social norms, like 'people should not become active in later life'.

Misunderstandings of the physical aspects of exercise (i.e. becoming breathless, but not in relation to a health condition) requires health care professionals and other providers to provide good information to minimize negative experiences and facilitate positive ones.

Understanding barriers and motivators to exercise participation needs consideration within the life course perspective. A review of longitudinal studies across the life course identifies a range of factors associated with exercise over time. Earlier physical activity in childhood and adolescence predicts a physically active lifestyle in adulthood as a long-lasting habit. However, higher socio-economic and educational status is associated with greater levels of activity in adulthood. Negative experiences at school influenced inactivity in adulthood, whereas interest and activities in childhood related to continuing interest as adults.[20]

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The authors recommend that practitioners need to explore their clients' prior activity levels and attitudes in order to foster appropriate support and encourage new activities.

The 'active ingredients', the theoretical and practical processes that render interventions effective, are often given scant attention in quantitative effectiveness studies, but clearly have implications for further implementation and long-lasting behaviour change. Windle *et al.*[11] summarize that all the included interventions in their review had been specifically designed for older people (i.e. people were not sent to younger age group exercise classes), targeted at those who are sedentary and delivered in a community setting, primarily through a group-based approach led by trained facilitators. This provides some practical guidance to service providers to help them maximize the effects of programmes.

In the qualitative study[19] almost all participants appeared to have initiated the referral, suggesting that they had already thought about changing their activity levels. The authors describe how getting older and associated health perceptions and life events had caused their participants to resume sufficient physical activity to enhance quality of life. The older women desired a sense of belonging and usefulness, and some felt it provided an opportunity to socialize. Participants also highlighted the importance of practical support through good supervision in the gym. The authors suggest that the gym environment at a leisure centre could be seen as a social outlet that enhances sense of purpose and social inclusion. Thus group membership and participation in purposeful, social activity was a key mechanism in the relationship between exercise and good mental health.

The qualitative study presents some useful insights into the theoretical processes that might mediate and facilitate behaviour change. Theory-driven approaches to supporting behaviour change are regularly missing from intervention research.[21] Social cognitive theory[22] is useful for understanding how exercise may or may not improve mental health. This theory emphasizes self-efficacy and outcome expectations (related to the situation and action) as central determinants of behaviour. In relation to the situation, these expectations are based on the view that some consequences are determined by the environment, and as such are external influences and not within personal control. Action expectations are related to the belief that individual actions are important to a specific outcome. Self-efficacy is having confidence of having the ability to perform a particular behaviour and the likelihood of successfully coping with environmental demands and challenges. Therefore social cognitive theory predicts that the desired outcome may be achieved if an individual believes they have control over the outcome, there are few external barriers, and they have confidence in their own ability. Understanding these theoretical aspects to behaviour could assist practitioners working with older people to identify potential barriers that currently reduce incentives to participation. In relation to the influence of exercise on mental health, positive changes may be due to a break from the stresses of life, improvements in self-efficacy, mastery and social interaction, which may be achieved by different types of activity and variable intensities.[14]

An obvious place to promote physical activity utilizing a theoretical framework is in a primary care setting. In the UK, exercise referral schemes are commonplace (and more recently also in some countries in Europe). A general practitioner or another member of the primary care team identifies and refers a sedentary individual with at least one cardiovascular risk factor to a specific service (e.g. a sports centre or other leisure facility). A systematic review of such exercise referral schemes found they significantly increased the number of sedentary people becoming moderately active, although the absolute risk reduction was small.[23] However, good consultations can help allay misapprehensions and fears, and potentially improve adherence. In general, moderate intensity exercise has little or no risk to the individual.[24] For the smaller number of people who may be at increased risk, it is important that those assessing and referring, and those delivering exercise programmes are sufficiently trained to manage risk and ensure sustained behaviour change.[24]

How much exercise should people do? Duration, frequency, intensity

The WHO Global Recommendations on Physical Activity for Health[25] recommends that adults aged 65 years and above undertake at least 150 minutes of moderate-intensity aerobic physical activity,

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or do at least 75 minutes of vigorous-intensity aerobic physical activity, throughout the week. Aerobic activity can be accumulated in bouts of at least 10 minutes. They also recommend that older adults perform strengthening activities at least twice a week, activities that improve balance at least three times a week, and minimize the time they spend in sedentary postures (sitting and lying down). However, this guidance was developed in relation to physical health outcomes (cancer, cardio-respiratory, metabolic, musculoskeletal and functional health).

Netz[14] points out the difficulty in extrapolating from the exercise and mental well-being research, noting how studies differ on the mode of exercise, the exercise dose, and how outcomes are measured. The review by Windle *et al.*[11] found no clear consensus from the data on how many sessions a week are needed to improve mental well-being, or how long they should last. They suggest that in relation to their evidence, the beneficial sessions for older sedentary people are likely to be of light to moderate intensity (not requiring high energy expenditure), undertaken as a minimum of two sessions per week, each being a minimum duration of 45 minutes. It should be noted that this is less than the recommended 'dose'; however, given the problems of motivation and adherence, it may be a more realistic target for people to achieve. Netz *et al.*[13] concluded that moderate intensity exercise most benefited the well-being of older adults. A longitudinal study of older people in Finland[26] found that age-related retirement significantly increased the time spent on moderate intensity activity (e.g. walking), whereas vigorous activity (e.g. running) decreased.

In relation to the evidence reviewed for the WHO Global Recommendations in adults aged 65 years and above, physical activity includes leisure time physical activity (e.g. walking, dancing, gardening, hiking, swimming), transportation (e.g. walking or cycling), occupational (if the individual is still engaged in work), household chores, play, games, sports or planned exercise, in the context of daily, family and community activities. Thus encouraging engagement in a wide range of occupations may be easier to adopt for those who have done little, if no, exercise across the life course. Taken together, this indicates that the potential for increased leisure time activities upon retirement presents opportunities for public health messages promoting moderate intensity exercise to be realistic and achievable for many people.

Limitations of the evidence – what needs to improve?

There is a general consensus from evidence syntheses that a major limitation of research is a lack of studies focusing on positive mental health; the primary measure of mental health is regularly depression. Therefore the literature could be improved and more conclusive health messages developed if exercise and physical activity researchers included measures of mental well-being. The review by Windle *et al.*[11] reports a lack of published research in relation to UK populations. Males and minority ethnic groups are regularly under-represented in the research. In addition, there is far less known about the effects of exercise on the mental well-being of frail older people. A meta-analysis of four related trials of interventions specifically developed for frail older people provides some evidence.[27] This focused on resistance, balance, strength and flexibility interventions. A significant small effect was found for the emotional health outcome score, providing some indication for the effectiveness of exercise in people with specific risk factors for frailty (e.g. functionally dependent in two or more activities of daily living, balance deficits, lower extremity weakness, or high risk of falling).

The cost-effectiveness of exercise has received less attention; the review by Windle *et al.*[11] identified only two studies that addressed this aspect. One found that although there was no difference in mental health outcomes between intervention and control groups, the twice weekly exercise classes led by qualified instructors were cost effective, with an incremental cost per quality-adjusted life year (QALY) gained of £12,100.[28] Another study[29] of a community walking programme had data appropriate for economic modelling. The estimated mean cost per person participating was £220 compared with £12 in the control group. The majority of the costs comprised salary costs associated with the training of those delivering the intervention and consumables (mobile phones and newsletters). Incremental cost utility ratio (compared with control) was £7372 per QALY gained over 6 months.[11]

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Methodological issues

In many research studies, participants self-selected or volunteered to take part. This can then lead to issues around the direction of causality – do happier people tend to take part in more activities, or does taking part in more activities make people happier? This can lead to some bias in results, as those taking part may be of a disposition to be more motivated and interested to seek out the perceived positive effects of exercise. This is of course improved by including a control group for comparison purposes; however, randomized participants may still have that initial disposition.

Reviews that undertook quality assessments report the lack of good quality research around this topic. Windle *et al.*[11] found that almost half the studies appraised by their methodology were below the quality assessment cut-off for best evidence. A clear recommendation is the need for high quality research to improve the evidence. Yet this in itself is a major challenge. Researchers aim to optimize as much as possible the ideal situation in which to test their intervention, which is often strongly influenced by research funding. Consequently RCTs of exercise interventions may be suitably designed to capture any benefits, yet because they are designed for primarily testing effectiveness, the sustainability aspects and permanent behaviour is not addressed. Significant effects are demonstrated, but how can these be extrapolated and implemented in practice?

Although RCTs are viewed as the 'gold standard' research design, other approaches may be equally appropriate. Some of the main evidence for the beneficial effects of exercise (and other lifestyle factors) comes from large, observational, longitudinal cohort studies adopting epidemiological principles. For example, the incidence rate of dementia was significantly lower in a group of older people exercising three times a week and this related to a 32% reduction in risk.[30] Another longitudinal study[31] found that an increase in just 1 point on the baseline physical activity measure was associated with nearly 20% reduction in the likelihood of becoming depressed at 5-year follow-up. Such methodological approaches examine people over much longer time spans, essentially in their 'natural' environment, and provide a powerful way of demonstrating effects. Not only that, longitudinal research studies often collect a wide range of data across a number of areas, potentially enabling hypotheses around motivators and barriers to be tested.

Conclusions

This mini-review has presented an overview from existing evidence syntheses of the effectiveness of exercise for promoting mental well-being. It has highlighted a number of points regarding barriers and motivators to exercise, and discussed issues and limitations of current research. Understanding the best ways to encourage people to exercise is critical to maintaining and improving lifelong population health. Based on the current evidence, it is recommended that health practitioners should encourage exercise or physical activity of low to moderate intensity, and leisure time activity such as walking, especially at retirement. Future research would benefit by focusing on people who have not self-selected into studies so as to understand the causal direction, and include theory-driven approaches to behaviour change.

Conflicts of interest

None

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