Examining methods, messengers, and behavioural theories to disseminate physical activity information to individuals with a diagnosis of schizophrenia: A scoping review

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Abstract

Background: Many individuals with a diagnosis of schizophrenia are not active and lack the necessary knowledge and confidence to become and stay active. To develop effective physical activity promotion interventions, it is necessary to identify credible messengers and effective methods to disseminate physical activity information to this population.

Aims: The purpose of this scooping review was to identify and examine knowledge mobilization theories, messengers, and methods used to disseminate physical activity information to individuals with a diagnosis of schizophrenia.

Method: This scoping review followed the methodological framework proposed by Arksey and O'Malley (2005).

Results: In total, 43 studies and 7 reviews identified multiple messengers and methods used to disseminate physical activity information to individuals with a diagnosis of schizophrenia, but few attempts to structure information theoretically. Findings do not point to which messengers or methods are most effective or which theories should be used to construct information interventions. Studies show that physical activity information should be provided in an individualised manner from staff who could easily connect with patients.

Conclusions: Few researchers have addressed the physical activity information needs of individuals with a diagnosis of schizophrenia. Researchers need to examine and implement effective knowledge mobilization strategies for this population.

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Keywords: Schizophrenia, physical activity, exercise, information, dissemination

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Introduction

Physical activity can help individuals with a diagnosis of schizophrenia improve their health (Faulkner, Gorczynski, & Arbour-Nicitopoulos, 2013; Firth, Cotter, Elliot, French, & Yung, 2015; Gorczynski & Faulkner, 2010), yet people with this diagnosis are less active than those in the general population (Lindamer, et al., 2008; Stubbs et al., 2016). Low levels of physical activity and high levels of sedentary behaviour (see Stubbs, Williams, Gaughran, & Craig, 2016) are concerning given the majority of individuals with a diagnosis of schizophrenia are either overweight or obese and have high rates of type 2 diabetes mellitus (Hennekens, Hennekens, Hollar, & Casey, 2005; Vancampfort et al., 2015; Vancampfort et al., 2016). The high rate of obesity and diabetes in this population has resulted in life expectancies that are considerably lower than those in the general population (Laursen, Munk-Olsen, & Vestergaard, 2012; Walker, McGee, & Druss, 2015). Given that obesity and diabetes are independent risk factors for cardiovascular disease, strategies like increasing physical activity, are needed to decrease the incidence of morbidity and mortality in this population.

Research has shown that despite high interest in being active, individuals with a diagnosis of schizophrenia may lack the necessary knowledge and confidence to become and stay active (Johnstone, Nicol, Donaghy, Larie, 2009). Providing health and physical activity information to this population has been suggested as a possible strategy to increase physical activity participation and improve overall health (McDevitt, Snyder, Miller, & Wilbur, 2006; Faulkner, Gorczynski, & Cohn, 2009; Gorczynski, Faulkner, & Cohn, 2014). Providing relevant, skill based health information can help individuals obtain the necessary directions to change their behaviours and become active (Kreps, 2011). Although recent research has

shown that knowledge of the benefits of physical activity alone may not be sufficient to change activity behaviours in psychiatric populations (Happell, Stanton, Hoey, & Scott, 2014), providing such information may help individuals identify and overcome specific physical activity barriers and develop the skills and confidence necessary to become active. Useful and relevant information delivered in an efficient manner has also been identified as being an integral part of larger and more complex health promotion campaigns. The Ecological Model for active living has associated strong information environments with motivating individuals to become more active (Sallis, Cervero, Ascher, Henderson, Kraft, & Kerr, 2006). Despite this need for greater health and physical activity information, no research has examined the design or effectiveness of knowledge mobilization strategies to deliver physical activity information to individuals with a diagnosis of schizophrenia. In effect, no systematic efforts have been made to understand target audience needs, how messages should be framed, and which methods and messengers should be used to disseminate physical activity information in this population. This scoping review aims to fill this gap and lay the groundwork necessary to design effective knowledge mobilization campaigns to help individuals with a diagnosis of schizophrenia become and stay active. Scoping reviews aim to map out the key concepts and gaps of a research area and the main sources of evidence available. They are inclusive of different study designs, topics, and sources of literature and allow for a participatory approach to obtaining and using information (Martin Ginis et al., 2012; Lavis, Robertson, Woodside, McLeod, & Abelson, 2003; Faulkner et al., 2009; Arksey & O'Malley, 2005). The purpose of this scoping review was to identify and examine knowledge mobilization theories, messengers, and methods used to disseminate physical activity information to individuals with a diagnosis of schizophrenia. Additionally, where possible, barriers and facilitators to delivering physical activity information for each messenger and method were examined.

Methods

This scoping review followed the methodological framework proposed by Arksey and O'Malley (2005) as well as previous research by Faulkner et al. (2009). This process was carried out in five stages:

1) Identifying the research questions. The questions of this scoping review were designed to identify gaps in existing literature regarding knowledge mobilization about physical activity information for individuals with a diagnosis of schizophrenia. Specifically, these questions were designed to explore knowledge mobilization theories, messengers, and methods with respect to physical activity information dissemination. These questions included: a) What are the knowledge mobilization theories used to disseminate physical activity information for individuals with a diagnosis of schizophrenia?; b) Who are credible and preferred messengers for physical activity information for individuals with a diagnosis of schizophrenia?; and c) What are the preferred methods of information dissemination about physical activity for individuals with a diagnosis of schizophrenia? Information pertaining to barriers and facilitators to delivering physical activity information for each messenger and method were also extracted and examined. Questions were based on previous work conducted by Faulkner et al. (2009) as well as the knowledge mobilization model described by Lavis et al. (2003).

2) Identifying relevant studies. The first two authors searched for and selected relevant literature that pertained to our three research questions. Two sources of information were searched for relevant literature, including: 1) published studies; and 2) contextual literature. For published studies, no limits were imposed on study types or study dates. The following databases were searched in March 2016: PSYCHINFO, PUBMED, PSYCHARTICLES, and GOOGLE SCHOLAR. A search strategy used by Faulkner and colleagues (2009) in a

scoping review examining knowledge mobilization for individuals with spinal cord injury was used for this review. The following terms were used to search databases: schizophrenia, physical activity, exercise, information, source, needs, knowledge, mobilization, message, messenger, dissemination, help, management, and health promotion. The reference lists of included studies were also searched for additional studies. Published studies were included in the results if they were written in English, involved individuals with a diagnosis of schizophrenia, discussed aspects of information dissemination for physical activity, and contained information related to any of the three questions of the scoping review. No time limits were imposed on this search. For contextual literature, systematic reviews, meta-analyses, and book chapters were examined. These sources of literature were identified through searches of the same databases used to identify published studies, using the same search terms. A 'review of reviews' was conducted to identify the best current information in order to develop rigorous knowledge mobilization strategies to promote physical activity to individuals diagnosed with schizophrenia.

3) Study selection. The first two study authors examined study titles and abstracts and determined whether studies could be considered for inclusion within the scoping review. The authors met throughout the review process to ensure the identification, review, and selection process was consistent. The authors independently reviewed literature to ensure it met inclusion criteria (i.e., provided information that addressed any of the three questions of the scoping review). When disagreements arose, the two authors reached a consensus after a discussion.

4) Charting the data. A data-charting form was used to extract relevant information on each identified piece of literature. The first two authors met to compare extraction results for consistency and made modifications where necessary. Information that was extracted and charted included: author(s); year; study location; definition of physical activity or exercise;

description of knowledge mobilization theories; messengers; methods; results; and any other key findings.

5) Collating, summarizing, and presenting the results. Findings were thematically organized with respect to mobilization theories, messengers, and methods. Extracted data from our identified literature was written in a narrative manner. Given the diversity of studies retrieved, no attempts were made to assess the quality of evidence presented.

Results

A total of 50 articles (43 studies and 7 reviews) were identified from the literature search that provided an answer to at least one of the stated research questions. Full results of the research articles can be seen in Table 1. Progression of the literature search can be seen in Figure 1. below.

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Studies were carried out in a number of nations globally, with the majority being conducted in North America (n=20) and Europe (n=12). Sample sizes ranged from 3 (Faulkner & Sparkes, 1999) to 732 (Motlova, Dragomirecka, & Kitzlerova, 2009), although with the exception of three studies, all were under 100 participants.

Study settings were predominantly hospitals and mental health centres, utilising samples of individuals who were in-patients. Two studies (Gomes et al., 2014; Warren et al., 2011) were set in university campus facilities with out-patient populations recruited through psychiatric day-care units. A range of exercises and types of physical activity were used in studies, with the most common being walking and jogging (Attux et al., 2013; Beebe et al., 2009; Beebe et al., 2013; P. Bernard et al., 2013; Faulkner & Sparkes, 1999; Gorczynski, Faulkner, Cohn, & Remington, 2014a; Maggouritsa et al., 2014; Melamed et al., 2008; Methapatara & Srisurapanont, 2011; Sailer et al., 2015; Warren et al., 2011; Wu, Wang, Bai, Huang, & Lee, 2007). Other studies used Yoga (Behere et al., 2011; Duraiswamy, Thirthalli,

Nagendra, & Gangadhar, 2007), video games (Leutwyler, Hubbard, Vinogradov, & Dowling, 2012) and small-sided competitive games (Gomes et al., 2014).

Knowledge Mobilisation Theories

Nine studies made reference to theory when disseminating information about physical activity. Studies that made reference to theory utilised a range of theories including the Trans-theoretical model (see Prochaska, Johnson, & Lee, 2009) (Bernard et al. 2013), Cognitive and Behavioural Therapy (Attux et al., 2013), Psychoanalysis (Pesek et al., 2011), mental contrasting and implementation strategies (see Oettingen & Gollwitzer, 2010) (Sailer et al., 2006), Self-Determination Theory (see Deci & Ryan, 2011) (Gorczynski et al., 2014a, Gorczynski et al., 2014b), and Social Cognitive Theory (see Bandura, 1986) (Beebe et al., 2010; Beebe et al., 2013). The use of these theories was integrated into the design and implementation of studies and appeared to contribute toward the development of interventions that aimed to help individuals diagnosed with schizophrenia progressively improve their levels of physical activity. For example Bernard et al. (2013) utilised the Trans-theoretical model of behaviour change (Prochaska, Johnson, & Lee, 2009) to guide the content of a counselling intervention, integrating core principles of the model (e.g., *processes of change* and *decisional balance*) into the intervention. Gorczynski et al. (2014a and 2014b) utilised aspects from the Trans-theoretical model, Social Cognitive Theory, and Self-Determination Theory (Deci & Ryan, 2011) to guide their exercise counselling intervention. The thorough application of theory served to guide not only knowledge mobilisation through effective counselling practice, but also gauge behaviour change by examining movement through stages of change. Sailer et al. (2006) applied a theory based Mental Contrasting and Implementing Intentions approach to guide a goal setting intervention to increase exercise in individuals with a diagnosis of schizophrenia. Sailer et al. paid attention to the importance of

social context, creating an autonomy-focused environment for successful goal pursuit. They found support for the approach in improving attendance rates at scheduled exercise sessions

Messengers of physical activity information

Twenty-nine studies identified a variety of messengers who provided physical activity information to individuals with a diagnosis of schizophrenia. These messengers can be separated into three broad categories that include mental health care professionals, research staff, and non-specified. Mental health care professionals were the primary physical activity message providers and included care workers (Faulkner & Sparkes, 1999), clinical staff (Littrell, Hilligoss, Kirshner, Petty, & Johnson, 2003; Pelham & Campagna, 1991; Sailer et al., 2015; Warren et al., 2011), nurses (R. Bernard et al., 1990; Melamed et al., 2008; Motlova et al., 2009; Niv, Cohen, Hamilton, Reist, & Young, 2014), therapists (e.g. physiotherapists) (Duraiswamy et al., 2007; Stubbs et al., 2014a, Stubbs et al., 2014b), psychiatrists (Chen, Chen, & Huang, 2009; Pesek, Mihoci, Medved, & Solinc, 2011), and exercise psychologists (Dodd, Duffy, Stewart, Impey, & Taylor, 2011). Other studies stated that research staff were the primary physical activity messengers (Beebe et al., 2009; Beebe et al., 2010; Beebe et al., 2013; Gorczynski et al., 2014a; Gorczynski, Faulkner, Cohn, & Remington, 2014b; Leutwyler et al., 2012; Methapatara & Srisurapanont, 2011), whilst other studies did not specify who were messengers (Acil, Dogan, & Dogan, 2008; Maggouritsa et al., 2014; McKibbin et al., 2006; Wu et al., 2007). Although many messengers were identified, the effectiveness of messengers was not assessed. A number of studies recommended the use of multiple messengers (Marzolini, Jensen, & Melville, 2009; Tetlie & Polit, 2009). For example Tetlie and Polit (2009) utilised psychiatric nurses to provide personalised messages regarding exercise participation while exercise instructors provided the exercise program. Only one study mentioned the use of patients' relatives in the provision of physical activity messages to enhance intervention effectiveness, citing that the use of

relatives was of particular importance where patients live with their families (Attux et al., 2013).

Methods of Physical Activity Information Dissemination

A total of 13 studies provided a wide range of methods to disseminate information regarding physical activity to individuals with a diagnosis of schizophrenia. A number of studies utilised structured educational sessions to inform study participants (Attux et al., 2013; Littrell et al., 2003; McKibbin et al., 2006; Motlova et al., 2009; Niv et al., 2014; Pesek et al., 2011). These sessions were often multidimensional in message delivery. For example, Littrell et al. (2003) utilised a combination of verbal and written information, reading aloud, discussion of topics, written exercises, quizzes and educational games to convey messages regarding physical activity. The use of classroom-based education sessions were typically part of wider interventions designed to improve health behaviours in general (e.g., diet, prescription drug use) and specific measures of physical activity were not taken. Other studies opted to use an approach which promoted independence amongst participants by providing physical activity information in a leaflet (Methapatara & Srisurapanont, 2011) or encouraging participants to keep an exercise diary (Chen et al., 2009; Gorczynski et al., 2014b; Kwon et al., 2006). Gorczynski, Faulkner, Cohn, and Remington (2013) aimed to increase stair use within a mental health centre with the use of stair riser banners that prompted patients and staff to "Take the stairs, stay healthy". Whilst results over a 6-week period indicated no significant change in stair use amongst patients, the study's use of stair risers to disseminate physical activity information had an effect on increasing staff stair usage, potentially creating a more activity conscious hospital environment. Similarly, Gorczynski et al. (2014a) examined the feasibility of accelerometer use with individuals with a diagnosis of schizophrenia, and presented that with some compliance strategies an objective measure of physical activity might be used as a motivator to be active, a finding that echoed

Beebe and Faust-Harris' (2012) work. How messages regarding physical activity are disseminated to patients appeared to be an oversight for many studies in that exercise programs were implemented without mention of the methods used to educate participants of what activities should be done, how they should be performed, or why they should be done.

Barriers and Facilitators to Message Dissemination

A number of studies (n=6) provided insight into some of the barriers and facilitators to physical activity message dissemination, (Crone, 2007; Gorczynski, Faulkner, & Cohn, 2013; Johnstone, Nicol, Donaghy, & Lawrie, 2009; Leutwyler, Hubbard, Jeste, & Vinogradov, 2013; Rastad, Martin, & Asenlof, 2014; Stubbs et al., 2014a; Stubbs et al., 2014b). Stubbs et al. (2014a and 2014b) examined the perceptions of physiotherapists' working in mental health on the assessment, benefits and delivery of physical activity in individuals with a diagnosis of schizophrenia. A key finding was that the inclusion of physiotherapists in physical activity programs was felt to be a facilitator to physical activity participation. Physiotherapists perceived that they had the necessary theoretical knowledge and clinical skills required to lead and oversee physical activity programs with individuals with a diagnosis of schizophrenia. Leutwyler et al. (2013) similarly posited how psychiatric staff felt that they played a key role in modelling and motivating physical activity for patients. Furthermore, it was reported how staff perceived patients were reluctant to join groups and preferred one-to-one support for physical activity. The personal support of health care staff was identified as a facilitator to message dissemination, with the impetus placed on messengers whom patients knew for a long period of time, staff whom patients trusted and felt connected with (Rastad et al., 2014). Similarly, Crone (2007) outlined that individuals with a diagnosis of schizophrenia attending a walking intervention thought that their participation was facilitated by the interpersonal skills of the intervention staff. Patients' trust and respect of messengers is a recurrent theme emerging from studies as an important factor

influencing physical activity message dissemination. For example, Johnstone et al., (2009) highlighted social anxiety as a significant barrier to physical activity participation with many individuals living with a diagnosis of schizophrenia finding it difficult to leave their home environment. Effective messengers were those who individuals trusted and respected including family and friends, long-term health care providers, and fellow patients. Other barriers included a lack of choice in physical activities, misconceptions about physical activity such as only intensive exercise was meaningful or you have to lose weight to be active, and negative expectations of physical activity such as fear of not succeeding (Rastad et al. 2014; Gorczynski et al., 2013). These barriers pose important considerations for physical activity intervention design as researchers and health providers need to carefully select information messengers who are trusted and familiar to patients and what information they are conveying.

Review of Reviews

Many review papers exist detailing the literature that has sought to examine physical activity and exercise interventions for individuals with a diagnosis of schizophrenia. From the range of review papers available, seven provide important points with regard to literature pertaining to messengers and the provision of messages in the promotion of physical activity (Faulkner, Cohn, & Remington, 2010; Faulkner & Gorczynski, 2014; Faulkner, Gorczynski, & Arbour-Nicitopolous, 2013; Gross, Vancampfort, Stubbs, Gorczynski, & Soundy, 2016; Holley, Crone, Tyson, & Lovell, 2011; Soundy et al., 2014; Vancampfort et al., 2011). Almost unanimous agreement was found in review studies regarding concern over the lack of theoretical underpinning in research studies' design and implementation which has led to an absence of understanding of the possible mechanisms responsible for intervention success. Gross et al.'s (2015) review of the value of social support in the promotion of physical activity offers useful insight into the importance of considering support in the operation of

physical activity interventions. Findings from 23 studies indicated that although informational support was the most abundant form of social support in studies, esteem support was the most valued by staff and patients. Gross et al. iterate the importance of social support for physical activity intervention outcome with emphasis placed on patient's sensation of trust and value generated through supportive exchanges with intervention organisers, particularly during early stages of intervention implementation. The importance of social support provision was echoed by other review studies including Faulkner et al. (2010) and Soundy et al. (2014) where support was considered an essential feature of message dissemination and barrier confrontation. For example, Soundy et al. (2014) outlines how research has identified that social anxiety is a prominent barrier to physical activity participation and effective support from other patients and care providers was seen to be a vital aspect influencing intervention outcome.

Discussion

This scoping review examined knowledge mobilization theories, messengers, and methods used to disseminate physical activity information to individuals with a diagnosis of schizophrenia. In total, 50 research articles, including studies and reviews, pointed to multiple messengers and methods used to disseminate physical activity information to people individuals with a diagnosis of schizophrenia, but few attempts to structure information using a theoretical approach. Most common messengers and methods of physical activity included clinical and research staff and educational approaches, respectively. Findings from the examined studies and reviews revealed that physical activity information should be provided in an individualised manner from staff who could easily connect with patients in a trusting manner. A number of researchers also recognized that physical activity is a social experience and emphasised that strategies should be put in place to help individuals with a diagnosis of schizophrenia address any fears or anxieties they may have with being social or being active. The incorporation of family and friends and other caregivers within physical activity programs may be a way to help address these anxieties and fears. Overall physical activity information should be provided in a manner that affords individuals with a diagnosis of schizophrenia the ability to be autonomous, feel connected to others in a supportive manner, and informed about the physical activity choices they make so as to improve their physical, mental, and social health.

In line with previous reviews examining physical activity interventions in individuals with diagnosis schizophrenia (Faulkner, Cohn, & Remington, 2010; Faulkner & Gorczynski, 2014; Faulkner, Gorczynski, & Arbour-Nicitopolous, 2013; Gross, Vancampfort, Stubbs, Gorczynski, & Soundy, 2016; Holley, Crone, Tyson, & Lovell, 2011; Soundy et al., 2014; Vancampfort et al., 2011), there was a lack of theory utilised in the studies found for this scoping review. The few studies that used theory in their design and application were able to

illustrate how theories may be used to inform and enhance aspects crucial to message design and transmission. Overall, theory based physical activity interventions are more effective than those designed not using any theory (Kahn et al., 2002). The use of theory can specifically help improve information dissemination by guiding message construction and the selection of helpful messengers and methods. Additionally, the use of theory in the construction of interventions can address specific known barriers individuals with a diagnosis of schizophrenia face to receiving information about being active. Two important areas that researchers may wish to focus on are ways of providing individuals with a diagnosis of schizophrenia information that aids with motivational support and impaired cognition (Vancampfort et al., 2013). Previous research has shown significant positive correlations between autonomous regulation, both extrinsic regulation (i.e., identified regulation) and intrinsic regulation, and levels of physical activity (Vancampfort et al., 2013). Providing physical activity information that is easily attainable, states the benefits of regular activity, and easy to understand that ultimately strengthens an individual's freedom of choice and ability to connect with others may prove beneficial to helping individuals with a diagnosis of schizophrenia find and participate in enjoyable physical activities both initially and for a prolonged period of time (Teixeira, Carraça, Markland, Silva, & Ryan, 2012). Such provisions to constructing and distributing health information to ensure all individuals, regardless of ability or impairment, can improve their overall wellbeing should be ensured by healthcare providers and healthcare systems, as has recently been done by the National Health Service (NHS) in the United Kingdom through the Accessible Information Standard (see NHS, 2016). Addressing this lack of theory in future research is essential and necessary to improve the overall quality of physical activity interventions for individuals with a diagnosis of schizophrenia (Faulkner & Gorczynski, 2014). Furthermore, the use of theory

can improve our understanding of the mechanisms underpinning physical activity message mobilisation within this population.

With regard to messengers and methods of physical activity information dissemination, there is a general lack of consideration within interventions as to how information should be transmitted to individuals with a diagnosis of schizophrenia. Additionally, the effectiveness of messengers and methods to provide physical activity information to individuals with a diagnosis of schizophrenia has not been addressed. Studies that were considerate of messengers (e.g. Marzolini et al., 2007; Tetlie & Polit, 2007) identified that using multiple messengers and family members may prove beneficial to overall information dissemination and physical activity participation. In line with previous research that has investigated the use of family interventions in the treatment of psychosis (Harvey & O'Hanlon, 2013), the involvement of family, friends, and caregivers to promote physical activity seems like a natural fit. Overall, family members want to be involved in the care and treatment of their relatives living with psychosis (Parker et al., 2010). Involving family, friends, and caregivers to learn about physical activity opportunities for their relatives may afford individuals with a diagnosis of schizophrenia the support that is necessary to learn about multiple physical activity options in their respective communities and then engage in physical activity through a supported manner. Physical activity may also prove to be a benefit for family, friends, and caregivers who may be experiencing caregiver fatigue and potential mental health problems of their own (Awad & Voruganti, 2008). Findings from a recent study show that carers are ready to be involved in research that will enhance the overall treatment of their loved ones living with serious mental health issues (Ashcroft, Wykes, Taylor, Crowther, & Szmukler, 2016). Further research into the involvement of physical activity programming into family psycho-education is needed and warranted.

The lack of theoretical consideration in the design of interventions and specifically to guide message mobilisation in studies is also of concern. Owing to the range and diversity of study designs and settings it is not possible to assess the contribution of theoretical consideration on study efficacy. However, the contribution of theory appears to enhance the robustness of study design and implementation by informing and justifying researchers' decision making. This enhancement can also be seen in research by Bradshaw et al. (2010) who did not make reference to a specific knowledge mobilisation theory per se but rather utilised the Medical Research Council (MRC) framework for the development and evaluation of randomised control trials to guide their study (Craig, Dieppe, Macintyre, Michie, Nazareth, & Petticrew, 2008). The MRC framework incorporates a range of theoretical underpinnings designed to guide practice and its use within Bradshaw and colleagues' study led to a clearly progressive, effective intervention.

The findings of this review offer several implications for healthcare professionals as to how best deliver physical activity information to individuals with a diagnosis of schizophrenia. Findings from the practice of physiotherapy shows that physiotherapists are comfortable with prescribing and helping individuals with a diagnosis of schizophrenia become physically active (Stubbs et al., 2014a; Stubbs et al., 2014b; Vancampfort, Rosenbaum, Schuch, Ward, Probst, & Stubbs, 2016). Unfortunately, similar work has not occurred with other healthcare professions. Research is needed to ensure other healthcare professions feel confident in their knowledge of physical activity guidelines, physical activity opportunities available to their patients, and methods in which they can effectively provide physical activity information to their patients. Such research would help ensure that appropriate training is created and offered to help healthcare professionals gain the necessary confidence to prescribe physical activity to their patients. Healthcare professionals need to also take steps to help individuals with a diagnosis of schizophrenia feel autonomous and

supported in their ability to become physically active. Providing information about various physical activity options is essential as is ensuring individuals with a diagnosis of schizophrenia have the necessary support to continue to be active. Incorporating family, friends, and other caregivers is one step to ensuring individuals with a diagnosis of schizophrenia can become and stay active. Healthcare professionals also need to better understand which methods of information dissemination are best for their patients. Further research is needed to identify effective strategies to deliver physical activity information to patients and at what stage of the recovery process.

A number of limitations with the current scoping review must be mentioned. First, it is possible that all relevant studies may not have been identified despite our systematic approach based on a similar scoping review to locating necessary literature. Second, scoping reviews offer a narrative or descriptive account of the literature in a particular field of study, and do not offer a synthesis of which intervention is best (Arksey & O'Malley, 2005). Findings from this current scoping review cannot point to which messengers or methods are most effective with respect to physical activity information dissemination to individuals with a diagnosis of schizophrenia or which theories should be used to construct information interventions. Rather, this scoping review offers suggestions for further targeted inquiry. The health benefits of physical activity are well known for both clinical and non-clinical populations. In the context of schizophrenia, the greatest challenge is not a lack of evidence; it is absent, inconsistent, or failed implementation of the evidence. This scoping review provides a foundation for future efforts in addressing effective knowledge translation.

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Figure 1. Flow diagram

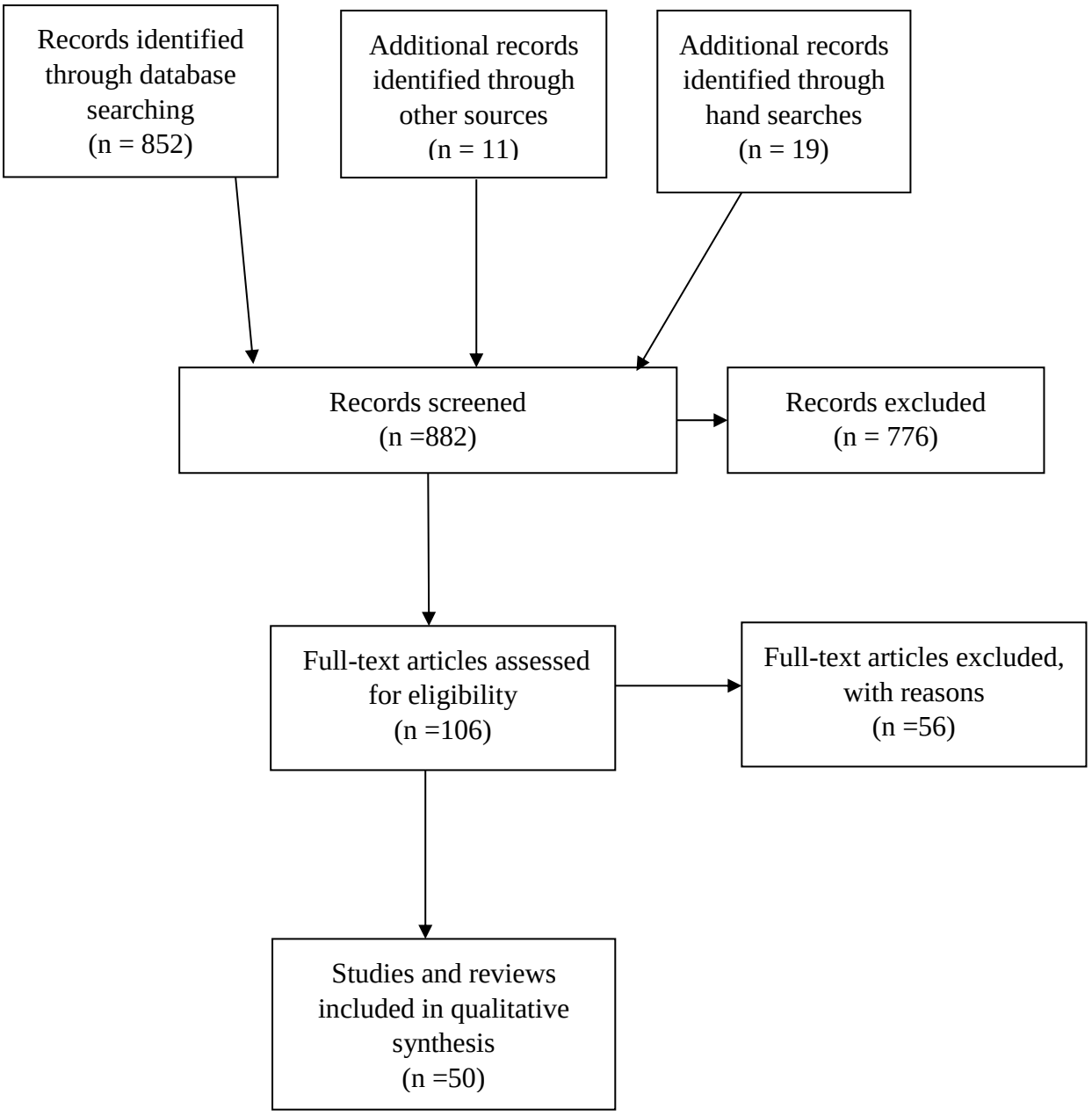

Table 1. Research articles included in the scoping review

Authors	Year	Location	Participants	Setting	Study Design	PA	Knowledge mobilisation Theory	Methods of Info. Dissemination	Messengers
Acil et al.	2008	Turkey	n=20	in and out patient hospital	RCT	not specified	not specified	not specified	not specified
Attux et al.	2013	Brazil	n=160	out-patients	RCT	walking, moderate and vigorous PA	not specified	education, DVD	mental health professions, DVD, patient relatives
Beebe & Faust Harris	2012	USA	n=24	community health centre	feasibility	pedometer use	not specified	verbal instruction	research staff
Beebe et al.	2009	USA	n=10	mental health center	intervention	walking	not specified	exercise program	not specified
Beebe et al.	2010	USA	n=97	mental health center	RCT	walking	social cogntive theory	verbal, visual aids, demonstration. Forum for discussion	research staff
Beebe et al.	2013	USA	n=22	mental health center	follow-up from	walking	social cogntive theory	verbal, visual aids, demonstration.	research staff
Behere et al.	2011	India	n=56	not specified	intervention	yoga, exercise	not specified	not specified	not specified
Belcher	1988	USA	n=1	nursing home	case study	walking	not specified	walking as a deterant	staff member
Bernard et al.	2014	France	n=12	inpatients	intervention	walking	transtheoretical model	counselling	psychiatric nurse, exercise specialist
Bradshaw et al.	2010	UK	n=45	in and out patients	intervention	Self-report PA	MRC framework	discuss problems and solutions	occupational therapists, social worker
Chamove	1986	UK	n=40	hospital and hostel	intervention	keep fit, gardening, swimming	not specified	not specified	nurses
Chen et al.	2009	Taiwan	n=33	hospital	intervention	aerobic activity	not specified	PA diaries, exercise program	psychiatrist, exercise specialist psychiatric nurse,
Crone	2007	UK	n=4	NA	Examine barriers and facilitators	walking	NA	NA	NA
Dodd et al.	2011	Australia	n=8	residential unit	intervention	circuit training and walking	not specified	exercise program	exercise psychologist, staff members
Duraiswamy et al.	2007	India	n=41	inpatients	intervention	yoga, exercise	not specified	exercise program	trained therapist
Faulkner & Sparkes	1999	UK	n=3	hostel	ethnography	walking/swimming	not specified	support	care workers
Gomes et al.	2014	Portugal	n=19	sports faculty	intervention	small sided games; basketball, soccor, volleyball, walking handball, jogging	not specified	support, positive feedback	PE teacher, research staff
Gorczynski et al.	2014a	Canada	n=4	mental health clinic	feasibility	accerlerometer use	not specified	accerlerometer	research staff
Gorczynski et al.	2014b	Canada	n=4	mental health clinic	intervention	mixed, self set goals	Self-efficacy theory transtheoretical model Self-determination theory	exercise counseling	research staff
Gorczynski et al.	2013	Canada	n=25	in patient	Examine barriers and facilitators	NA	NA	NA	NA
Gorczynski, Faulkner, et al.	2013	Canada	not specifed	mental health unit	intervention	stair use	not specified	point of choice prompts	point of choice prompt
Johnstone et al.	2009	UK	n=27	community dwelling patients	examine barriers and facilitators	NA	NA	NA	NA
Kwon et al.	2006	South Korea	n=48	clinical centers	RCT	not specified	cognitive and behavioural therapy	exercise diaries, PA discussion	exercise coordinator
Leutwyler et al.	2012a	USA	n=15	not specified	feasibility	active video games	not specified	video games	research staff
Leutwyler et al.	2012b	USA	n=23	NA	Examine barrier and facilitators	NA	NA	NA	NA

Littrell et al.	2003 USA	n=75	not specified	intervention	not specified	not specified	verbal and written information. reading aloud, quizzes discussion of topics, and educational games	clinician
Maggouritsa et al.	2014 Greece	n=30	inpatient hospital	intervention	walking, aerobic exercises, balance and coordiation	not specified	exercise program	not specified
Marzolini et al.	2009 Canada	n=13	community centre	intervention	walking, weight training	not specified	exercise program	Cardic rehab. specialist nurse, social worker
McKibbin et al.	2012 USA	n=57	board and care facilities	RCT	self-report PA	not specified	teach and query training methods, mnemonic aids, print materials in large font and limit text	not specified
Melamed et al	2008 USA	n=59	inpatient hospital	intervention	walking	not specified	exercise program	nurses
Methapatara & Srisurapanont Srisurapanont	2011 Thailand	n=64	inpatient hospital	RCT	walking	motivational interveiwing	leaflets, pedometer	research staff
Motlova et al.	2009 Czech Republic	n=732	mental health units	intervention	not specified	not specified	education	phyciatric nurses
Niv et al.	2014 USA	n=109	not specified	intervention	not specified	not specified	handouts, knowledge quizzes, education principles suitable for schizophrenia	nurse care coordinator
Pelham & Campagna	1991 Canada	n=3	mental health clinic	single subject	bicycle ergometer	not specified	not specified	clinic staff
Pelham et al.	1993 Canada	n=11,10,15	not specified	3 comparisons	bicycle ergometer	not specified	exercise program	not specified
Pesek et al.	2011 USA	n=32	out-patient clinic	intervention	attitudes towards PA	psychoanalytic group approach	psycho education, cognitive techniques, non-structural conversation and clarifications	psychiatrist, psychiatric nurse
Rasad et al.	2014 Sweden	n=20	out-patient clinic	examine barriers and facilitators	NA	NA	NA	health care professionals
Sailer et al.	2015 Germany & Switzerland	n=36	inpatients hospital	intervention	jogging	mental contrasting & implementation intentions (MCII)	MCII strategies identifty barriers and solutions and goal setting	research and nursing staff
Stubbs et al.	2014 multinational	n=151	NA	Examine barriers and facilitators	NA	NA	NA	physical therapists
Tetlie	2009 Norway	n=15	hospital	intervention	gym, swimming, hiking	not specified	exercise program	nurses and exercise instructors
Warren et al.	2010 USA	n=17	campus research facility	feasibility	walking/jogging	not specified	exercise program	clincal staff, research staff
Wu et al	2015 Taiwan	n=20	psychiatric day care unit	intervention	HIIT	not specified	exercise program	specialist in internal medicine
Wu et al	2007 Taiwan	n=53	hospital	RCT	walking/stiars	not specified	exercise program	not specified