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Routine participation in sports and fitness activities among out-patients with psychotic disorders: A multi-site cross-sectional survey in England

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ABSTRACT

Background: Sedentary lifestyle is a significant contributor to poor outcomes in people with psychotic disorders. However, little is known about the extent of routine participation in specific sports and fitness activities among those who do take part. We investigated the frequency, intensity, time and type of sports and fitness activities ("fitness") completed by people with psychotic disorders in their daily life and explored correlates associated with fitness participation.

Methods: We conducted a cross-sectional survey among out-patients with psychotic disorders ($n = 529$) recruited from six different NHS sites in England. Subjective participation in fitness activities during the previous week was assessed by an adaptation of the UK Time Use Survey. The main outcome was whether participants met the minimum World Health Organization recommendations for moderate intensity physical activity (≥150 min/week) through fitness. Poisson regression models with robust error variance were used to examine associations of this outcome with participant variables.

Results: In total, 267 (52.2%) participants reported taking part in routine fitness activities in the previous week, many of whom did so alone ($n = 163$, 59.1%). Only 21.5% ($n = 114$) completed ≥150 min of fitness activities in the previous week. The likelihood of attaining these recommendations was lower among participants who were female, older in age, in a relationship, unemployed and with fewer social contacts.

Conclusion: Mental health services promoting physical activity interventions among people with psychotic disorders may need to modify their approaches based on previous patient preference and increase their focus on sub-groups of patients who are less likely to routinely engage in fitness activities.

1. Introduction

The physical health of people with long-term psychotic disorders, such as schizophrenia spectrum disorders, has consistently been shown to be worse than that of the general population (Buhagiar, Templeton, & Osborn, 2020; De Hert, Schreurs, Vancampfort, & Van Winkel, 2009; McNamee, Mead, MacGillivray, & Lawrie, 2013), leading to reduced life expectancy by nearly twenty years (Chang et al., 2011). Modifiable risk factors, including lack of physical activity due to sedentary behaviour is a major contributory factor to such poor physical health in this patient group (De Hert et al., 2009).

In order to reduce these physical health inequalities in people with psychotic disorders, there has been a surging interest over the past two decades within both research and clinical realms, to test and deliver a variety of physical activity interventions (Soundy et al., 2013). The effectiveness of such interventions as a treatment for psychotic disorders is now well established, exerting exerting positive impact on cardiometabolic risk factors, general physical fitness and psychiatric

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symptoms, particularly if these interventions implement adequate doses of exercise and engage patients sufficiently (Firth et al., 2015, 2018; Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014). However, the majority of physical health interventions delivered in mainstream clinical settings to date, tend to be planned, repetitive, purposive and structured according to specific protocols (Soundy, Roskell, Stubbs, Probst, & Vancampfort, 2015). These interventions also make limited attempts to foster enjoyment or interest among patients (Langle, Siemssen, & Hornberger, 2000), while also overlooking the importance of motivation and autonomy (Vancampfort et al., 2013). Consequently, uptake of these interventions has historically been limited (Kelley, Coursey, & Selby, 1997; Warren et al., 2011), while drop-out rates have similarly been extremely high, precluding the full attainment of successful treatment outcomes (Vancampfort et al., 2016).

A further reason for this poor engagement could stem from a failure to consider preferences and previous experiences of sports or fitness activities. Taking into account individual experiences and preferences may identify activities that are deemed as "fun" or enjoyable for patients, given the person-specific nature of what may constitute fun and leisure, while fostering patient autonomy. This approach would also support proactively patients with specific sociodemographic characteristics who are otherwise less likely than others to engage in sports and fitness activities. For instance, findings consistently show reduced engagement in sports and fitness activities among ethnic minority groups and women from the general population in high-income countries (Guthold, Stevens, Riley, & Bull, 2018). Hence, it would be important to determine whether these associations are also replicated among people with psychotic disorders, and with respect to routine participation in goal-directed physical activity.

In an attempt to address the challenges related to adherence inherent to prescriptive physical activity interventions, more creative interventions containing more leisurely approach have started to emerge, including those characterised by clear-cut goals (Soundy et al., 2015; Brooke, Lin, Ntoumanis, & Gucciardi, 2019). For instance, a study exploring participation of a sample of people with schizophrenia preparing for a long-distance race, found very high levels of engagement (Warren et al., 2011). Feasibility studies exploring non-generic physical activity interventions, including football (Battaglia et al., 2013), horse-riding (Cerino, Cirulli, Chiarotti, & Seripa, 2011), canoeing (Clark, Goering, & Tomlinson, 1991), basketball (Takahashi et al., 2012) have also shown promising results with respect to both engagement and overall health outcomes. According to the self-determination theory (SDT), people become motivated to grow and develop (i.e. become self-determined) when their needs for autonomy, competence and relatedness are fulfilled (Ryan & Deci, 2017). The applicability of this notion of autonomous and intrinsic motivation, has also been highlighted within the context of people's participation in physical activity in general (Teixeira, Carraça, Markland, Silva, & Ryan, 2012). Therefore, given that these activities may provide a leisure and "fun" component, they are likely to increase uptake and reduce drop-out (Soundy et al., 2015), by acting a useful platform to foster the three basic needs underpinned by SDT (Hermens, Super, Verkooijen, & Koelen, 2017).

While an extensive body of work has investigated physical activity and inactivity among people in the community with psychotic disorders, studies have normally not attempted to gain insight into the specific types of sports and fitness activities conducted in daily life (Soundy et al., 2013). In addition, the majority of work to date has not measured physical (in)activity on the basis of the four key domains of physical activity, namely frequency, intensity, time and type (FITT) (Warren et al., 2010). Finally, only a limited set of correlates of participation in psychical (in)activity has previously been explored among this patient group (Soundy et al., 2013), and even less is known about the correlates of more specific sports and fitness activities as opposed to generic non-sedentary behaviour. This information would be crucial for enhancing future uptake of physical activity interventions in clinical settings by matching it with patients' previous preferences or experiences, as well as for promoting these interventions more emphatically to sub-groups of patients who are less likely to routinely participate in sports and fitness activities.

Against this background we therefore aimed to investigate the frequency, time and type of sports and fitness activities conducted in their daily lives by a sample of individuals with chronic psychotic disorders receiving out-patient care. We then investigated participant correlates with (i) participation in sports and fitness activities, and (ii) attainment of the minimum universal recommendation of physical activity per week as proposed by the World Health Organization (WHO) (Bull et al., 2020) as a measure of the intensity of these activities.

2. Methods

2.1. Study design and setting

This study is a cross-sectional survey conducted among participants recruited between June 2017 and May 2018 from six NHS trusts in England: Cornwall Partnership NHS Foundation Trust; Devon Partnership NHS Trust; East London NHS Foundation Trust (covering East London, Luton and Bedfordshire); Oxford Health NHS Foundation Trust (covering large areas of Oxfordshire and Buckinghamshire); Somerset Partnership NHS Foundation Trust; Tees, Esk and Wear Valleys NHS Foundation Trust (covering county Durham, Darlington, Teesside and North Yorkshire). A mixture of urban and suburban mental health settings was thus captured from these participating sites. Ethical approval was granted by the West Midlands – Solihull Research Ethics Committee (17/WM/0191).

2.2. Participants

Participants were eligible for inclusion in the study if they: (i) had an established clinical diagnosis of schizophrenia-spectrum disorder or any other non-affective psychotic disorder (ICD-10 F20–29); (ii) were receiving mental health care from out-patient secondary mental health services or primary care services; (iii) could communicate in English; (iv) were aged between 18 and 65; and (iv) had the capacity to give valid consent to taking part in research. Participants were excluded if they had: (i) no capacity to provide informed consent; (ii) a current and primary diagnosis of substance use disorders or (iii) received mental health treatment in hospital in the previous week (although they could be re-approached at a later time).

2.3. Procedures

Potential participants were initially approached in person by their respective treating clinicians, providing them with verbal and written information about the study. Those providing preliminary verbal consent were subsequently invited to a face-to-face meeting with trained researchers, where the information sheet and any ensuing queries were discussed. Capacity to consent was assessed continuously throughout the study, first having been established by the clinician who made initial contact, and later on during further meetings with the researchers. All participants were asked to provide written informed consent. Face-to-face assessments took about 45 min to complete and were conducted in quiet rooms in community mental health teams, primary care settings, or at participant's homes using standardised case report forms. Anonymised survey data was then entered into a database stored on a secure server.

2.4. Measurements

2.4.1. Participant-level variables

The following sociodemographic variables were obtained from face-to-face interviews and dichotomised if necessary for the purposes of

analysis: age (years), gender (male vs. female), marital status (single vs. married), country of birth (born in the UK vs. not), education level (tertiary or further vs. secondary or less), type of accommodation (independent housing vs. supported housing and homelessness), living situation (living with others vs. living alone), post code, employment status (unemployed vs. employed), receipt of benefits (receiving benefits vs. not), ethnicity (white vs. non-white). Clinical variables were obtained from medical records, namely: primary psychiatric diagnosis, presence of psychiatric co-morbidities and year of first contact with mental health services.

The number of self-reported social contacts in the previous week was assessed by the Social Contact Assessment schedule (Giacco, Palumbo, Strappelli, Catapano, & Priebe, 2016). The instrument asks participants to list the initials of social contacts who they have been in contact with in the last seven days, excluding first degree relatives, people they live or work with, as well as mental health professionals, to generate a total number of social contacts.

2.4.2. Physical activity participation through sports and fitness activities

The UK Time Use Survey (Lader, Short, & Gershuny, 2006) as adapted by our research group (Priebe et al., 2016) and further modified for the current study (See Supplementary Table S1), was used to ask participants to report their participation in sports and fitness activities during the previous week. The following list of activities was presented: swimming, cycling, gym/weight training, exercise classes, team sports, racquet sports, jogging, cross country, road running, walking or hiking 30 min or more, snooker, pool and darts. If they participated in an activity that was not on the list, they were also asked to specify the activity they completed. If they did participate in such activities, they were then asked to report (i) the number of times they completed the activity (i.e. only taking short breaks in between constituted one activity), (ii) the duration to the nearest 10 min, (iii) whether participation took place alone or with someone else, (iv) and if with someone else, to define the relationship of this individual with the participants: parent, sibling, friend, partner or other. Participants were finally asked to confirm whether this was a typical week for them or not.

We then calculated the total duration of participation in sports or fitness activities in minutes. Based on previous work (Lindamer et al., 2008; Vancampfort, Probst, Knapen, Carraro, & De Hert, 2012), we considered these activities to constitute "moderate intensity" physical activities. We finally created two dichotomous variables based on (i) whether participants partook in sports or fitness activities in the previous week or not, and (ii) whether participants completed ≥150 min of moderate intensity aerobic physical activity in the previous week or not as per WHO recommendations (Bull et al., 2020). The latter acted as a proxy measure for the intensity element of the FITT model.

2.5. Statistical analysis

Descriptive statistics (mean, median, standard deviation, range and the interquartile range) for the sample characteristics and for participation in sports and fitness activities were calculated.

We had two dependent variables of interest, namely: (i) participating in sports and fitness activities vs. not, and (ii) completing ≥ 150 min of moderate intensity aerobic physical activity in a week vs. not. For these outcome measures, we estimated relative risks (RR) and 95% confidence intervals (95% CI) using Poisson regression with robust error variance according to the method described by Zou (2004). Prior to conducting data analysis, diagnostic tests for our data were performed to assess distribution, variance and multicollinearity, demonstrating that none of the assumptions for using parametric tests had been violated.

First, we used univariable tests to explore the associations between individual participant-level variables and the dependent variable. Second, each significant association at an alpha level of 10% in these univariable tests was entered in a final multivariable model, set at a significance level of 5%. In a secondary analysis to assess the robustness of our findings, we also used simple and multiple linear regression to test associations of these independent variables of interest, with the duration of participation sports and fitness activities as a continuous dependent variable. All statistical analyses were conducted using *Stata* 16 for Windows.

3. Results

3.1. Participant characteristics

A total of 587 participants were initially enrolled onto the study, of whom 58 were excluded as they failed or declined to complete questions related to sports and fitness activities (Fig. 1).

We had a complete set of data for the remaining 529 participants, hence procedures for handling missing data were not necessary.

Table 1 summarises the participants' sociodemographic and clinical characteristics. The majority of participants included in this analysis were male ($n = 345$, 65.2%), white British ($n = 356$, 68.0%), single ($n = 398$, 75.7%) and living alone ($n = 245$, 46.6%). The mean age of participants was 43.5 years (SD 10.9, range 20–69).

3.2. Participation in sports and fitness activities

Slightly more than half of the sample ($n = 276$, 52.2%) completed at least one type of sports or fitness activity in the previous week, with a small minority participating in more than one ($n = 89$, 16.8%) (Table 2). Walking or hiking for ≥30 min was the most popular activity, completed by 181 (65.6% of $n = 276$) participants. On average, participants completed sports or fitness activities on 2.4 (±3.7; median = 1.0) separate occasions per week, with a total mean duration of 92.9 (±204.5; median = 30.0) minutes. Overall, 114 participants (21.5%) completed ≥150 min of activities. Over half of the sample reported participating in these activities alone ($n = 163$, 59.1%). When they did participate with others ($n = 113$, 40.9%), their companions were more often comprised of family members, carers or other patients ($n = 64$, 56.6%), rather than friends. Lastly, the majority of participants ($n = 464$, 88.21%) reported that this was a typical week for them, with no variation in response between those who had practised fitness activities or not ($\chi^2 = 3.06$, $p = 0.082$).

3.3. Association of participant variables with sports and fitness participation

As summarised in Table 3, the results of a modified univariable Poisson regression analysis showed lower RRs for participating in at least one sports or fitness activity among participants who were female, older, married, unemployed (hence on benefits) and with fewer social contacts. As age and illness duration were highly correlated, we removed the latter variable from further analysis. Associations with completing ≥150 min of sports or fitness activities per week followed the same trend. Adjusting for confounders, participants who were female, unemployed and had fewer social contacts continued to maintain the same significant association with participating at least once in sports or fitness activities. Being older in age and married, were additionally associated with not completing ≥150 min of sports or fitness activities per week in the adjusted model. The results of linear regression analysis testing associations with the duration of participation in minutes as a continuous variable did not alter these results (Supplementary Table S2).

4. Discussion

4.1. Main findings

In our large cross-sectional survey of people with psychotic disorders in the community, we found that only just over half of participants

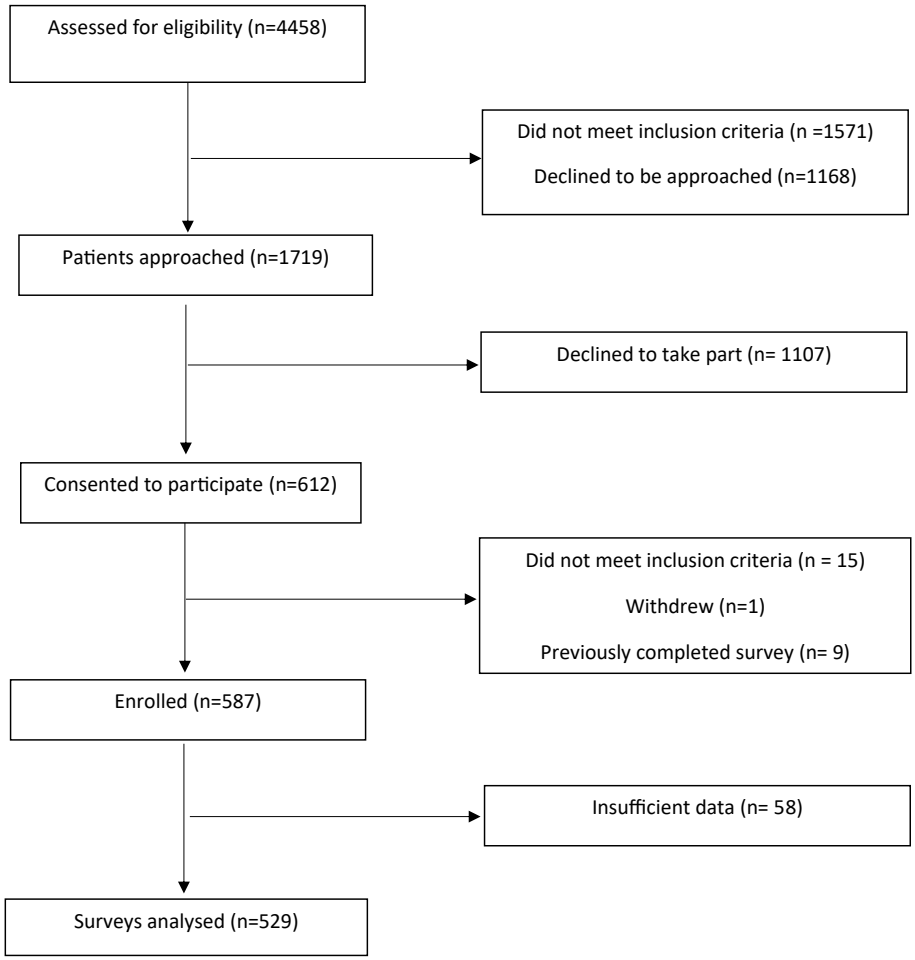

Fig. 1. CONSORT flow diagram describing recruitment of community participants with psychotic disorders.

reported taking part in sports or fitness activities at least once in the previous week, and only about one-fifth met the current universal recommendations for moderate weekly physical activity. Being female, older in age (hence also longer illness duration), unemployed, in a relationship and socially isolated predicted lower rates of sport participation, as well as shorter duration of participation. In addition, the majority of participants conducted these activities alone and when they did engage in these activities with companions, these were mostly family members and professional carers, rather than friends.

4.2. Strengths and limitations

To our knowledge, this is the first study to explore the extent of sports and fitness participation conducted by people with psychotic disorders in their daily lives outside of physical activity programmes delivered by mental health services. A wealth of prior studies has been conducted evaluating physical (in)activity among people with severe mental illness, however these studies have generally not endeavoured to explore specific activities. In addition, our study adopted the FITT elements to measure outcomes, in keeping with previously proposed directions of research (Soundy et al., 2013). While the intensity element of physical activity was measured via a proxy using the total duration of participation, this was unfortunately the drawback of using subjective survey data rather than actual objective measurements of activity such a those using pedometers or otherwise.

Our study has several limitations. Firstly, the study sample is not a representative clinical sample of people with psychotic disorders, given that participants were almost exclusively recruited from secondary care. In addition, the study adopted a cross-sectional approach. Potential selection bias might have therefore also been present dependent on the inclination of participants to participate and the mental state at the time of recruitment (Etter & Perneger, 2000). However, the relatively high statistical power yielded by the large sample size is likely to have mitigated these effects, allowing associations to be tested robustly . Secondly, sports and fitness participation was collected entirely by self-report, which might have been influenced by recall or social desirability bias, overestimating the reported participation. However, 88.21% of participants reported this was a usual week for them and our tool quantifying engagement has also been extensively used previously (Priebe et al., 2016). Responses were also potentially influenced by the type of activities available in the local area and by the list provided in the survey. Finally, we did not recruit participants from the general population, precluding any comparative investigations about sports activities.

4.3. Interpretation of findings and comparison with the literature

We found that nearly half of participants in the study failed to complete any sports-related activities during the previous week. While we did not measure sedentary behaviour itself, it is safe to assume, that this finding highlights the widespread physical inactivity among this patient group, and its role in predisposing to the premature mortality. Previous work has shown that patients with schizophrenia spend more time sitting than age- and gender-matched counterparts from the general population (Vancampfort, Probst, et al., 2012). In addition, in previous studies, only about 30% of people with schizophrenia reported

Table 1
Summary of socio-demographic and clinical characteristics of participants (n = 529).

Variable[a]	
***Age**, years*	
mean (SD)	43.5 (10.9)
median (IQR)	44 (36–52)
Range	20–69
***Sex**, female, n* (%)	183 (34.7)
***Ethnic group**, n (%)*	
White	356 (68.0)
Black	76 (14.5)
Asian	67 (12.8)
Mixed	10 (1.9)
Other	16 ((3.1)
***Relationship status**, n (%)*	
Single	398 (75.7)
Married, co-habiting or civil partnership	78 (14.8)
Divorced or separated	43 (8.2)
Widowed	7 (1.3)
***Living situation**, n (%)*	
Living alone	245 (46.6)
Living with family	184 (35.0)
Living with friends	8 (1.5)
Shared accommodation	89 (16.9)
***Accommodation**, n (%)*	
Independent or unsupervised accommodation	389 (73.8)
Supported accommodation	113 (21.4)
Homeless	6 (1.1)
Other	19 (3.6)
***Highest level of education**, n (%)*	
Tertiary or further education	231 (44.8)
Secondary education	222 (43.0)
Primary education or less	39 (7.6)
***Employment status**, n (%)*	
Unemployed	373 (71.1)
Voluntary work	58 (11.1)
Student	19 (3.6)
Employed part-time or full-time	49 (9.3)
Homemaker	5 (1.0)
Retired	9 (1.7)
Other	10 (1.9)
***Born in the UK**, n* (%)	427 (80.7%)
***Place of current residence**, n (%)*	
Bedfordshire	42 (7.9)
Cornwall	50 (9.5)
Devon	50 (9.5)
Co. Durham	94 (17.8)
London	166 (31.9)
Oxfordshire	78 (14.7)
Somerset	49 (9.2)
***Receiving state benefits**, n* (%)	471 (89.4)
***Diagnosis**, n (%)*	
Schizophrenia	363 (71.6)
Schizotypal disorder	3 (0.6)
Delusional disorder	11 (2.2)
Brief Psychotic Disorder	14 (2.8)
Schizoaffective disorder	83 (16.4)
Psychosis NOS	33 (6.5)
Number of social contacts	
Mean (SD)	2.9 (2.6)
Median	2
Range	1–15
***Co-morbid psychiatric diagnosis**, n* (%)	134 (25.3)
Years since first contact with mental health services	
mean (SD)	17.6 (10.7)
median (IQR)	17
Range	1–55
***MANSA score**, mean (SD)*	4.5 (0.9)
Number of social contacts, Mean (SD)	2.9 (2.6)
Median (IQR)	2

IQR: Interquartile range; *MANSA*: Manchester Short Assessment of Quality of Life; *SD*: standard deviation.
[a] Counts may not add up to total due to missing data.

Table 2
Summary of participation in sports and fitness activities in the previous week as reported by participants (n = 529).

Variable	*n* (%)
Number of sports and fitness activities completed[a]	253 (47.8)
None	187 (35.4)
1	55 (10.4)
2	26 (4.9)
3	7 (1.3)
4	1 (0.2)
5	
Type of sports and fitness activity[b, c]	29 (10.5)
Cycling	181 (65.6)
Walking or hiking ≥30 min	26 (9.4)
Exercise classes (e.g. aerobics, martial arts)	59 (21.4)
Gym or weight training	34 (12.3)
Pub games (e.g. snooker, pool, darts)	14 (5.1)
Racquet sports (e.g. tennis, badminton, squash)	20 (7.3)
Jogging, cross country, road running	26 (9.4)
Swimming	18 (6.5)
Team sports (e.g. rugby, football, cricket, hockey)	
***Completed ≥150 min**, yes*	114 (21.5%)
Participation companion[d]	45 (16.3)
Friend(s)	31 (11.2)
Family	15 (5.4)
Professional carer(s)	18 (6.5)
Patients	4 (1.5)
Not specified	163 (59.1)
None	

SD: Standard deviation.
[a] Counts may not add up to due to missing data.
[b] Some participants practised more than one sports and fitness activity.
[c] Percentages or summary statistics are for sub-sample of participants taking part in sports and fitness activities.
[d] Frequency is measured by the number of times people participated in a sports and fitness activity on the Time Use Survey (Priebe et al., 2016)

to be physically active at all compared to about 60% of people from the general population (Lindamer et al., 2008). Our slightly higher proportion of just under 50% of participants with psychotic disorders reporting taking part in sports activities may reflect the increased efforts through public health campaigns over the years to encourage physical activity participation. However, in our sample, only about one-fifth of patients adhered to the recommendations for moderate intensity physical activities, indicating the challenges people with psychotic disorders continue to face with sedentary lifestyle as result of negative and cognitive symptoms, as well as from extra-pyramidal side-effects of antipsychotics (Vancampfort et al., 2012a, 2013a). In addition, our sample consisted mostly of older individuals with a median age of 44. Given the typical onset of first episode psychosis during the second decade of life (O'Donoghue et al., 2015), it is likely that the ensuing effects of negative symptoms and cognitive decline might have contributed further to the sedentary behaviour apparent in our sample. Our findings, however are discrepant with those of a recent meta-analysis, identifying 56.6% of people with schizophrenia meeting the recommended 150 min of moderate physical activity per week through generic physical activities (Stubbs et al., 2016). Notably, all of the pooled studies but one, had much smaller sample sizes ranging 26 to 299, compared with 529 in current study, rendering our findings potentially more reliable.

We found that on average participants completed about 90 min of moderate physical activity per week in the form of sports or fitness activities. Previous work examining generic physical (in)activity among this patient group reported between 110 and 224 min of weekly moderate physical activity (Lindamer et al., 2008; Vancampfort, Probst, et al., 2012), with meta-analytic data suggesting a pooled mean of about 175 min. We specifically measured sports and fitness activities rather than physical activity in general. This may potentially explain the shorter weekly duration reported by our participants, although the

Table 3
Summary of Poisson regression models with robust error variance evaluating association between participant variables and (i) participation in sports or fitness activities, and (ii) participation in at least ≥150 min of sports or fitness activities self-reported in the previous week among patients with chronic psychotic disorders ($n = 529$).

	Participation in sports and fitness activities[a]								≥150 min of sports and fitness participation[b]							
	Univaraiable model				Multivariable model[c]				Univaraiable model				Multivariable model[c]			
	RR	95% CI		*P*	RR	95% CI		*P*	RR	95% CI		*P*	RR	95% CI		*P*
		Lower bound	Upper bound			Lower bound	Upper bound			Lower bound	Upper bound			Lower bound	Upper bound	
Gender, *female* (ref = *male*)	0.82	0.68	0.99	.039	0.81	0.67	0.97	.020	0.55	0.37	0.82	.003	0.54	0.37	0.80	.002
Age	0.99	0.98	1.00	.019	0.99	0.97	1.01	.292	0.97	0.95	0.98	<.001	0.98	0.97	0.99	.005
Marital status, *married* (ref = *single*)	0.79	0.64	0.98	.032	0.85	0.68	1.05	.128	0.46	0.27	0.76	.002	0.54	0.33	0.88	.013
Ethnicity, *white* (*ref = non-white)*	1.13	0.95	1.35	.173					0.83	0.60	1.15	.267				
Place of birth, *not UK* (*ref = UK)*	0.76	0.59	0.96	.074	0.80	0.63	1.01	.064	0.79	0.51	1.23	.297				
Level of education, *secondary or less (ref = tertiary or further)*	1.03	0.88	1.22	.663					1.02	0.74	1.42	.868				
Benefit status, *receiving benefits (ref = not receiving benefits)*	0.75	0.61	0.91	.005	0.84	0.68	1.03	.109	0.58	0.39	0.87	.008	0.81	0.54	1.22	.313
Employment status, *employed (ref = unemployed)*	0.70	0.60	0.82	<.001	0.76	0.65	0.91	.002	0.52	0.38	0.72	<.001	0.43	0.85	0.89	.004
Living situation, *living alone (ref = living with others)*	0.97	0.83	1.14	.750					0.96	0.69	1.32	.790				
Accommodation, *independent (ref = supported/ homeless)*	0.95	0.79	1.13	.55					1.36	0.84	2.24	.211				
Number of social contacts[d]	1.13	1.05	1.20	.001	1.04	1.01	1.07	.002	1.08	1.02	1.14	.004	1.12	1.03	1.21	.008
No co-morbid psychiatric diagnosis, (ref = co-morbid diagnoses)	0.84	0.68	1.03	.089	0.78	0.51	0.82	.236	0.73	0.49	1.11	.147				

RR: Risk Ratio, *CI*: confidence intervals.

[a] Reference group: Participated in sports or fitness activities in previous week *vs*. not.

[b] Reference group: Completed ≥150 min of sports or fitness activities in previous week *vs*. not.

[c] Adjusted for variables significant at alpha level of 10% in univariable models.

[d] Measured with the Social Contact Assessment schedule (Giacco et al., 2016), self-reported as the number of social contacts outside their immediate environment in the previous week.

subjective measurement in our study might have also underestimated outcomes. These findings overall, however, suggest that despite the passage of time since these previous studies were conducted, very little appears to have changed in terms of uptake of physical activity within routine contexts among this patient group.

Being female, older in age and with longer duration of illness, unemployed, married and socially isolated were all found to be predictive of reduced routine participation in sports and fitness activities, whether absolute participation or duration. Participation in physical activities is a generally complex endeavour, driven by a range of interpersonal, intrapersonal, environmental, societal and policy-based factors (Yamamoto et al., 2010). These findings related to predictors are consistent with those identified by a previous meta-analysis on the correlates of physical activity in general among people with schizophrenia (Vancampfort, Knapen, et al., 2012). However, age has not been previously found to be a correlate of physical activity among people with psychotic disorders. Our question focusing specifically on sports therefore highlighted the propensity for older individuals to be less proactive in this respect, driven by cultural norms and traditional roles, along with a lack of community and environmental factors reducing participation in sport (Wilcox, Castro, King, Housemann, & Brownson, 2000). With respect to marriage as a predictor - although being in a relationship can be beneficial to health (Umberson, Liu, & Powers, 2009), relationship status can lead to predictable and significant changes in weight that can have major health consequences.

Since 2005, the Taking Part Survey has been commissioned annually by the Department for Culture, Media and Sport since collecting cross-sectional data from a sample representative of the general population in England about their engagement in sports and fitness activities, amongst others (Department for Digital, Culture, Media and Sport, 2020). About 68% of the population reports engaging in some form of sports and fitness activities (Jones, H., Millward, P., & Buraimo, 2011), a trend that has generally remained consistent and stable over time (Downward, Dawnson & Mills, 2016), and notably a proportion that is much higher than that among our sample of individuals with psychotic disorders. The Taking Part series of surveys, however, reports engagement during the preceding four weeks, rather than 1 week as in our study, limiting strict comparisons. However, to highlight the salient differences in participation between the two groups, about 62% of adults in England adhere to physical activity guidelines as captured by the Health Survey for England 2016 (Scholes & Neave, 2017) – a much higher proportion than that of participants with psychotic disorders.

The trend of correlations between sociodemographic variables (i.e. gender, life-stage, socioeconomic status, marital status, peer group/social isolation) among the general population in England (Jones, H., Millward, P., & Buraimo, 2011) and elsewhere (Rapp & Schneider, 2013; Breuer, Hallmann, & Wicker, 2011), also mirrors the findings from our participants with psychotic disorders. However, a clear correlation between ethnicity and participation has also been highlighted previously in the general population, which was not apparent in our study, possibly due to a degree of underpowering.

Despite the similar pattern of correlations, people with psychotic disorders have higher risk of somatic comorbidities and they may be even less aware about these health risks relative to the general population (Buhagiar, Templeton, & Osborn, 2020), while also lacking sufficient motivation to engage in sports and fitness activities (Vancampfort, De Hert, et al., 2013). This therefore underpins the need to better understand and support these underserved groups in innovative and more emphatic ways. To achieve this, there is a need to further explore the social, environmental and cultural factors that may limit their participation in sports and fitness activities, including lack of time, available facilities, finances and culture preferences (Wilcox et al., 2000). Importantly, when these groups of individuals with psychotic disorders are introduced to sports and fitness activities in a clinical setting, it would be important to recognise their vulnerabilities to social and emotional perceptual biases (Soundy et al., 2014), which themselves may be the driving force for the reluctance to participate in sports in the first instance as demonstrated by our findings.

Lastly, we found that the majority of participants took part in activities alone rather than with others. Previous research has consistently shown the difficulties encountered by people with psychotic disorders with social interactions (Giacco et al., 2016) and meeting friends (Buhagiar, Priebe, et al., 2020), which may underpin the preference for solitary activities such as walking or hiking in our sample. This contrasts with previous findings from the general population in England, with only about one-third reporting engaging in sports and fitness activities alone (Jones, H., Millward, P., & Buraimo, 2011). Engagement in solitary activities among individuals with psychotic disorders, may nevertheless represent a degree of intrinsic autonomous motivation in accordance with SDT. Delivering sports activities favouring solitary participation, may therefore be a first step to initially encourage participation, and ultimately pave the way for a socialising element that continues to promote more active sports participation, when negative symptoms have started to gradually curtail pursuant to the effect of these interventions (Soundy et al., 2015; Vancampfort, De Hert, et al., 2013). The benefit of sport and fitness participation in people with severe mental illness has in fact been highlighted previously, demonstrating its impact that goes above and beyond its effect as a whole, for instance by conferring confidence gained from social interactions (Soundy et al., 2014). Consequently, this yields an ability to transfer the formation of social interactions to broader contexts, hence improving social functioning, while also having a wider bio-psychosocial health benefit.

4.4. Implications

This study has implications for both research and services promoting physical activity among people with psychotic disorders. Our findings showing the limited routine participation in sports and fitness activities among people with psychotic disorders, indicate that more health promotion strategies and active therapeutic interventions addressing the complex aetiologies of physical inactivity is required if outcomes are to improve through physical activity interventions. The evidence to date about the positive role of physical health interventions among people with psychotic disorders is unequivocal, including its effect on reducing negative symptoms (Rosembaum et al., 2014; Firth et al., 2015). Nevertheless, these interventions, still adopt a prescriptive and structured approach, and uptake and drop-out rates unfortunately remain high (Soundy et al., 2015). On the other hand, sport participation may have overarching benefits that transcend the benefits delivered through structured interventions, addressing also social interaction, enhancing self-esteem (Langle et al., 2000) and overall global functioning(Corretti et al., 2011). Recent work has started to emerge on the understanding of motivation among people with schizophrenia based on SDT (Vancampfort et al., 2014). Findings have highlighted the need for clinicians to shift away from their focus on physical activity as merely a means of improving outcomes related to physical health. On the other hand, clinical environments that promote self-determined types of motivation, by nurturing the crucial need for autonomy, competence and relatedness are likely to yield better outcomes from these interventions (Vancampfort, De Hert, et al., 2013). Goal-directed sports and fitness activities are likely to lend themselves particularly beneficial to attaining these aims, given their group-based structure and intrinsic ability to provide a social milieu, while ultimately fostering autonomy and competence through the achievement of some form of success and the underlying “fun” (Soundy et al., 2015; Vancampfort, De Hert, et al., 2013).

Evidence for the role of sports-based interventions for people with psychotic disorders is overall encouraging, but still in its infantile stages (Soundy et al., 2015). A previous meta-analysis has identified that drop-out rates from physical health interventions is essentially predicted by the extent of qualifications of the professional delivering the interventions (Vancapfort et al., 2016). However, there is no such data to

date exploring uptake and drop out from sports-based interventions proper. This would be an area to additionally explore in the future, against the predictors of routine participation identified in our study. Therefore, the health benefits of specific sport participation among people with psychotic disorders requires further exploration in a more proactive manner, based on emerging findings of previous work (Soundy et al., 2015) and the findings from the current study, particularly in relation to exploiting previous preferences.

Finally, given the identified correlates of reduced participation in fitness activities, future interventions of this kind may need to be tailored to encourage greater participation on the basis of the socio-demographic correlates identified in our study. Amongst others, our findings identify the increased predisposition for sedantary behaviour with increasing age. This highlights the importance of introducing individualised sports and fitness activities at a younger age in the immediate aftermath of the onset of symptoms, when the affected individuals are potentially more physically active and experiencing fewer physical co-morbidities. Among the general population, a link between engagement in sport and fitness activities and increased levels of health by means of primary and secondary prevention of both physical and mental disorders has incontrovertibly been demonstrated in accordance with the model of health production (Warburton, Nicol, & Bredin, 2006). In addition, findings from time-series data obtained from the Taking Part Surveys between 2005 and 2013 have also demonstrated that the set of sports and fitness activities also analysed in our study, carry maximum impact on health benefits in the younger age groups (Downward, Dawnson & Mills, 2016). Implementing these activities as an integral part of therapeutic programmes for people with first episode psychosis, is therefore, also likely to bring about longer-term benefits, such as reducing negative symptoms, self-efficacy and ultimately improving the overall physical health (Firth et al., 2018). This may also set a blueprint for lifetime engagement in sports among this patient group.

Interventions may also need to be matched with the preferences of those who have already participated in sports and fitness activities. This strategy may make it easier to overcome the barriers that otherwise make people with psychotic disorders reluctant to be physically active, while at the same, encourage uptake in keeping with SDT. Previous work has in fact already identified that previous engagement in sport may be a key factor in bringing about benefit when sports-based interventions are then introduced (Soundy et al., 2015). While reasons for reluctance to participate in sports and fitness activities by a sub-group of individuals with psychotic disorders may be inferred from social and environmental biases identified from studies conducted among the general population (Guthold et al., 2018) and on the notions of motivation/self-determination (Vancmapfrot et al., 2013b; Vancampfort et al., 2014), specific qualitative studies to explore these barriers among people with psychotic disorders would also help the further understanding of these challenges. This would then permit future interventions to adopt more sensitive, direct and targeted approaches to increase uptake and reduce drop-out.

4.5. Conclusion

Participation in sports and fitness activities among outpatients with psychotic disorder in their daily lives is limited, suggesting that sedentary behaviour among this patient group remains a problem despite campaigns and interventions over the years to address physical inactivity. More enjoyable sports-based interventions may however be an alternative to this, if preferences and prior participation are taken into account, as this is likely to further promote autonomy, competence and relatedness. Implementing sports and fitness activities as an early intervention may further maximise uptake and outcomes success. These interventions may also need to ensure that they target sub-groups of patients more at risk of physical inactivity based on the sociodemographic correlates identified, especially once an understanding of the more salient barriers has been acquired through future work.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.mhpa.2021.100402.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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