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

1.0 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 (De Hert et al., 2009, McNamee et al., 2013; Buhagiar, Templeton, & Osborn, 2020), 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, with positive impact on cardiometabolic risk factors, general physical fitness and psychiatric symptoms, particularly if these interventions implement adequate doses of exercise and engage patients sufficiently (Firth et al., 2015; Firth et al., 2018; Rosenbaum et al., 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 et al., 2015). Consequently, these interventions 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 previous 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 et al., 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 et al, 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 et al., 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 et al., 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 et al., 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., 2011). 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 a 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 patient's 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 Organisation (WHO) (Bull, et al., 2020) as a measure of the intensity of these activities.

2.0 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, Teeside 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 minutes 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 (Giacco et al., 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) 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 minutes or more, snooker, pool and darts. If they participated in an activity that was not on the list, they were

then also asked to specify the activity they participated in. If they did participate in such activities, they were then asked to report (i) the number of times they participated in such activity (i.e. only taking short breaks in between constituted one activity), (ii) the duration to the nearest 10 minutes, (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 then 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 minute. Based on previous work (Lindamer et al. 2008; Vancampfort et al., 2012a), 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 minutes 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 interests, namely: (i) participating in sports and fitness activities vs. not, and (ii) completing ≥ 150 minutes of moderate intensity aerobic physical activity in a week period vs. not. For these outcomes measures separately, 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 (1994). 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.

3.0 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.

[Fig.1. here]

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).

[Table 1 here]

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 minutes 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 minutes 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 (χ^2=3.06, p=0.082).

[Table 2 here].

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 minutes 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 minutes 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).

[Table 3 here]

4.0 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 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 more often were 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 routinely 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 a purposive sampling method was used and

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 and minimising any ensuing distortion of results. Secondly, sports and fitness participation was collected entirely by self-report, which might have been influenced by recall or social desirability bias, overestimating their reported participation. However, 88.21% of participants reported this was a usual week for them and our tool quantifying engagement has also been used previously with robust outcomes (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 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 et al., 2012a). In addition, in previous studies, only about 30% of people with schizophrenia reported 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 as result of negative and cognitive symptoms, as well as the effects of extra-pyramidal side-effects from antipsychotics (Vancampfort et al., 2012a; Vancampfort et al., 2013a). In addition, our sample consisted in the larger part of older individuals with a median age of 44, and given the typical onset of first episode psychosis during the second decade of life (O'Donoghue et al., 2015), it is likely that 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 minutes 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 robust.

We found that on average participants completed about 90 minutes 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 minutes of weekly moderate physical activity (Lindamer et al., 2008; Vancampfort et al., 2012a), with meta-analytic data suggesting a pooled mean of about 175 minutes. We specifically measured sports and fitness activities rather than physical activity in general, hence potentially explaining the shorter weekly duration reported by our participants, although the 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 since then in terms of uptake 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 of participation. Participation in physical activities is 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 et al., 2012b). 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 et al., 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, as opposed to one week as in our study, limiting strict comparisons with our study. However, to highlight the salient differences in participation between the two groups, about 62% of adults in England adhere to the physical activity guidelines as captured by the Health Survey for England 2016 (Scholes & Neve, 2017) highlights – a much higher proportion found in our 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,

312 Hallmann & Wicker P 2011), also mirrors the findings from our participants with psychotic disorders.
313 However, a clear correlation between ethnicity and participation has also been highlighted
314 previously in the general population, which was not apparent in our study, possibly due to a degree
315 of underpowering.

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

329 Lastly, we found that the majority of participants took part in activities alone rather than
330 with others. Previous research has consistently shown the difficulties encountered by people with
331 psychotic disorders with social interactions (Giacco et al., 2016) and meeting friends (Buhagiar et al.,
332 2020), which may underpin the preference for solitary activities such as walking or hiking in our
333 sample. This contrasts with previous findings from the general population in England, with only
334 about one-third reporting engaging in sports and fitness activities alone (Jones, H., Millward, P., &
335 Buraimo, 2011). Engagement in solitary activities among individuals with psychotic disorders, may
336 nevertheless represent a degree of intrinsic autonomous motivation in accordance with SDT.
337 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 et al, 2013b). The benefit of sport and fitness participation on 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, Siemssen, & Hornberger, 2000) and overall global functioning (Corretti et al., 2015). 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 instead 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 et al., 2013b). 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 et al., 2013b).

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 sessile 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), while potentially also setting 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, and eventually 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 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 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 have been understood through future work.

5.0 REFERENCES

Battaglia, G., Alesi, M., Inguglia, M., Roccella, M., Caramazza, G., Bellafiore, M., Palma, A. (2013). Soccer practice as an add-on treatment in the management of individuals with a diagnosis of schizophrenia. *Neuropsychiatric Disease and Treatment*, 9:595-603.

Breuer C, Hallmann K, Wicker P. (2011). Determinants of sport participation in different sports. *Manag Leisure,* 16(4):269–86.

Brooke, L. E., Lin, A., Ntoumanis, N., & Gucciardi, D. F. (2019). Is sport an untapped resource for recovery from first episode psychosis? A narrative review and call to action. *Early Intervention in Psychiatry*, *13*(3), 358-368.

Buhagiar, K., Templeton, G., & Osborn, D. P. (2020). Recent physical conditions and health service utilization in people with common mental disorders and severe mental illness in England: Comparative cross-sectional data from a nationally representative sample. *European Psychiatry*, *63*(1).

Buhagiar, K., Priebe, S., Klingemann, J., Lasalvia, A., Nicaise, P., Soltmann, B. and Giacco, D., (2020). Social contacts, friends and satisfaction with friendships in patients with psychotic, mood and neurotic disorders 1 year after hospitalisation: data from five European countries. *Social Psychiatry and Psychiatric Epidemiology* https://doi.org/10.1007/s00127-020-01915-8

Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine* 1;54(24), 1451–62.

Cerino, S., Cirulli, F., Chiarotti, F., & Seripa, S. (2011). Non conventional psychiatric rehabilitation in schizophrenia using therapeutic riding: the FISE multicentre Pindar project. *Annali dell'Istituto Superiore di Sanita*, *47*, 409-414.

Chang, C.K., Hayes, R.D., Perera, G., Broadbent, M.T., Fernandes, A.C., Lee, W.E., Hotopf, M. and Stewart, R., (2011). Life expectancy at birth for people with serious mental illness and other major disorders from a secondary mental health care case register in London. *PloS one*, 6(5), p.e19590.

Clark, C., Goering, P., & Tomlinson, G. (1991). Challenging expectations: Client perceptions of white water canoeing. *Psychosocial Rehabilitation Journal*, *14*(4), 71.

Corretti, G., Martini, C., Greco, P. L., & Marchetti, F. P. (2011). Sport in psychiatric rehabilitation: a tool in pre-acute, post-acute and chronic phase. *International Journal of Clinical Medicine*, 2(5). doi:10.4236/ijcm.2011.25093

De Hert, M., Schreurs, V., Vancampfort, D., & Van Winkel, R. (2009). Metabolic syndrome in people with schizophrenia: a review. *World Psychiatry*, *8*(1), 15.

Department for Culture, Media and Sport (2020). Taking Part Survey. Available from: https://www.gov.uk/guidance/taking-part-survey. Last accessed: 30th March 2021.

Downward, P., Dawson, P., & Mills, T. C. (2016). Sports participation as an investment in (subjective) health: a time series analysis of the life course. *Journal of Public Health*, 38(4), e504-e510.

Etter, J. F., & Perneger, T. V. (2000). Snowball sampling by mail: application to a survey of smokers in the general population. *International Journal of Epidemiology*, *29*(1), 43-48.

Firth, J., Cotter, J., Elliott, R., French, P., & Yung, A. (2015). A systematic review and meta-analysis of exercise interventions in schizophrenia patients. *Psychological Medicine*, 45, 1343-1361.

Firth, J., Carney, R., French, P., Elliott, R., Cotter, J., & Yung, A. R. (2018). Long-term maintenance and effects of exercise in early psychosis. *Early Intervention in Psychiatry*, *12*(4), 578-585.

Giacco, D, Palumbo, C, Strappelli, N, Catapano, F, & Priebe, S. (2016). Social contacts and loneliness in people with psychotic and mood disorders. *Comprehensive Psychiatry*, *66*, 59-66.

Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2018). Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. *The Lancet Global Health*, *6*(10), e1077-e1086.

Hermens, N., Super, S., Verkooijen, K. T., & Koelen, M. A. (2017). A systematic review of life skill development through sports programs serving socially vulnerable youth. *Research Quarterly for Exercise and Sport*, *88*(4), 408-424.

Jones, H., Millward, P., & Buraimo, B. (2011) Adult participation in sports. *Department for culture, media and sport*. https://www.gov.uk/government/publications/adult-participation-in-sport-analysis-of-the-taking-part-survey

Kelley, M. P., Coursey, R. D., & Selby, P. M. (1997). Therapeutic adventures outdoors: A demonstration of benefits for people with mental illness. *Psychiatric Rehabilitation Journal*.

Lader, D., Short, S., & Gershuny, J. (2006). The time use survey, 2005. *London: The national Amendment, Office for National Statistics*.

Langle, G., Siemssen, G., & Hornberger, S. (2000). The role of sports in the treatment and rehabilitation of schizophrenic patients. *Rehabilitation Stuttgart*, *39*(5), 276-282.

Lindamer, L. A., McKibbin, C., Norman, G. J., Jordan, L., Harrison, K., Abeyesinhe, S., & Patrick, K. (2008). Assessment of physical activity in middle-aged and older adults with schizophrenia. *Schizophrenia Research*, 104(1-3), 294-301.

O'Donoghue, B., Lyne, J., Madigan, K., Lane, A., Turner, N., O'Callaghan, E., & Clarke, M. (2015). Environmental factors and the age at onset in first episode psychosis. *Schizophrenia Research*, 168(1-2), 106-112.

McNamee, L., Mead, G., MacGillivray, S., & Lawrie, S. M. (2013). Schizophrenia, poor physical health and physical activity: evidence-based interventions are required to reduce major health inequalities. *The British Journal of Psychiatry*, *203*(4), 239-241.

Priebe S, Pavlickova H, Eldridge S, Golden E, McCrone P, et al. 2016. Effectiveness of one-to-one volunteer support for patients with psychosis: protocol of a randomised controlled trial. *BMJ Open,* 6:e011582.

Rapp, I., & Schneider, B. (2013). The impacts of marriage, cohabitation and dating relationships on weekly self-reported physical activity in Germany: A 19-year longitudinal study. *Social science & medicine*, *98*, 197-203.

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J., Ward, P.B. P (2014). Physical activity interventions for people with mental illness: a systematic review and meta-analysis. *J Clin Psychiatry*, 75(9):964-74.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.

Scholes, S., & Neave, A. (2017). Health Survey for England 2016: Physical activity in adults. Leeds: *Health and Social Care Information Centre*.

Soundy, A., Wampers, M., Probst, M., De Hert, M., Stubbs, B., Vancampfort, D., ... & Ströhle, A. (2013). Physical activity and sedentary behaviour in outpatients with schizophrenia: a systematic review and meta-analysis. *International Journal of Therapy and Rehabilitation*, *20*(12), 588-595.

Soundy, A., Freeman, P., Stubbs, B., Probst, M., Coffee, P., & Vancampfort, D. (2014). The transcending benefits of physical activity for individuals with schizophrenia: a systematic review and meta-ethnography. *Psychiatry Research*, *220*(1-2), 11-19.

Soundy, A., Roskell, C., Stubbs, B., Probst, M., & Vancampfort, D. (2015). Investigating the benefits of sport participation for individuals with schizophrenia: a systematic review. *Psychiatria Danubina*, *27*(1), 0-13.

Stubbs, B., Firth, J., Berry, A., Schuch, F. B., Rosenbaum, S., Gaughran, F., ... & Vancampfort, D. (2016). How much physical activity do people with schizophrenia engage in? A systematic review, comparative meta-analysis and meta-regression. *Schizophrenia Research*, *176*(2-3), 431-440.

Takahashi, H., Sassa, T., Shibuya, T., Kato, M., Koeda, M., Murai, T., ... & Okubo, Y. (2012). Effects of sports participation on psychiatric symptoms and brain activations during sports observation in schizophrenia. *Translational Psychiatry*, *2*(3), e96-e96.

566 Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise,
567 physical activity, and self-determination theory: a systematic review. *International Journal of*
568 *Behavioral Nutrition and Physical Activity*, *9*(1), 1-30.
569
570 Umberson, D., Liu, H., & Powers, D. (2009). Marital status, marital transitions, and body
571 weight. *Journal of Health and Social Behavior*, *50*(3), 327-343.
572
573 Vancampfort, D., Probst, M., Knapen, J., Carraro, A., & De Hert, M. (2012a). Associations
574 between sedentary behaviour and metabolic parameters in patients with schizophrenia. *Psychiatry*
575 *Research*, 200(2-3), 73-78.
576
577 Vancampfort, D., Knapen, J., Probst, M., Scheewe, T., Remans, S., & De Hert, M. (2012b). A
578 systematic review of correlates of physical activity in patients with schizophrenia. *Acta Psychiatrica*
579 *Scandinavica*, 125(5), 352-362.
580
581 Vancampfort, D., Probst, M., Scheewe, T., De Herdt, A., Sweers, K., Knapen, J., ... & De Hert,
582 M. (2013a). Relationships between physical fitness, physical activity, smoking and metabolic and
583 mental health parameters in people with schizophrenia. *Psychiatry Research*, 207(1-2), 25-32.
584
585 Vancampfort, D., De Hert, M., Vansteenkiste, M., De Herdt, A., Scheewe, T. W., Soundy, A.,
586 ... & Probst, M. (2013b). The importance of self-determined motivation towards physical activity in
587 patients with schizophrenia. *Psychiatry Research*, 210(3), 812-818.
588
589 Vancampfort, D., Vansteenkiste, M., De Hert, M., De Herdt, A., Soundy, A., Stubbs, B., ... &
590 Probst, M. (2014). Self-determination and stage of readiness to change physical activity behaviour in
591 schizophrenia. *Mental Health and Physical Activity*, 7(3), 171-176.
592
593 Vancampfort, D., Rosenbaum, S., Schuch, F. B., Ward, P. B., Probst, M., & Stubbs, B. (2016).
594 Prevalence and predictors of treatment dropout from physical activity interventions in
595 schizophrenia: a meta-analysis. *General hospital psychiatry*, *39*, 15-23.
596
597 Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the
598 evidence. *CMAJ*, 174(6), 801-809.
599

Warren, J. M., Ekelund, U., Besson, H., Mezzani, A., Geladas, N., & Vanhees, L. (2010). Assessment of physical activity–a review of methodologies with reference to epidemiological research: a report of the exercise physiology section of the European Association of Cardiovascular Prevention and Rehabilitation. *European Journal of Cardiovascular Prevention & Rehabilitation*, 17(2), 127-139.

Warren, K. R., Ball, M. P., Feldman, S., Liu, F., McMahon, R. P., & Kelly, D. L. (2011). Exercise program adherence using a 5-kilometer (5K) event as an achievable goal in people with schizophrenia. *Biological Research for Nursing*, *13*(4), 383-390.

Wilcox, S., Castro, C., King, A. C., Housemann, R., & Brownson, R. C. (2000). Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States. *Journal of Epidemiology & Community Health*, *54*(9), 667-672.

Yamamoto, H., Yamamoto, K., Miyaji, S., Yukawa-Inui, M., Takai-Kamiya, M., Tatematsu, S., ... & Miyaoka, H. (2010). Physical activity of daily living in patients with schizophrenia. Schizophrenia Research, 2(117), 519-520.

Zou G. (2004). A Modified Poisson regression approach to prospective Studies with binary data. *American Journal of Epidemiology*, 159, 702–706.