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Cardiorespiratory fitness and self-reported physical activity levels of referring mental healthcare professionals, and their attitudes and referral practices related to exercise and physical health

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ABSTRACT

Background: Physical activity (PA) interventions can improve mental and physical health of people with mental illness, especially when delivered by qualified exercise professionals. Also, the behaviour, engagement and support of referring mental healthcare professionals (HCP) seem essential, but research is scarce. We aimed to study HCP physical fitness and PA, and associations with their attitudes and referral practices related to physical health and PA interventions.

Methods: HCP at the Dutch Association for Psychiatry congress (2019) were invited to an online questionnaire (demographic/work characteristics, stress, PA levels, knowledge/attitudes regarding PA, referral practices) and cycle ergometer test. Strongest associations were analysed using linear and logistic regression.

Results: Of the 115 HCP who completed the questionnaire (40 also completed the ergometer test), 43% (n = 50) met PA guidelines (i.e., ≥150min moderate-to-vigorous PA and ≥2x bone/muscle-strengthening exercises/week). Women, HCP interns/residents and HCP experiencing more stress were less active and less likely to meet PA guidelines. Conversely, there were positive associations with personal experience with an exercise professional. Knowledge/attitudes on physical health and PA were positive. HCP were more likely to refer patients to PA interventions if they met PA guidelines (OR = 2.56, 95%BI = 0.85–7.13) or had higher beliefs that exercise professionals can increase adherence to PA interventions (OR = 3.72, 95%BI = 1.52–9.14).

Limitations: Mainly psychiatrists, affecting generalizability.

Conclusions: HCP report the importance and relevance of PA in mental healthcare. Despite strong evidence and guidance for PA interventions in prevention and treatment, referral to such interventions partly depends on the PA behaviour and attitude of patient's physician/clinician.

1. Background

It is well known that besides their impaired mental health, people with mental illness often experience impaired physical health which contributes to their substantially reduced life expectancy. This premature mortality is relatively more often caused by cardiometabolic diseases, for which people with mental illness have a 1.4–2.0 times higher risk than the general population, regardless of diagnosis (Firth et al., 2019; Plana-Ripoll et al., 2019, 2020). In addition to disease- and treatment-specific risk factors such as side effects of psychotropic medication, an unhealthy lifestyle including high levels of sedentary behaviour, low physical activity (PA), high smoking rates and poorer dietary patterns is more common in people with mental illness and plays an important role in their poorer health status (Firth et al., 2019; Peckham et al., 2017; Stubbs et al., 2018; Teasdale et al., 2019).

There is robust evidence showing that interventions aiming to

Abbreviations: PA, Physical activity; HCP, Healthcare professional; MVPA, Moderate to vigorous physical activity; BMSE, Bone and muscle strengthening exercises; PSS, Perceived stress scale; AIC, Akaike's information criterion.

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address lifestyle factors, such as PA interventions, can improve the health of people with mental illness within various diagnoses. Maybe the greatest potential of such interventions in mental healthcare is that, in addition to physical health, they can improve mental health, including psychiatric symptoms, global and cognitive functioning and quality of life, as shown by multiple recent meta-reviews (Ashdown-Franks et al., 2020; Czosnek et al., 2019; Firth et al., 2020; Stubbs et al., 2018). These benefits of physical activity interventions are of great value since people with mental illness often experience long-lasting psychiatric symptoms and challenges in social functioning, despite medication or psychotherapy (Patel et al., 2018). Besides larger effects when executed at sufficient levels of intensity, PA interventions are most efficacious and show lower dropout rates when delivered by qualified exercise professionals (Czosnek et al., 2019; Schmitt et al., 2018; Stubbs et al., 2016, 2018; Vancampfort et al., 2016b, 2019, 2021). This stresses the added value of involving professions such as psychomotor therapists, physiotherapists or exercise physiologists with adequate training in mental healthcare.

Despite this evidence base, health care professionals (HCP) do not always refer their patients to PA programs or qualified exercise professionals. In Australia, a study found that although 70% of HCP prescribed exercise daily or weekly for stress, anxiety or depression symptoms, only 11% prescribed exercise daily in schizophrenia or bipolar disorders (Way et al., 2018). Remarkably, HCP who indicated that they were physically active for at least five days of a usual week prescribed exercise more frequently for all diagnoses. Similar findings were shown in physicians and nurses in general healthcare, showing adherence to a Mediterranean diet, higher PA levels and absence of current and former smoking to be positively associated with frequency and duration of counselling practices on these topics (Belfrage et al., 2018; Carlos et al., 2020; Fie et al., 2012). However, a study mainly including psychiatrists in Australia and New Zealand found no evident associations between self-reported PA, fitness measures and referrals of their patients to accredited exercise physiologists (Fibbins et al., 2018a).

Thus there are indications for the impact of personal and professional lifestyle-related factors of HCP on their counselling and referral practices towards patients. Nevertheless, insight into the extent to which the current evidence on PA interventions for physical and mental health in specifically mental illness is reflected in knowledge, attitudes and referral practices of HCP in mental healthcare and its relationship with their PA and fitness levels is limited and inconsistent.

Therefore, we aimed to explore the PA and physical fitness of referring HCP, their attitudes related to physical health and PA, and referral practices to PA interventions for improving mental and physical health. Additionally, we aimed to explore whether personal and professional characteristics are associated with these outcomes.

2. Methods

2.1. Study design

For this cross-sectional study, we recruited participants at the 2019 Dutch Association for Psychiatry (NVvP) congress (April 3–5). This is the main psychiatry congress in the Netherlands. Attendees were invited to participate in an online survey and fitness test.

2.2. Procedure

Participants were recruited plenary (central meetings, congress app and social media) and at a stand in the main congress hall where two ergometer bikes were set up. Parallel to the online questionnaire invitation, participants were invited for the cycle ergometer test which was carried out by two trained research assistants supervised by a psychomotor therapist and exercise physiologist. Participation was voluntary and informed consent was requested for both parts. If one participated in both the questionnaire and cycle ergometer test, we asked participants to fill in a self-chosen number (as unique as possible) on both forms to link data. A poster at the stand provided the participants with information about the test and helped them to interpret personal results. The study was conducted according to the Declaration of Helsinki. Ethics approval was received from the Medical Ethical Committee of the Isala Academy (case 190402).

2.3. Participants

The congress is attended by most Dutch psychiatrists and interns/residents in psychiatry annually, joined by referring HCP such as psychologists and nurse practitioners and interested managers and researchers (n ≈ 2500). For this study, we only included referring HCP (e.g., psychiatrists, psychologists, interns/residents in psychiatry or psychology such as postgraduate or senior house officer or specialist registrar, and nurse practitioners). For the ergometer test, we asked people about any health concerns related to their heart rate and/or cycling in general. If there were any concerns, we advised them not to participate. Also, specifically, people known with the following criteria were advised not to participate in the cycle ergometer test: hypertension (systolic pressure >160 mmHg or diastolic pressure >115 mmHg), tachycardia during rest (>100/min), severe dyspnea, continuous cough or edema in feet, ankles or calves.

2.4. Measurements

2.4.1. Self-reported questionnaire

The self-reported questionnaire consisted of four parts, focusing on demographic and work characteristics, knowledge and attitudes and referral practices, PA levels and habits, and stress levels. For the full questionnaire, see supplementary document S1. Demographic and work characteristics included sex (i.e., biological assignment at birth), age, profession years working, and main population and diagnosis classification they worked with.

Questions on knowledge, attitudes and referral practices were based on similar previous research among HCP in mental healthcare (Fibbins et al., 2018a). Questions on knowledge and attitudes (e.g., *people with a mental illness are more likely to develop cardiometabolic disease, referring people with a mental illness to an exercise professional can increase their adherence to a physical activity program)* were scored from 1 (totally disagree) to 5 (totally agree). Referral practices focused on whether participants ever referred a person with mental illness to an exercise program or PA, most common ways and main reasons to refer people, ranking effectiveness of ways to advise patients, and whether they worked with an exercise professional in their treatment facility.

For self-reported PA, we focused both on the separate components of the international guidelines, namely ≥150min moderate to vigorous physical activity (MVPA) per week and ≥2x bone and muscle strengthening exercises (BMSE) per week, as well as the recommended combination of the two (Bull et al., 2020). Questions regarding MVPA levels were based on the Physical Activity Vital Sign (Greenwood et al., 2010; Sallis, 2011) which showed moderate validity and was previously used in research among HCP and patients in mental healthcare (Fibbins et al., 2018a; Golightly et al., 2017; Vancampfort et al., 2016a, 2016c). Participants were asked how many days a week on average they engage in MVPA, such as a brisk walk or sports. Secondly, it was asked how many minutes per week on average (in total) they engage in PA at this level. Additionally, we asked which activities they mainly do, how many days a week on average they do BMSE, and whether they have personally been referred to an exercise professional. For analyses, we calculated the average minutes MVPA per week and whether participants met the international PA guidelines (separate components and both, yes/no).

To assess stress levels, we used a Dutch version of the Perceived Stress Scale (PSS) (Cohen et al., 1983) which has previously used in a Dutch longitudinal population study (Hoogendijk et al., 2020). The PSS is a 10-item easy-to-use questionnaire with acceptable psychometric

properties (Lee, 2012). Questions were scores from 0 (never) to 4 (very often). Total scores were calculated after reversing positive items so that higher scores indicated higher perceived stress. Total scores were represented in a sum score (0–40, used for analyses) and subscales for perceived helplessness (e.g., *in the last month, how often have you felt nervous and stressed?*, ranging from 0 to 24) and perceived self-efficacy (e.g., *in the last month, how often have you felt that things were going your way?,* ranging from 0 to 16).

2.4.2. Cycle ergometer test

As a measure of physical fitness, aerobic fitness expressed as maximal oxygen uptake per kilogram body weight per minute (VO_2max in ml/kg/min) was estimated using the submaximal Åstrand-Rhyming cycle ergometer test (Astrand, 1960). According to the Åstrand Rhyming protocol, participants cycled 6min on a cycle ergometer (Corvial Rehab 2) at a pedalling frequency of 60 rpm and the rate of work was set to elicit a steady-state heart rate between 125 and 170 beats per minute. Heart rate (Polar A300 monitors) and workload were recorded at 1-min intervals. In the case that the heart rate failed to achieve the target zone, the load was adjusted accordingly. In the context of this test, participants were asked for their smoking status, weight (participants could check this on a scale if they had no recent knowledge of it) and length (to calculate BMI). We also used this for descriptive statistics on personal lifestyle-related variables of the participants who completed the ergometer test (i.e., the ergometer test only, or also the self-reported questionnaire). The protocol was to be interrupted if threatening symptoms appeared. VO_2max was estimated using the Åstrand-Rhyming gender-sensitive nomogram (American College of Sports Medicine, 2013a; Astrand, 1960) and normalised to age. This protocol is widely used in clinical settings and has also been used in similar previous research in HCP in mental healthcare (Fibbins et al., 2018a), and people with mental illness (Vancampfort et al., 2015a, 2015b).

2.5. Data analyses

First, for participants who participated in both the questionnaire and the cycle ergometer test, data were linked using their self-chosen personal number. Using SPSS version 25, continuous variables were examined for linearity, normality, and homogeneity as assumptions for linear analysis by comparing means with medians and analyzing frequency histograms, normality plots, and plots of residuals versus predicted values. To gain insight into PA and physical fitness levels, knowledge and attitudes and referral practices, data were summarized in descriptive statistics, separately for participants who only participated in the questionnaire or cycle ergometer test, and participants who participated in both. For skewed data, median, and interquartile ranges were reported.

We used stepwise backward elimination using Akaike's Information Criterion (AIC) in linear and logistic regression with the stepAIC function from the MASS package in R version 4.1.0 (Venables and Ripley, 2002) to analyse which personal and professional characteristics were most strongly associated with HCP's average minutes MVPA per week, estimated VO_2max (ml/kg/min) and adherence to PA guidelines. Inserted independent variables were sex, age, intern/resident (yes/no), total perceived stress, self-employed (yes/no), personally referred/visited an exercise professional (yes/no). As years working was strongly correlated with age ($r = 0.87$) we only added age. To analyse associations with knowledge and attitudes (sum score), meeting the PA guidelines (yes/no) was added to the independent variables. Lastly, to analyse associations with referral of patients and whether they worked personally with an exercise professional in their treatment facility, the abovementioned independent variables were supplemented with the four knowledge/attitude items regarding PA. To check for multicollinearity, changes in models were observed and the variance inflation factors (VIF) were inspected, where VIF >10 indicated a potential problem for multicollinearity. If the assumption of normal distribution was violated, data for regressions was bootstrapped using 1000 samples with 95% confidence intervals, bias-corrected and accelerated (Wright et al., 2011).

3. Results

3.1. Participants

Eventually, 115 referring HCP participated in the survey, 60 referring HCP completed the fitness assessment, and 40 completed both. As can be seen in Table 1, these groups did not substantially differ in sex, age, and professional characteristics. The vast majority were a psychiatrist or general physician who was not a resident (n = 1), employed at a healthcare institution and mainly working with adults. Almost half of them mainly focused on mood or psychotic disorders.

3.2. Physical activity, physical fitness, and stress

Based on the self-reported PA levels of the participants who responded to the questionnaire, 50% met the international guidelines of ≥150min MVPA per week, and 43% met the combination of this with ≥2x BMSE per week. Participants who completed both the questionnaire and fitness assessment were more active, met PA guidelines more often and relatively more often reported cycling as their preferred activity, compared to participants who conducted the questionnaire only. The gender-specific age-corrected estimated VO_2max was substantially higher in men than in women. Almost none of the participants smoked. On average, total perceived stress levels were 12 on a scale of 40.

Table 2 shows the results from the regression analyses. The model on MVPA minutes per week ($F(df = 3) = 3.23$, $p = 0.03$, $R^2_{adj} = 0.06$) showed that, on average, women reported 66 min less than men and interns/residents reported 59 min less compared to their senior colleagues, which was also reflected in lower odds of meeting ≥150min MVPA per week ($X^2(df = 4) = 10.80$, $p = 0.03$, Nagelkerke $R^2 = 0.12$). Women also scored lower on physical fitness, together with older age, as showed in the submaximal VO_2max model ($F(df = 2) = 20.33$, $p < 0.001$, $R^2_{adj} = 0.50$). Healthcare professionals who had personal experience with an exercise professional were more physically active and had higher odds to meet the different guideline components. A personal referral or visit to an exercise professional in the past was associated with an average of 45 more minutes MVPA per week and 2.1 to 3.6 higher odds to meet ≥150min MVPA per week, ≥2x BMSE per week ($X^2(df = 2) = 11.25$, $p = 0.004$, Nagelkerke $R^2 = 0.14$) and both ≥150min MVPA and ≥2x BMSE per week ($X^2(df = 2) = 11.93$, $p = 0.003$, Nagelkerke $R^2 = 0.13$). Conversely, more perceived stress uniformly contributed to lower odds to meet these guidelines.

3.3. Knowledge, attitudes and referral practices

Table 3 shows positive attitudes and knowledge regarding physical health and PA for people with mental illness. Most participants acknowledged the increased risk of somatic diseases, know that physical inactivity is a risk factor and believe that exercise interventions and referral to exercise interventions are important. Eighty percent of the participants referred a person with mental illness to an exercise program or physical activities, mostly (61%) via qualified exercise professionals (i.e., psychomotor therapist, physiotherapist and movement therapist), for both physical and mental health, and least for social well-being. In line with this, a personal interview and referral to an exercise professional are perceived as the most effective ways to advise people with mental illness about PA, and 75% have personally worked with an exercise professional in their treatment facility.

Higher age and being an intern/resident were positively associated with a higher sum score on knowledge and attitudes regarding physical health and PA ($F(df = 2) = 1.31$, $p = 0.27$, $R^2_{adj} = 0.01$), as can be seen in Table 2. Referring HCP who met the international PA guidelines (i.e.,

Table 1
Participant characteristics.

Outcome (scale)	Questionnaire (N = 115)		Åstrand-Rhyming test (N = 60)		Both (N = 40)	
Sex, n (%) female	65	(56.5)	29	(48.3)	22	(55.0)
Age, years, mean (SD)	45.0	(11.7)	46.3	(12.5)	45.6	(11.2)
Years working in discipline, median (IQR)[a]	11.0	(3.0–20.0)	13.0[b]	(4.0–20.0)	12.5	(4.0–20.0)
Profession, n (%)						
Psychiatrist/physician	86	(74.8)	42	(70.0)	29	(72.5)
Psychiatry or psychology intern/resident	26	(22.6)	18	(30.0)	11	(27.5)
Nurse practitioner	2	(1.8)				
Psychologist	1	(0.9)				
Self-employed, n (%)	16	(13.9)	10	(16.7)	4	(10.0)
Main population, n (%)				–		
Children & youth	25	(21.7)			11	(27.5)
Adults	77	(67.0)			26	(65.0)
Elderly	10	(8.7)			2	(5.0)
Not specifically one group	3	(2.6)			1	(2.5)
Main diagnoses, n (%)				–		
Psychotic disorders	28	(24.3)			9	(22.5)
Mood disorders	27	(23.5)			10	(25.0)
Neurodevelopmental disorders	8	(7.0)			2	(5.0)
Trauma- and stressor-related disorders	6	(5.2)			3	(7.5)
Personality disorders	6	(5.2)			2	(5.0)
Feeding and eating disorders	2	(1.7)			1	(2.5)
Obsessive-compulsive and related disorders	1	(0.9)				
Substance use disorders	1	(0.9)			1	(2.5)
Not specifically one group	36	(31.3)			12	(30.0)
Lifestyle-related						
Weight, kg, mean (SD)		–	72.5	(10.2)	73.3	(10.6)
BMI, mean (SD)		–	23.5[c]	(2.8)	23.9[d]	(3.1)
PA levels, minutes MVPA per week, median (IQR)[a]	150.0	(90.0–250.0)		–	180.0	(120.0–290.0)
Guidelines, n (%)						
≥150min MVPA per week	58	(50.4)		–	27	(67.5)
≥2x BMSE per week	85	(73.9)		–	33	(82.5)
Both	49	(42.6)		–	24	(60.0)
Kind of activities, n (%)[e]						
Walking	43	(37.4)		–	15	(37.5)
Cycling	54	(47.0)		–	24	(60.0)
Running	29	(25.2)		–	10	(25.0)
Fitness	30	(26.1)		–	10	(25.0)
Team sports	7	(6.1)		–	5	(12.5)
Other	34	(29.6)		–	12	(30.0)
Have you personally been referred to an exercise professional? (yes), n (%)	38	(33.0)		–	13	(32.5)
Smokes, n (%)		–	2[f]	(3.3)	1[g]	(2.5)
Estimated VO_2max after correction for age, in ml/kg/min, mean (SD)		–				
Overall			43.8	(11.8)	43.6	(11.2)
Men			48.7	(13.0)	50.8	(11.1)
Women			38.6	(7.6)	37.7	(7.1)
Stress levels [h]						
Perceived stress, total (0–40)	12.2	(5.7)		–	11.6	(5.0)
Perceived helplessness (0–24)	7.5	(4.2)		–	7.2	(3.8)
Perceived self-efficacy (0–16)	11.3	(2.7)		–	11.6	(2.2)

- = not assessed in the questionnaire or Åstrand-Rhyming test, respectively; BMI = Body Mass Index; PA = Physical Activity; MVPA = Moderate to Vigorous Physical Activity; BMSE = Bone and Muscle Strengthening Exercise.

[a] Median (interquartile range) as data was skewed.
[b] Missings (n = 19) due to an unreported number of years.
[c] Missings (n = 13) due to unreported length.
[d] Missings (n = 9) due to unreported length.
[e] Multiple answers were possible.
[f] Missings (n = 14) due to unreported smoking status.
[g] Missings (n = 10) due to unreported smoking status.
[h] For total perceived stress, the self-efficacy scale (with higher scores meaning less stress) was recoded so that higher total scores mean more perceived stress.

≥150min MVPA and ≥2x BMSE per week) and showed higher beliefs that referring to exercise professionals can increase adherence to PA interventions, had 2.5 and 3.7 higher odds, respectively, of ever having referred a patient to an exercise program or physical activities (X^2(df = 2) = 13.37, p = 0.001, Nagelkerke R^2 = 0.17). Personal experience with an exercise professional in the past (i.e., referral or visit for own physical health or PA) was associated with higher odds for having worked with an exercise professional in their treatment facility for physical health or PA of their patients (X^2(df = 1) = 2.83, p = 0.09, Nagelkerke R^2 = 0.04).

Table 2
Strongest associations for PA, physical fitness, knowledge, attitudes and referral practices of referring healthcare professionals.

	B	(95% CI)
Average minutes MVPA per week[a,b]		
Sex	−65.56	(-124.33 to −10.57)*
Intern/resident	−59.39	(-113.53 to −0.94)*
Personally referred to/visited an exercise professional	44.96	(-16.68 to 103.48)
Estimated VO_2max normalised to age[a,c]		
Sex	−14.40	(-19.55 to −9.26)***
Age	−0.42	(-0.65 to −0.19)***
Knowledge and attitudes (sum core)[d]		
Age	0.03	(-0.01 to 0.07)
Intern/resident	0.92	(-0.30 to 2.13)

	OR	(95% CI)
Meeting ≥150min MVPA per week[a]		
Sex	0.45	(0.24–1.10)
Intern/resident	0.50	(0.19–1.30)
Perceived stress	0.94	(0.88–1.01)
Personally referred to/visited an exercise professional	2.14	(0.91–5.05)
Meeting ≥2x BMSE per week[a]		
Perceived stress	0.91	(0.84–0.98)*
Personally referred to/visited an exercise professional	3.56	(1.20–10.56)*
Meeting ≥150min MVPA & ≥2x BMSE per week[a]		
Perceived stress	0.91	(0.85–0.98)*
Personally referred to/visited an exercise professional	2.84	(1.24–6.50)*
Ever referred a person with mental illness to an exercise program or PA[e]		
Meeting ≥150min MVPA & ≥2x BMSE per week	2.46	(0.85–7.13)
Referring to exercise professionals can increase adherence to interventions	3.72	(1.52–9.14)**
Ever worked personally with an exercise professional in treatment facility[e]		
Personally referred to/visited an exercise professional	2.27	(0.84–6.17)

MVPA = Moderate to Vigorous Physical Activity; PA = Physical Activities; BMSE = Bone and Muscle Strengthening Exercise.
*p < 0.05, **p < 0.01, ***p < 0.001.
[a] Included variables: sex (female = 1), age, intern/resident (yes = 1), total perceived stress, self-employed (yes = 1), personally referred to/visited an exercise professional (yes = 1).
[b] Bootstrapped (1000 samples; bias-corrected and accelerated) because of right-skewed distribution.
[c] n = 40.
[d] Included variables: sex (female = 1), age, intern/resident (yes = 1), total perceived stress, self-employed (yes = 1), personally referred to/visited an exercise professional (yes = 1), meeting physical activity guidelines of ≥150min in MVPA & ≥2x BMSE per week (yes = 1).
[e] Included variables: sex (female = 1), age, intern/resident (yes = 1), total perceived stress, self-employed (yes = 1), personally referred to/visited an exercise professional (yes = 1), meeting national physical activity guidelines of ≥150min in MVPA & ≥2x BMSE per week (yes = 1) and beliefs that sedentary behaviour is a risk factor, physical activity can assist in reducing mental health symptoms, people with mental illness are less likely to be physically active and that referring to exercise professionals can increase adherence to interventions (propositions 3–6 on knowledge and attitudes in Table 3).

4. Discussion

This study aimed to explore the PA and physical fitness of referring HCP, their attitudes related to physical health and PA, referral practices to PA interventions, and whether personal and professional characteristics are associated with these outcomes.

We found that 50% of HCP met the international guidelines of ≥150min MVPA per week, and 43% met the combination of ≥150min MVPA and ≥2x BMSE per week. This is a little less compared to the Dutch general population in 2019 in the same age category (25–65 years old), of whom 56% met ≥150min MVPA per week, and 50% met this combined with ≥2x BMSE per week (CBS, 2020). This difference was even larger compared to people with comparable current education levels (higher education), of whom 63% met ≥150min MVPA per week, and 58% met this combined with ≥2x BMSE per week. Yet, Dutch psychiatrists were physically more active than Australian psychiatrists. Fibbins et al. (2018a) studied the PA levels and referral practices of congress delegates at the 2017 Royal Australian and New Zealand College of Psychiatrists and found that only 37% did meet ≥150min MVPA per week. The lower levels of PA are also seen in the Australian population in which 45% meet ≥150min MVPA per week and only 15% also meet ≥2x BMSE per week (Australian Institute of Health and Welfare, 2020). The difference in PA levels between the Dutch and Australian population might be caused by cultural differences. In the Netherlands, more than 25% of all trips are made by bicycle, for instance (National Institute for Public Health and the Environment, 2018). A potential bicycle training effect may also have contributed to the relatively high mean estimated VO_2max of participants, which is supported by the fact that participants who completed the cycle ergometer test more often reported cycling as their preferred activity (60%) compared to participants who conducted the questionnaire only (47%). Overall, the estimated VO_2max was remarkably lower in Australian peers, especially in men (33.7 vs. 48.7 mL/kg/min in men and 35.1 vs. 38.6 mL/kg/min in women) (Fibbins et al., 2018a). Table 4 shows this comparison including the interpretation using the American College of Sports Medicine rating (American College of Sports Medicine, 2013b), as was done in the study of Fibbins et al. (2018). The ratings confirm the above-average to excellent physical fitness of participants in the current study. Apart from a potential training effect and bicycle culture in the Netherlands, selection biases, in general, could have contributed to differences, taking the lower number of included participants by Fibbins and colleagues into account. Previous research using comparable ergometer protocols showed an estimated VO_2max of 34.5 mL/kg/min (SD = 8.7) in patients with schizophrenia (Vancampfort et al., 2015a) and 31.6 mL/kg/min (SD = 7.1) in patients with major depressive disorders (Kruisdijk et al., 2019).

Table 3
Knowledge, attitudes and referral practices of referring healthcare professionals (n = 115).

Outcome (scale)			Disagree (1–2)		Neutral (3)		Agree (4–5)	
	M	(SD)	n	(%)	n	(%)	n	(%)
Knowledge and attitudes (scale 1-5)								
Maintaining a healthy weight and waist circumference is important in reducing risk of developing cardiometabolic diseases (e.g., CVD and T2DM)	4.7	(0.8)	4	(3.5)	1	(0.9)	110	(95.7)
People with a mental illness are more likely to develop cardiometabolic diseases	4.7	(0.5)	1	(0.9)	1	(0.9)	113	(98.3)
Sedentary behaviour is a risk factor for cardiometabolic diseases	4.5	(0.6)	1	(0.9)	4	(3.5)	110	(95.7)
Regular physical activity can assist in reducing some symptoms associated with mental illness	4.6	(0.5)		–		–	115	(100.0)
People living with a mental illness are less likely to be physically active	4.0	(0.6)	3	(2.6)	13	(11.3)	99	(86.1)
Referring people with a mental illness to an exercise professional (e.g., psychomotor therapist, physiotherapist) can increase their adherence to a physical activity program	4.2	(0.6)	1	(0.9)	8	(7.0)	106	(92.2)

Referral practices	N	(%)
Have you ever referred a person with mental illness to an exercise program or physical activities? (yes)	92	(80.0)
What is the most common way for you to refer people with mental illness to exercise programs or physical activities?		
General practitioner	19	(16.5)
Physiotherapist	15	(13.0)
Psychomotor therapist	45	(39.1)
Movement therapist	10	(8.7)
Department of daily activities in institution	14	(12.2)
Other	8	(7.0)
Does not apply	4	(3.5)
What are usually reasons for which you refer people with mental illness to an exercise program or physical activities?[a]		
Physical health	59	(51.3)
Mental health	57	(49.6)
Social well-being	26	(22.6)
When you think of different ways to advise people with mental illness about PA, how would you order the next methods from 1 (most effective) to 6 (least effective)[b]		
Personal interview	1.9	(1.3)
Referral to an exercise professional	2.3	(1.4)
Referral to general practitioner	3.7	(1.1)
Regular gym	4.1	(1.4)
Written explanation (e.g., a flyer)	4.2	(1.6)
Referral to community facilities	4.7	(1.3)
Have you personally worked with an exercise professional in your treatment facility? (yes)	86	(74.8)

CVD = Cardiovascular diseases; T2DM = type 2 diabetes mellitus; [a] multiple answers were possible; [b] mean (SD).

The average total perceived stress level of HCP was 12 out of 40, which could be considered low stress (Cohen et al., 1983) and is comparable with stress levels in the general population (Nielsen et al., 2008). Women and people reporting higher perceived stress had lower odds to meet ≥150min MVPA per week. The difference between men and women on MVPA per week is also seen in the Dutch population in which 5% more men adhere to MVPA (National Institute for Public Health and the Environment, 2020). Likewise, people reporting higher perceived stress had lower odds to meet both PA guidelines, which is in line with previously found relationships between experienced stress and lower PA (Stults-Kolehmainen and Sinha, 2014). The finding that healthcare professionals with personal experience with an exercise professional had higher odds to meet PA guidelines could be bidirectional (i.e., more active people may face more support from exercise professionals).

Most HCP had positive attitudes and knowledge regarding physical health and PA for people with mental illness and 80% of the HCP referred a person with mental illness to an exercise program. A personal interview and referral to an exercise professional were perceived as the most effective ways to advise about PA. These findings are consistent with Fibbins et al. (2018a) and correspond with previous evidence showing larger effects and fewer dropouts in interventions led by qualified exercise professionals (Czosnek et al., 2019; Schmitt et al., 2018; Stubbs et al., 2016, 2018; Vancampfort et al., 2016b, 2019, 2021). Referrals to the gym or community services were found less effective. This might be caused by a lack of overview and knowledge regarding exercise programs in the neighbourhood, which was a barrier for Dutch GPs to refer patients to health-promoting programs whilst the availability of health programs within their practice was a facilitator for referral (Geense et al., 2013). Moreover, people with mental illness experience several barriers to becoming physical active (Firth et al., 2016) and HCP might be well aware that a referral to the gym or community services causes multiple barriers and is, therefore, less effective than a referral to an exercise professional.

We did find that the referring HCP who met the PA guidelines, who ever worked with an exercise professional, and/or who showed higher beliefs that referring to exercise professionals can increase adherence to PA interventions, had higher odds of ever having referred a patient to an exercise program or PA. An association between a professional's PA level and referral practices was not found in Australian and New Zealand colleagues (Fibbins et al., 2018a), which might be explained by a difference in methods and sample size. The online and wide distribution of

Table 4
Estimated VO2max of participants by age category.

	Current study (n = 60)				Fibbins et al. (2018a) (n = 24)			
	VO_2max			ACSM rating	VO_2max			ACSM rating
	n	M	(SD)		n	M	(SD)	
Men (age)								
18–25	1	61.6	(−)	Excellent	–	–		
26–35	7	63.1	(7.2)	Excellent	2	37.4	(1.1)	Below average
36–45	5	51.9	(3.6)	Excellent	3	42.4	(18.3)	Above average
46–55	8	47.4	(8.0)	Excellent	1	26.5	(−)	Poor
56–65	5	44.8	(8.3)	Excellent	3	24.1	(10.1)	Poor
65+	5	28.5	(6.7)	Above average	1	36.2	(−)	Good
Women (age)								
18–25	–	–			–	–		
26–35	8	42.6	(8.2)	Above average	2	47.4	(3.7)	Good
36–45	7	34.9	(3.2)	Above average	3	42.5	(3.5)	Good
46–55	8	37.1	(8.1)	Good	3	36.6	(6.8)	Good
56–65	6	39.7	(8.6)	Excellent	5	26.3	(3.7)	Average
65+	–	–			1	27.2	(−)	Above average

ACSM: American College of Sports Medicine (2013b).

the questionnaire at the congress most likely resulted in a more heterogeneous sample of HCP regarding PA levels and referral practices, compared to Fibbins et al. where a smaller number of delegates participated after approaching an information booth about exercise in mental healthcare. Nevertheless, our findings are consistent with other studies showing that mental health practitioners who exercised more prescribed exercise more often in various mental health conditions (Way et al., 2018). Also, in a wide range of medical specialities outside mental healthcare, better physician adherence to healthy lifestyle behaviour (i.e., PA, dietary pattern, smoking) was associated with more frequent and longer counselling of their patients on those topics (Carlos et al., 2020).

4.1. Limitations

Our study has some limitations. First, there might have been selection bias. More physically active people might be more willing to participate, which is reflected in the fact that participants who also completed the fitness assessment were more active compared to participants who only conducted the questionnaire. Also, this congress is mainly attended by psychiatrists and less by other referring HCP in mental healthcare (e.g., clinical psychologists, nurse practitioners) which affects the generalizability of findings to all referring HCP. Second, we chose self-reported PA instead of accelerometer-measured PA due to its non-invasive and accessible nature, but this could have caused bias compared to objective measures. However, a strong association ($r_s = 0.62$) between self-reported PA and estimated VO_2max in participants who completed both the questionnaire and ergometer test indicates valid PA measurement. Lastly, the submaximal Åstrand-Rhyming cycle ergometer test is less valid than a comprehensive test protocol measuring the actual VO_2max. Despite indications of underestimating VO_2max, this submaximal protocol is more feasible for non-laboratory environments (Cink and Thomas, 1981; Macsween, 2001) and potential bias applies to all participants and studies with which we have compared our results.

4.2. Implications for clinical practice

Our findings show that HCP who are more active, who ever worked with an exercise professional or who have higher beliefs that referring to exercise professionals can increase adherence to PA interventions, are more likely to ever have referred a patient to an exercise program or PA.

Even though this seems obvious, there is strong evidence for PA interventions in the (secondary) prevention and treatment of mental illness. For light to moderate depression, PA interventions are even first-line treatment, for instance (Malhi et al., 2015; Stubbs et al., 2018). This supports that PA interventions should always be considered and discussed with patients as part of their treatment, just like more conventional topics and options, rather than depending on their HCP's personal attitude and lifestyle. Although HCP reported good basic knowledge and positive attitudes regarding PA and physical health, it could help to upskill HCP on current knowledge regarding PA interventions and especially adopting this in curricula of relevant training, guidelines and referral protocols. Besides such traditional strategies, experiencing PA interventions by HCP themselves can play a role in improving patients' PA levels. Previous findings are optimistic and highlight the potential for such relatively low-cost interventions as a key component in achieving culture change and increasing PA counselling (Fibbins et al., 2018b; Shrestha et al., 2021). In line with this, it is recommended that employers of HCP in mental healthcare encourage and enable PA for HCP, whether or not together with patients, which can improve the health of HCP too. Future research should examine whether exercise interventions targeting staff improve referring practices and improve patients' PA levels. Also, it is good to take potential additional barriers into account in referring patients to PA that were not included in our questionnaire (i.e., patient-related barriers, time and organizational restraints) and to discuss strategies to overcome them.

5. Conclusion

In summary, it is positive that HCP report the importance and relevance of PA in mental healthcare. Although there is strong evidence and guidance for PA interventions in prevention and treatment in people with mental illness, referral to such interventions partly depends on the PA behaviour and attitude of the patient's physician/clinician. Strategies to engage HCP in PA, improving training, referral protocols and guidelines, and eliminating organizational barriers could improve equal opportunities for people with mental illness to receive PA interventions to improve their mental and physical health.

Ethics approval and consent to participate

The study was conducted according to the Declaration of Helsinki. Ethics approval was received from the Medical Ethical Committee of the Isala Academy (case 190402). Informed consent was obtained from all participants.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

JD: study idea, study design, retrieving, processing, and analyzing data, drafting and critically reviewing the manuscript. LK: drafting and critically reviewing the manuscript. TS: study design, retrieving data, drafting and critically reviewing the manuscript. FvD: retrieving data and critically reviewing the manuscript. WC: study design, critically reviewing the manuscript.

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Appendix A. Supplementary data

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