Published in final edited form as:

Early Interv Psychiatry. 2015 August ; 9(4): 284–291. doi:10.1111/eip.12107.

Exercise Practices in Individuals at Clinical High Risk of Developing Psychosis

Stephanie Deighton¹ and Jean Addington²

¹Department of Neuroscience, University of Calgary, Calgary, Alberta, Canada

²Hotchkiss Brain Institute, Department of Psychiatry, University of Calgary, Calgary, Alberta, Canada

Abstract

Aim—Recent research suggests aerobic exercise has a positive impact on symptoms and cognition in psychosis. Since individuals with psychosis are at risk of weight gain and the resultant metabolic side effects, developing effective exercise programs is of interest. Furthermore, this may be a useful intervention for those who are at risk of developing psychosis i.e. those at clinical high risk (CHR). The aim of this initial exploratory project was to examine the role of exercise in participants at CHR for psychosis.

Methods—A comprehensive questionnaire was developed to assess current physical activity involvement, exercise levels in terms of frequency, intensity and duration, and perceived fitness levels. Reported barriers to exercise and reasons for exercising were also considered. Eighty participants, 40 CHR and 40 healthy-controls, were assessed with this questionnaire.

Results—Overall, both groups were involved in a wide range of physical activity. Healthy controls reported higher levels of participation in indoor/outdoor activities and strength and/or flexibility training. They also exercised more frequently, more intensely and reported higher perceived fitness levels than CHR participants. Levels of exercise were unrelated to clinical symptoms and functioning in CHR participants. CHR youth reported more barriers to exercise and less positive reasons for exercising that were related to self-perception.

Conclusion—The results suggest that exercise should be investigated further in the CHR population as it may have treatment implications.

Keywords

clinical high risk; psychosis; exercise; prodrome; risk

INTRODUCTION

Regular physical activity is an important factor in maintaining a healthy weight and preventing cardiovascular disease and diabetes¹ and it has also been observed that good health habits, including regular exercise, often coincide with good mental health.² Thus,

*Corresponding Author: Dr Jean Addington, Mathison Centre for Mental Health Research and Education, University of Calgary, 3280 Hospital Drive NW, Calgary, Alberta T2N 4Z6 Canada. jmaddding@ucalgary.ca.

exercise may be beneficial for those with mental illness. First, exercise may help physical problems as individuals with serious mental illness have an increased risk of morbidity and a high degree of co-morbidity of diseases such as diabetes, hypertension, respiratory and cardiovascular disease.^{3,4} For example, people with schizophrenia have a high risk for obesity, often induced by antipsychotic medication use, increasing the chance for cardio-metabolic disorders.^{5,6} Secondly, exercise has been shown to have a positive impact on cognition and brain structure in both healthy individuals and psychiatric patients.⁷⁻⁹ Thirdly, physical activity has been shown to protect against anxiety and depressive symptoms.² For those with psychotic illness, a recent systematic review¹⁰ showed that lack of exercise impacts both physical health and symptoms. Longitudinal studies of interventions utilizing exercise have demonstrated improvements in positive and negative symptoms, cognitive functioning¹¹⁻¹³ and other symptoms occurring with schizophrenia such as depression, low self-esteem and social withdrawal.¹⁴ Despite these advantages, the majority of adults with mental illness participate in sporadic activity and are less physically active than the general population.¹⁵ Patients reported that their symptoms, medication side-effects and fear of discrimination were barriers preventing them from exercising.¹⁶

The majority of exercise and mental health research has focused on adults with established mental illnesses, despite evidence that most mental disorders begin in adolescence and early adulthood.¹⁷ However, research related to the benefits of exercise interventions in young people experiencing mental health problems is rare.^{18,19} A growing area in youth mental health is that of early detection of psychosis.²⁰ With recent progress in risk identification methodology, it is now possible to identify individuals who appear to be putatively prodromal for psychosis,²¹ that is at clinical high risk (CHR) of developing a psychotic disorder, 36% of whom will develop psychosis within three years.²² However, little is known about exercise in people at CHR for developing psychosis. A recent Finnish study investigated physical activity and cardiorespiratory fitness in 6987 adolescents and found that adolescents who developed psychosis were more likely to be physically inactive.²³

The aim of this pilot study was to investigate the exercise practices of young people at CHR for psychosis and examine the relationship of exercise practices to clinical symptoms and functioning. It was hypothesized that, compared to controls, CHR participants would report decreased levels of frequency, intensity and duration of exercise and report lower levels of perceived fitness. Secondly, it was predicted that, for the CHR participants, increased levels of exercise would be associated with improved clinical symptoms and functioning. An exploratory goal of the study was to investigate reported barriers to exercise and reasons for exercising.

METHODS

Participants

The sample consisted of 40 CHR participants (22 male, 18 female) recruited from the Calgary site of the North American Prodrome Longitudinal Study (NAPLS 2). All CHR participants were required to meet the Criteria of Prodromal Syndromes (COPS) using the Structured Interview for Prodromal Syndromes (SIPS).²¹ Participants were excluded if they met criteria for any current or lifetime axis I psychotic disorder, had an IQ less than 70,

and/or past or current history of a clinically significant central nervous system disorder. A more detailed description of ascertainment, inclusion and exclusion criteria, for the overall NAPLS-2 study and participant details is provided elsewhere.²⁴

The control group was comprised of 40 psychology undergraduate students from the University of Calgary (21 male, 19 female). These participants were recruited using the Psychology Department's Research Participation System (RPS), an online tool for managing research studies involving Psychology students. As part of the RPS requirements, all participants were awarded 0.5 research credits towards an undergraduate psychology course for their participation. Control participants were screened for attenuated psychotic symptoms using the Prime Screen Revised (PS-R).²⁵

Measures

Demographic information such as age, sex and race was collected from all of the participants. *The Prime Screen Revised (PS-R)*,²⁵ a self-report questionnaire of 11 self-reported items with high clinical construct validity, was used to screen controls for attenuated psychotic symptoms. *The Structured Interview for Prodromal Syndromes (SIPS)*²¹ was used to determine criteria for being at CHR of psychosis and includes the *Scale of Prodromal Symptoms (SOPS)*, to determine the presence and severity of attenuated psychotic symptoms and negative symptoms.

All participants filled out an *exercise survey*, designed by the investigators specifically to capture the exercise practices of participants in this study. The survey was developed from traditionally used measures of exercise and recreation practices such as the International Physical Activity Questionnaire: Short,²⁶ The World Health Organization Quality of Life-BREF,²⁷ Motivations for Physical Activities Measure- Revised²⁸ and the Physical Self-Description Questionnaire.²⁹ The survey first asked participants to identify their current physical activity involvement such as team sports, group exercise classes, racquet sports, indoor/outdoor activities etc. Participants were asked the frequency, intensity and duration of exercise in a typical week. Participants were also asked to report their perceived fitness levels and identify barriers preventing them from exercising as well as reasons why they exercise. See supplemental material.

The Global Functioning Social Scale (GF:S) and *The Global Functioning Role Scale (GF:R)*, specifically designed for individuals at CHR³⁰ were used to assess social functioning (e.g. interpersonal skills, relationships with friends and family) and role functioning (e.g. student, employee, homemaker). Anxiety was assessed with the *Social Interaction Anxiety Scale (SIAS)* and *Social Anxiety Scale (SAS)*.³¹ Depression was assessed with the *Calgary Depression Scale for Schizophrenia (CDSS)*.³² *The Alcohol and Drug Use Scale (AUS/DUS)*³³ was used to assess the level and frequency of use of alcohol, cannabis and tobacco, scoring level of use from 1 (no use) to 5 (dependence) and frequency from 0 (no use) to 5 (use almost daily).

Procedures

This study was approved by the University of Calgary Conjoint Health Research Ethics Board (CHREB). Informed consent was obtained from all participants. Healthy controls were administered the exercise survey in individual meetings where they could ask questions if necessary. CHR participants completed the exercise survey simultaneously with their clinical and functioning measures. The measure took 10–15 minutes to complete.

Data Analysis

T-test, chi-square and Mann-Whitney U tests were used to compare the healthy controls and the CHR participants on demographics and exercise variables. Spearman correlations were used to assess associations between age, clinical variables and the exercise variables (frequency, intensity, duration and perceived fitness levels) for both groups.

RESULTS

Baseline demographic information is presented in Table 1. The groups differed in age with controls being older.

Activity participation

The activity participation for both healthy controls and CHR participants is presented in Table 2. Overall, there were minimal differences between the two groups. Significant differences were observed for current participation in strength and/or flexibility training ($U=580.00, p < 0.05$) and indoor/outdoor activities ($U=580.00, p < 0.05$). Healthy controls were currently more involved in both of these activities than CHR participants.

Comparison between the Groups on Exercise Variables

Healthy controls reported significantly higher frequency and intensity of exercise in a typical week as well as perceived fitness levels. The groups did not differ on reported duration of exercise. See Table 3.

Since healthy controls and CHR participants differed in age, relationships between age and the exercise variables were investigated. There was a small, but significant association between age and intensity of exercise ($\rho = 0.24, p < 0.05$), with older participants reporting more intense exercise. When the groups were examined separately, the only significant relationship was between age and intensity of exercise for controls only ($\rho = 0.39, p < 0.05$), with older age being related to increased intensity. A Mann-Whitney U test was used to examine differences between exercise variables for males and females for both healthy controls and CHR participants. A significant difference was seen in frequency of exercise between males and females for CHR participants only ($U = 121.00, p < 0.05$). Males reported higher frequency of exercise.

Barriers to Exercise

Total scores for the numbers of barriers to exercise that were endorsed were created for both groups. Barriers can be grouped into those that reflect availability and accessibility (e.g. time, transportation, interest, level), those related to motivation and support and those

related to self-esteem and self-perception, (e.g. not liking how their body looks, feeling uncomfortable or intimidated). A statistically significant difference in barrier scores between CHR and controls were observed for four of the barrier items (related to self-esteem and self-perception) and for the total barrier score. For all scores that were significantly different, the CHR group endorsed more barriers. These results are presented in Table 4.

Reasons for Exercising

A total score of number of reasons endorsed was calculated for both groups. Reasons reflected improved physical health, stress and negative mood reduction, as well as improved self-perception and confidence. A statistically significant difference in reasons for exercising between controls and CHR participants was observed for seven reasons, in the areas of self-perception, self-confidence, reducing stress, improved health and for the total reasons score. For all significant differences the healthy controls endorsed more positive reasons. These results are presented in Table 5.

Functioning and Symptoms in CHR Participants

Mean scores, standard deviations and ranges for clinical symptoms and functioning are presented in Table 6.

No significant correlations were observed between exercise levels (i.e. frequency, intensity, duration and perceived fitness levels) and positive symptoms, negative symptoms, social functioning, role functioning, depression and anxiety.

Substance Use

Frequency and severity of drug use was unrelated to frequency and duration of exercise and perceived level of fitness. However, significant correlations were observed for increased intensity of exercise and the frequency ($\rho=0.400$, $p<0.01$) and severity ($\rho=0.453$, $p<0.01$) of alcohol use, the frequency ($\rho=0.349$, $p<0.05$) and severity ($\rho=0.329$, $p<0.05$) of cannabis use and the frequency ($\rho=0.648$, $p<0.001$) and severity ($\rho=0.648$, $p<0.001$) of tobacco use. However, very few used the substances alcohol, tobacco and cannabis. For those that did, the frequency of use was low.

DISCUSSION

The purpose of this study was to examine the role of exercise for young people at CHR for psychosis in, to the best of our knowledge, the first study to do so. Results indicated that both groups participated in a wide range of physical activities, with the only differences being that CHR participants were currently less involved in strength and/or flexibility (e.g. weight lifting, yoga) and indoor/outdoor exercise activities (e.g. running, hiking, indoor training machines). Since the category of indoor/outdoor activities was fairly general, the difference observed between the two groups for this category may reflect an overall difference in engaging in activities. For example, involvement in activities such as weight training, and yoga may be difficult for those at CHR since such activities may require specialized knowledge, training, specialized classes, and being involved in a more public

place. These may be difficult for these young people who are more withdrawn and less sociable.²⁰

Results supported the hypothesis that healthy controls would exercise more frequently and more intensely than CHR participants and have a greater sense of perceived fitness. The one exception was that when the CHR participants do exercise, they do not differ from the healthy controls in the time spent exercising at any one time. National Guidelines³⁴ for youth and adults exist in Canada. In comparison to these guidelines the CHR group are exercising less than prescribed in the guidelines for both youth and adults; whereas the healthy controls are meeting the guidelines.³⁴ The lower perceived fitness levels observed for CHR individuals may suggest that they are less physically fit than healthy controls, although this was not directly tested. This would fit with the findings of Koivukangas et al²³ who found that adolescents, who were at risk for psychosis and later developed a psychotic illness, were more likely to be physically inactive and have poorer cardio-respiratory fitness.

Interestingly, we did not find that CHR participants who exercised more had improved clinical symptoms and higher functioning than those who did little to no exercise. It is possible that their symptoms and functioning do not appear to interfere with exercising or that the extent of their symptoms may not have been great enough to impact exercise practices. Alternatively, the intensity of exercise engaged in by the CHR group may have been insufficient to impact symptoms, particularly since it was below the guidelines of prescribed physical activity. At present, it is uncertain as to the “dose of exercise” required to treat mental illness. Of course, since the study is cross-sectional it could not be determined whether those who had been exercising more had seen any improvement in symptoms and functioning compared with those who had exercised less. It was surprising that an increase in intensity of exercise was associated with severity and frequency of use of alcohol, tobacco and cannabis. However, the majority of the CHR participants reported abstinence for all substances and none of those who used were in the range of abuse. The low frequency with which they used tobacco, alcohol or cannabis may not have interfered with their exercise and may have reflected more social use.

We also explored barriers to exercise and reasons for exercising. CHR participants reported more barriers to exercise than controls. The groups did not differ on barriers that reflect availability and accessibility (e.g. time, transportation, interest, level) or on barriers related to motivation and support. The CHR participants did however endorse more barriers that were related to self-esteem and self-perception, (e.g. not liking how their body looks, feeling uncomfortable or intimidated). The results are consistent with the findings by Stowkowy & Addington³⁵ who observed that CHR participants had higher levels of negative self-evaluation compared to healthy controls.

Additionally, CHR participants reported significantly less reasons for exercising compared to healthy controls. In particular, they reported fewer reasons related to self-confidence and self-perception than healthy controls; for example, “exercise makes me feel better about myself,” “exercise makes me feel more self-confident,” “I will look better” and “I will have fun.” CHR participants also tended to report fewer reasons for exercising related to managing stress and feeling healthier, both of which have been found to improve with

exercise. This is unfortunate as these young people are stressed and as such would benefit from exercise.

There are several limitations in this study. Firstly, the sample may have been too small and most likely underpowered based on the number of variables that were included, which limited the ability to draw conclusions. However, it was an initial exploratory study to examine exercise practices in this “at risk” group. Secondly, the control group consisted entirely of University of Calgary students who may place a different value on exercise compared those who are not students and may have more access to the fitness facilities as a part of their tuition, although there was no difference between both groups for barriers relating to accessibility. The only demographic data we had for the controls were age and gender and it is possible that other factors such as years of education may have impacted the results. The university students were slightly older as a group than the CHR participants. However, age was only relevant for intensity of exercise in the control group. Thirdly, the measure consisted of items on exercise taken from other longer questionnaires on health and exercise and had not been tested for psychometric properties. Finally, the exercise survey was a self-report and it is possible that there may be differences between the groups when responding to a self-report, for example controls may over-report their level of physical activity and clinical participants may be more realistic.

In summary, CHR participants were found to exercise less often and less intensely than controls. However, it may be important to address self-esteem and self-perception in this population, since CHR participants reported both more barriers and less positive reasons related to these issues than controls. Secondly, it did not appear as if symptoms and functioning were related to exercise variables for these CHR participants, although it still must be recognized that they do have symptoms and impaired functioning compared to the healthy population.³⁶ It may be that symptoms such as unusual thoughts or negative symptoms such as withdrawal may limit the kind of exercise in which they are involved. Since the CHR group was on average slightly younger and younger students might be expected to have a higher level of engagement in physical activities such as school based activities, it is possible the differences may have been greater if the groups had been more similar in age. The implications of this study are that developing exercise programs for those at CHR may be important. In addition, since barriers to and perceived benefits of exercise differed for the CHR participants, these areas need to be targeted in future interventions aimed at either increasing exercise or even preventing a reduction in exercise in this population. Since the perceived barriers were related to self-perception rather than costs or accessibility, it is possible that engaging in exercise may have an impact on improving self-esteem, which might change perceptions of barriers and reasons. Alternatively motivational interviewing may help with these self-perceptions. We know that, even for those who do not make the transition to psychosis, many continue to have attenuated symptoms as well as poorer functioning³⁵ and exercise may help.¹² Furthermore, 10–15% of people at CHR for psychosis are being prescribed anti-psychotic medications.³⁷ Since some types of antipsychotic medications can cause weight gain and other metabolic side effects, instituting an exercise regiment early on could result in improvements in health and reductions in weight gain as it has been shown that, as for those with psychosis, young people at CHR are just as much at risk of weight gain from anti-psychotics³⁸ and weight gain prevention for

young people on antipsychotic medication is possible.³⁹ Thus, good exercise practice could help decrease the cardiovascular risk associated with psychotic disorders such as schizophrenia, for those who may be more at risk of developing a psychotic illness.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Role of funding source

This study was supported by the National Institute of Mental Health (grant U01MH081984) to Dr. Addington and an Alberta Innovates Health Solutions Studentship to S. Deighton. The NIMH had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

REFERENCES

1. American College of Sports Medicine Position Stand. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Med Sci Sports Exerc.* 1998; 30:975–991. [PubMed: 9624661]
2. Dunn A, Jewell JS. The effect of exercise on mental health. *Am J Sports Med.* 2010; 9:202–207.
3. Berren MR, Hill KR, Merikle E, Gonzalez N, Santiago J. Serious mental illness and mortality rates. *Hosp Community Psychiatry.* 1994; 45:604–605. [PubMed: 8088743]
4. Leucht S, Burkard T, Henderson J, Maj M, Sartorius N. Physical illness and schizophrenia: a review of the literature. *Acta Psychiatr Scand.* 2007; 166:317–333. [PubMed: 17919153]
5. Henderson DC, Nguyen DD, Copeland PM, et al. Clozapine, diabetes mellitus, hyperlipidaemia and cardiovascular risk and mortality: Results of a 10 year naturalistic study. *J Clin Psychiatry.* 2005; 66:1115–1121.
6. Lawrence DM, Holman CD, Jablensky AV, Hobbs MS. Death rate from ischaemic heart disease in Western Australian psychiatric patients 1980–1998. *Br J Psychiatry.* 2003; 82:31–36. [PubMed: 12509315]
7. Erickson KI, Voss MW, Prakash RS, et al. Exercise training increases size of hippocampus and improves memory. *Proc Natl Acad Sci.* 2011; 108:3017–3022. [PubMed: 21282661]
8. Chaddock L, Erickson KI, Prakash RS, et al. A neuroimaging investigation of the association between aerobic fitness, hippocampal volume, and memory performance in preadolescent children. *Brain Res.* 2010; 1358:172–183. [PubMed: 20735996]
9. Pajonk FG, Wobrock T, Gruber O, et al. Hippocampal Plasticity in response to exercise in schizophrenia. *Arch Gen Psychiatry.* 2010; 67:133–143. [PubMed: 20124113]
10. Vancampfort D, Knapen J, Probst M, Scheewe T, Remans S, De Hert M. A systematic review of correlates of physical activity in patients with schizophrenia. *Acta Psychiatr Scand.* 2012; 125:352–362. [PubMed: 22176559]
11. Ellis N, Crone D, Davey R, Grogan S. Exercise interventions as an adjunct therapy for psychosis. *Br J Clin Psychol.* 2007; 46:95–111. [PubMed: 17472204]
12. Scheewe TW, Backx FJ, Takken T, et al. Exercise therapy improves mental and physical health in schizophrenia: a randomized control trial. *Acta Psychiatr Scand.* 2012; 127:464–473. [PubMed: 23106093]
13. Van Citters AD, Pratt SI, Jue K, et al. A pilot evaluation of the SHAPE individualized health promotion intervention for adults with mental illness. *Community Ment Health J.* 2010; 46:540–552. [PubMed: 20012197]
14. Faulkner G, Biddle S. Exercise as an adjunct treatment for schizophrenia. *J Ment Health.* 1999; 8:441–457.

15. Compton MT, Daumit G, Druss B. Cigarette smoking and overweight/obesity among individuals with serious mental illnesses: a preventive perspective. *Harvard Rev Psychiatry*. 2006; 14:212–222.
16. Ussher M, Stanbury L, Cheeseman V, Faulkner G. Physical activity preferences and perceived barriers to activity among persons with severe mental illness in the United Kingdom. *Psychiatr Serv*. 2007; 58:405–408. [PubMed: 17325117]
17. Gore FM, Bloem PJ, Patton GC, et al. Global burden of disease in young people aged 10–24 years: a systematic analysis. *Lancet*. 2011; 377:2093–2102. [PubMed: 21652063]
18. McCloughen A, Foster K, Huws-Thomas M, Delgado C. Physical health and wellbeing of emerging and young adults with mental illness: An integrative review of international literature. *Int J Ment Health Nurs*. 2012; 21:274–288. [PubMed: 22533335]
19. Parker AG, Hetrick SE, Jorm AF, et al. The effectiveness of simple psychological and exercise interventions for high prevalence mental health problems in young people: a factorial randomised controlled trial. *Trials*. 2011; 12:76. [PubMed: 21396122]
20. Addington J, Heinssen R. Prediction and prevention of psychosis in youth at clinical high risk. *Annu Rev Clin Psycho*. 2012; 13:1–21.
21. McGlashan TH, Zipursky RB, Perkins D, et al. The PRIME North America randomized double-blind clinical trial of olanzapine versus placebo in patients at risk of being prodromally symptomatic for psychosis: Efficacy and safety results of the double-blind and no-treatment follow-up periods. *Am J Psychiatry*. 2006; 163:790–799. [PubMed: 16648318]
22. Fusar-Poli P, Bonoldi I, Yung AR, et al. Predicting psychosis: Meta-analysis of transition outcomes in individuals at high clinical risk. *Arch Gen Psychiatry*. 2012; 69:220–229. [PubMed: 22393215]
23. Koivukangas J, Tammelin T, Kaakinen M, et al. Physical activity and fitness in adolescents at risk for psychosis within the Northern Finland 1986 Birth Cohort. *Schizophr Res*. 2010; 116:152–158. [PubMed: 19942409]
24. Addington J, Cadenhead KS, Cornblatt BA, et al. North American Prodrome Longitudinal Study (NAPLS 2): Overview and recruitment. *Schizophr Res*. 2012; 142:77–82. [PubMed: 23043872]
25. Kobayashi H, Nemoto T, Koshiwaka H, et al. A self-reported instrument for prodromal symptoms of psychosis: Testing the clinical validity of the PRIME Screen-Revised (PS-R) in a Japanese population. *Schizophr Res*. 2008; 106:356–362. [PubMed: 18809299]
26. Bergier J, Kapka-Skrzypczak L, Bilinski P, Paprzycki P, Wojtyla A. Physical Activity of Polish adolescents and young adults according to IPAQ: a population based study. *Ann Agric Environ Med*. 2012; 19:109–115.
27. Lucas-Carrasco. The WHO quality of life (WHOQOL) questionnaire: Spanish development and validation studies. *Qual Life Res*. 2012; 21:161–165. [PubMed: 21611868]
28. Kane J, Lee H, Sereika S, Brar J. Feasibility of pedometers for adults with schizophrenia: pilot study. *J Psychiatr Mental Health Nurs*. 2012; 19:8–14.
29. Simons J, Capio CM, Adriaenenssens P, Delbroek H, Vandenbussche I. Self-concept and physical self-concept in psychiatric children and adolescents. *Res Dev Disabil*. 2012; 33:874–881. [PubMed: 22245732]
30. Cornblatt BA, Auther AM, Neindam T, et al. Preliminary findings for two new measures of social and role functioning in the prodromal phase of schizophrenia. *Schizophr Bull*. 2007; 33:688–702. [PubMed: 17440198]
31. Olivares J, Garcia-Lopez LJ, Hidalgo MD. The social phobia scale and the social interactions anxiety scale: Factor structure and reliability in a Spanish speaking population. *J Psychoeduc Assess*. 2001; 19:69–80.
32. Addington D, Addington J, Maticka-Tyndale E. Assessing depression in schizophrenia: The Calgary Depression Scale. *Br J Psychiatry*. 1993; 163:39–44.
33. Drake RE, Mueser K, McHugo G. Clinical Rating Scales. In: Sederer L, Dicky B, editors. *Outcomes assessment in clinical practice*. Baltimore, MD: Williams and Wilkins; 1996. p. 113–116.
34. Tremblay MS, Warburton DER, Janssen I, et al. New Canadian Physical Activity Guidelines. *Appl Physiol Nutr Metab*. 2011; 36:36–46. [PubMed: 21326376]

35. Stokowy J, Addington J. Maladaptive schemas as a mediator between defeat and positive symptoms in young people at clinical high risk for psychosis. *Early Interv Psychiatry*. 2012; 6:87–90. [PubMed: 21951894]
36. Addington J, Cornblatt BA, Cadenhead KS, et al. At clinical high risk for psychosis: Outcome for nonconverters. *Am J Psychiatry*. 2011; 168:800–805. [PubMed: 21498462]
37. Walker E, Cornblatt C, Addington J, et al. The relation of antipsychotic and antidepressant medication with baseline symptoms and symptom progression: A naturalistic study of the North American Prodrome Longitudinal Sample. *Schizophr Res*. 2009; 115:50–57. [PubMed: 19709859]
38. McGlashan, T.; Walsh, BC.; Woods, SW. *The psychosis risk syndrome: Handbook for diagnosis and follow-up*. New York: Oxford University Press; 2010.
39. Alvarez-Jimenez M, Hetrick SE, Gonzales-Blanch C, Gleeson JF, McGorry PD. Non-pharmacological management of antipsychotic-induced weight gain: systematic review and meta-analysis of randomised controlled trials. *Br J Psychiatry*. 2008; 193:101–107. [PubMed: 18669990]

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1

Baseline Demographics

Variable	Healthy Controls (n=40)	CHR (n=40)	Test Statistic
Age (Mean (SD))	19.12 (1.35)	17.05 (2.70)	t=4.34**
Number of Males (n, %)	21 (53%)	18 (55%)	χ2=0.05
Number of Females (n, %)	19 (47%)	22 (45%)	
Racial Background (n, %)			
White	25 (63%)	29 (73%)	χ2=3.58
Asian	9 (22%)	8 (20%)	
Interracial	6 (15%)	2 (5%)	

**
p<0.01

Table 2

Current Physical Activity Involvement Reported by Participants

Activities	Current Involvement	
	CHR	Control
	Frequency (%)	
Indoor/outdoor activities	15 (37.5%)	26 (65.0%)
Strength and/or flexibility training	14 (35.0%)	25 (62.5%)
Racquet sports	1 (2.5%)	5 (12.5%)
Seasonal activities	7 (17.5%)	6 (15.0%)
Team sports	6 (15.0%)	6 (15.0%)
Group exercise classes	7 (17.5%)	9 (22.5%)
Martial arts	2 (5.0%)	4 (10.0%)

Table 3

Group Comparisons on Exercise Variables

Exercise Variable Range 1–4	Healthy Controls (n=40) Mean (SD)	CHR (n=40) Mean (SD)	Mann-Whitney U
Frequency	2.83 (0.96)	2.40 (1.01)	602.50 *
Duration	2.90 (0.81)	2.55 (1.08)	653.00
Intensity	3.43 (0.68)	3.03 (0.83)	587.50 *
Perceived Fitness	2.60 (0.78)	2.15 (0.77)	556.00 *

*
p<0.05

Table 4

Barriers Preventing Participants from Exercising

Barrier	Barrier Scores		Test Statistic Mann-Whitney U
	Healthy Controls	CHR	
Lack of time	47	37	639.50
Lack of transportation	11	19	716.50
Lack of facilities near by	16	14	750.00
Lack of programs that are at my level	9	10	788.50
Lack of programs that interest me	22	29	710.00
Lack of energy	41	43	770.50
Lack of motivation	43	46	749.00
Lack of support from others	15	17	787.00
Do not have anyone to go with	25	30	725.00
Cost of physical activity program	18	30	650.00
Previous negative experiences with exercise	7	15	689.50
Failure to achieve exercise goals in the past	7	11	707.50
Don't like how my body looks	8	22	598.00*
Feeling uncomfortable or intimidated	14	29	591.00*
Fear of injury or re-injury	8	17	668.00
Fear of making an existing condition worse	9	20	632.00*
Lack of skills or ability to do a certain type of exercise	17	26	670.50
Lack of knowledge about how to do a certain type of exercise	15	30	575.00*
Total Barrier Score	356	482	596.00*

*
p<0.05

Table 5

Reasons for Exercising

Reason	Reason For Exercising Score		Test Statistic Mann-Whitney U
	Healthy Controls	CHR	
Exercising makes me feel better	37	30	660.00*
Exercise will help me lose weight	23	18	700.00
Exercise will make me healthier	40	31	620.00*
Exercise helps me manage stress	31	20	580.00*
Exercise helps me manage my mood	25	19	680.00
Exercise stops me from getting tired easily	18	10	640.00
Exercise makes me feel more self-confident	32	23	620.00*
Exercise makes me feel strong	30	22	640.00
I will feel better about myself	32	21	580.00*
I will have more energy	26	20	680.00
I will sleep better	26	23	740.00
I will look better	34	26	640.00*
I will have fun	30	20	600.00*
Total Reason Score	384	283	476.50**

*
p<0.05,**
p<0.01

Table 6

CHR Participants' Functioning and Symptom Scores

Measure	Mean	SD	Range for Measure	Range for Sample
Positive Symptoms	10.98	4.83	0–30	0–24
Negative Symptoms	9.26	4.45	0–36	1–17
GF:S	6.88	1.64	1–10	3–10
GF:R	5.53	2.78	1–10	1–9
CDSS	3.60	4.64	0–27	0–17
SIAS	27.48	17.45	0–80	0–72
SAS	44.12	14.80	20–80	25–75