

Piloting Cognitive Fitness in the mental health sector

Exercise and cognition training in one programme



FONDS
PSYCHISCHE
GEZONDHEID

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Foreword

Before you is the report on the study of Cognitive Fitness training in long-term care. The Cognitive Fitness training combines physical exercise with cognitive exercises. Three GGz institutions cooperated in the study: Altrecht, Kwintes and the SBWU. A total of 40 participants started this training. We were interested in the participants' experiences and whether they would also feel physically and cognitively fitter after the 12-week training. This pilot has, in addition to a pre- and post-measurement, a short interview with the participants to map the experiences.

Trimbos Institute, January 2012

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Introduction

In recent years, there has been increasing evidence that sports and exercise are not only important for a healthy body, but also contribute to a healthy mind. Recent epidemiological research by the Trimbos Institute (Ten Have et al., 2010) shows that exercising reduces the risk of developing a mental disorder by 50%. Not only is it an effective prevention tool, sports also ensures faster recovery after mental illness.

Favourable results are found not only in the general population, but also in people with severe psychiatric disorders. Van Campfort et al. (2010) concluded in a review that sports and exercise in people with schizophrenia lead to significant improvements in cardiovascular and metabolic parameters and even to a reduction in psychiatric symptoms. In addition, exercise has social benefits. It teaches better coping with feelings of stress and increases quality of life. Movement exercises have also been shown to have a beneficial impact on neurocognitive processes in schizophrenia patients. Pajonk et al (2010) report in a study that physical exercise in both healthy subjects and people with schizophrenia results in improvements in short-term memory, possibly due to an increase in the volume of the hippocampus. The hippocampus is involved in storing new memories and plays a role in learning. The increase in hippocampal volume was therefore found to be associated with improvements in short-term memory.

There is evidence that when exercise is combined with cognitive stimulation further improves information-processing capacity (Sitskoorn, 2004). One possible explanation for this is the production of the substance BDNF (brain-derived neurotrophic factor). Besides protecting nerve cells and making new connections, this substance also ensures the growth of neurons (Laske et al., 2010). Based on the above mechanisms, Learning Motion (www.learningmotion.nl) developed a neurocognitive training method to promote physical and mental fitness based on physical exercise, intellectual challenge and conscious relaxation exercises. This intervention, called Cognitive Fitness, combines fitness exercises with cognitive elements that consciously activate the brain.

Cognitive Fitness was initially developed to counteract the cognitive effects of aging. At a later stage, this intervention was also applied to people with brain injuries. In this study, Cognitive Fitness participants are people with severe psychiatric disorders in the long-term mental health care system. This target group relatively often has problems in cognitive functioning (planning, concentration, learning, memory) and lifestyle/weight (Appelo et al, 2005; McGurk et al, 2005; Daumit et al, 2005; Keefe & Fenton, 2007; Slooff et al, 2008). These problems in turn adversely affect the social participation and ultimate life expectancy of this target group; the target group's employment rate is not much higher than 10-20% and its life expectancy is more than 20 years lower than that of the general population (McGurk et al., 2005; Tiihonen et al., 2009).

This project aims to further develop a Cognitive Fitness training for people with severe psychiatric disorders, to apply this training in practice and to determine the first benefits of the training for participants. We want to find out whether participants appreciate the training, become physically fitter, improve their cognitive skills and exercise more in daily life.

1 Cognitive Fitness

1.1 Content and structure of training

Cognitive Fitness is a method to promote physical and mental vitality based on physical exercise, intellectual challenge and conscious relaxation exercises. The Cognitive Fitness training programme consists of 12 group classes, which take place once a week and last one hour and 15 minutes. The training programme is divided into four blocks. The first block focuses on logic and memory, the second on concentration and responsiveness and the third on coordination. The last block is a repetition of the above blocks. Each block includes a relaxation component, which consists of breathing techniques and introductory meditation forms.

During the training we work with a workbook that is handed out during the first training. The workbook contains theoretical information, coaching exercises and homework exercises and is gradually supplemented with additional information and exercises. In addition, during the first lesson materials are handed out consisting of juggling balls, an elastic band, a pedometer and a CD with relaxation exercises. These materials are meant to be used at home when doing the homework exercises.

In addition, there is a website where participants can retrieve lessons. Through the website, participants also have access to a virtual environment where cognitive tasks, among others, can be done.

1.2 Lesson structure

Each class consists of a warm-up, a core section and a cool-down. The warm-up consists of exercises that promote blood flow to the muscles and increase heart rate and breathing. The core part consists of a combination of muscle-strengthening exercises and cardio exercises interspersed with exercises aimed at stimulating cognitive skills such as memory, responsiveness, coordination and logic. In 'boot camp', for example, participants have to switch physical activities every minute. Examples of these activities include: dribbling with a sprint in the last 10 seconds, using the dynaband to bring arms apart and lifting weights. Examples of exercises that combine cognition and movement are:

- memory: imitating your predecessor's exercise or remembering words you hear on a sound clip as you walk around the room;
- reactivity: move your feet as quickly as possible when touched;
- coordination: throwing up a ball and clapping your hands, juggling;
- logic: putting pictures from a comic strip in the right order, doing arithmetic.

Each workout ends with a cool-down that consists of breathing and relaxation exercises to calm the body and mind again.

2 Research design

2.1 Research questions

In the Cognitive Fitness study, development, implementation and research went hand in hand. On the one hand, the aim of this project was to adapt the existing Cognitive Fitness training for people with long-term mental illnesses and, on the other hand, we wanted to know whether the training had an effect on the participants; in other words, did it make them fitter? In doing so, we formulated the following research questions:

1. What adjustments should be made to Cognitive Fitness training for people with severe psychiatric disorders?
2. Do we see changes in Cognitive Fitness training participants on the following aspects:
 - a. cognitive skills
 - b. movement behaviour
 - c. psychological complaints
 - d. general health and well-being
 - e. metabolic parameters such as weight and blood pressure
3. How are the participants' experiences?

2.2 Research methods

To answer the first research question, a focus group was organised. During this focus group, counsellors and clients were asked to critically review content and suitability of the training for the target group of people with long-term mental illnesses.

To answer question 2, a pre- and post-measurement took place prior to the training and after the training. The pre- and post-measurement consisted of the following items:

Questionnaires

- General data
- Short Complaints List (Lange & Appelo 2007). The KKL is a questionnaire that gives an indication of the extent of a person's psychological suffering. Only the following complaints were asked for this survey: concentration problems, memory problems, irritability and sleep problems.
- RAND-36 (Van der Zee & Sanderman 1993). This questionnaire measures the general state of health. It contains scales for functional limitations, physical limitations, mental health, social functioning and general health perception.

- Short Questionnaire to Assess Health enhancing physical activity, SQUASH (RIVM, 2004). This questionnaire measures the level of physical activity and whether a person meets the Dutch Standard for Healthy Exercise.
- Quality of life questionnaire. From the South Limburg Care Monitor (Delespaul et al., 2008).

Physical parameters

- blood pressure
- weight
- length

Neurocognitive research

- 15 word test (Saan & Deelman, 1986). This is a test for verbal learning and short-term memory.
- Trail-making A and B (Eling, et al. 2003): This test measures the speed of information processing (component A) and divided attention (component B).
- The Wisconsin Card Sorting Test (Berg, 1948) is a neuropsychological test by which disorders of cognitive flexibility can be detected. The test focuses on the ability to digest new information during a cognitive task and adapt the solution strategy accordingly.

To answer research question 3, semi-structured interviews were held with participants. In addition, the researchers attended two training sessions for observation.

2.3 Analyses

For the quantitative analyses, apart from descriptive statistics, the paired t-test, the X^2 squared test and the McNemar test were used to show any changes. If the variable was not normally distributed, the Wilcoxon ranking test was used. The analyses were done using SPSS-19. For averages, the standard deviation (SD) is also presented.

In the results section, we report on the participants who had both a pre-measurement and a post-measurement. These are 31 participants. From a number of individuals, we miss some results on the post-measurement. We only report the deviating n if it deviates 10% or more. In the statistical analyses, we use a significance level of 0.05. Since the study group is relatively small and it is therefore more difficult to show significant effects, we also present the trend ($\alpha < 0.1$).

The interviews were prepared in writing. The researchers analysed the texts and arranged them by theme.

2.4 Setting and recruitment process

The study took place at three mental health institutions in the province of Utrecht: Kwintes, Al-trecht and SBWU. Al-trecht is a general mental health institution and Kwintes and SBWU are institutions for protected and assisted living in mental health and social care. Participants were recruited by distributing recruitment leaflets. This leaflet contained general information about the training and the study. The leaflets were distributed to various teams of the institutions by the contact person. In addition, the recruitment was highlighted on the institutions' intranets. An information meeting was held at each institution. During the information meeting, the trainers gave a mini-workshop Cognitive Fitness and the researcher told something about the study. Recruitment went well, the information meetings were well attended and the researchers experienced relatively few problems recruiting participants. The training sessions took place on site at the relevant three mental health institutions.

3 Results

In this chapter, we show the results. First, we describe the adjustments we made to the training. Next, we discuss the dropout rate and describe the study group. This is followed by the pre- and post-measurement results.

Successively discussed are; mental health, general health and quality of life, physical exercise, physical parameters and neurocognitive outcomes.

3.1 Adaptation training Cognitive Fitness

With this study, we want to find out what the effects of Cognitive Fitness are in people with long-term mental illnesses. Because the training has not been used with this target group before, a focus group was first organised to gain more insight into its suitability for this target group and any adjustments that need to be made. In this focus group, personal supervisors, psychologists as well as clients were represented. From this focus group, two points emerged that needed to be adjusted:

1. Meditation

Both counsellors and clients stressed that meditation should be handled with caution. They indicated that people with long-term psychiatric complaints often have an 'active inner world'. Visualisation, in particular, can strengthen this inner world. Breathing and relaxation exercises were suggested as alternatives.

2. Workbook

The focus group revealed that the language used in the workbook needed to be more in line with the target group. The language was too abstract, the sentences were too long and the exercises could be explained more clearly. Clients also expressed a preference for more variety and varied exercises. Finally, the exercises should be easy to do in daily life.

The training was subsequently modified on the above points. Meditation was replaced by breathing and relaxation exercises and the workbook was adapted to be more in line with the target group.

3.2 Dropout post-measurement and training

A total of 40 clients participated in the study. These were 15 clients from Altrecht, 14 from SBWU and 11 from Kwintes. Of these clients, 31 participated in both the pre- and post-measurement.

Drop-out research

Of the 40 participants, 9 did not participate in the post-measurement. There were various reasons for this. Four participants could not take part in the post-measurement because of psychological problems, one because of private circumstances and the reason for four clients is unknown because we did not manage to get in touch with them.

We compared the group with a post-measurement and the group without a post-measurement on a number of characteristics. The clients who also have an after-measurement do not differ on demographic characteristics such as gender, marital status, education and psychiatric background. However, the clients with an after-measurement were on average older (52 years vs 41 years, $t=2.3$ $p=0.03$).

Drop-out training

Of the 40 participants, 22 completed the training (>6 courses), 18 participants thus stopped the training in the interim. For this, participants contribute a variety of and often a combination of reasons. Having psychological complaints is the reason most often mentioned by participants. Other reasons mentioned were: Friday was not a pleasant day, training time too late, care for a child, participants did not like the training. For six participants it is unknown why they stopped.

We compared the group that stopped (or attended <6 trainings) on a number of characteristics. We found no differences with respect to age, gender, education, marital status and psychiatric background compared to the group that did complete the training (or attended >6 trainings). We see that dropout was highest at SBWU (38%) and lowest at Altrecht (28%). At Kwintes, 35% did not complete the training.

Reasons for dropout

One of the participants indicated beforehand that it would be difficult for her because her day and night rhythm was disrupted. Despite having trouble getting out of bed, she appeared at the pre-measurement and the first training session. Unfortunately, she then still did not manage to attend the first training. Another participant indicated at the pre-measurement that she moved very little and had not been on a bike for years. It was already a victory for her that she appeared at the pre-measurement, given the street fears that limited her. She also came to the first training session but after that it turned out to be quite tough for her, partly because the training session took place at the end of the week and her energy was completely depleted by then. Her personal tutor motivated her a few more times to go to the training but she eventually stopped.

3.3 Characteristics research group

Sociodemographic characteristics

The group of participants (n=40) consists of equal numbers of men and women. The youngest participant is 22 years old and the oldest participant is 75 years old. The average age is 49.6 years (sd=12.7). More than half (60%) have as their highest completed education primary education, lower vocational education or mavo. Most clients are unmarried (65%) or divorced (30%). Of the participants, the largest group lives in an institution or apartment of an institution (42.5%), 40% live independently and alone and 13% live with a partner and/or children.

Half (50%) of the participants do voluntary work, 7.5% have paid work, 5% go to school or study and 20% follow a course or training. More than half (58%) of the participants have been declared partially or fully disabled.

Psychiatric background

The vast majority (95%) of participants have suffered from mental health symptoms for 2 years or more. Over half of the participants (55%) report having depressive symptoms, 40% have anxiety symptoms, 30% struggle with a personality disorder and 36% suffer from psychosis or schizophrenia. A large majority (68%) use medication on a doctor's prescription to reduce or control their psychological symptoms.

Participants mainly experience limitations in work (77%) and social contacts (74%). Slightly more than half (53%) of the participants also experience living limitations. Of the participants, 62% reported having concentration problems, 43% memory problems, 45% sleep problems and 31% irritability.

General health

Almost half of the participants consider their health moderate to poor (48%), while the rest rate their health as good to very good. Almost half (45%) of participants say their health is better compared to a year ago. Almost one-third (30%) say their health has remained about the same. The average weight of participants is 84 kilograms and the average BMI is 28. With a BMI above 25, it is called overweight. More than half of the participants (58%) have a BMI higher than 25 and therefore struggle with overweight. Almost one third (30%) of the participants have a BMI higher than 30. This means they are suffering from severe overweight, also called obesity (WHO, 2004).

Movement behaviour

Participants spend a total of 705 minutes (nearly 12 hours) per week on exercise activities such as walking, cycling, housework, gardening and sports. This is significantly lower than the general population who spend an average of 1379 minutes (over 22 hours) in

the week moves. Participants moved moderately to intensively for an average of 3.9 days a week. The Dutch standard 'healthy exercise' prescribes that everyone should have 30 minutes of moderately intensive physical activity at least five days a week. A small minority do not comply with this (43%).

Participants were also asked to what extent they are physically active and to what extent they want to change this. 8% of the participants do not exercise or sport regularly and do not plan to change this (phase 1), 32% of the participants do not exercise or sport regularly but plan to start doing so in the near future (phase 2), 16% of the participants have occasionally exercised or sported in the past few months (phase 3), 34% have been actively involved in sport and exercise at least 5 days a week in the past six months (phase 4) and 8% have exercised or sported intensively at least 3 days a week in the past six months (phase 5).

3.4 Psychological health

Figure 1 shows in which areas the participants perceive that they experience limitations from their mental symptoms. The results show that in the post-measurement, compared to the pre-measurement, the participants experience fewer limitations from their psychological complaints in the areas of living and social contacts. The biggest difference is seen in the area of social contacts. At the pre-measurement, 75% of the participants indicated experiencing limitations in this area. At the post-measurement, only 57% of the participants experience limitations. Because of the small study group, the differences are not significant. No positive change occurred in the area of work.

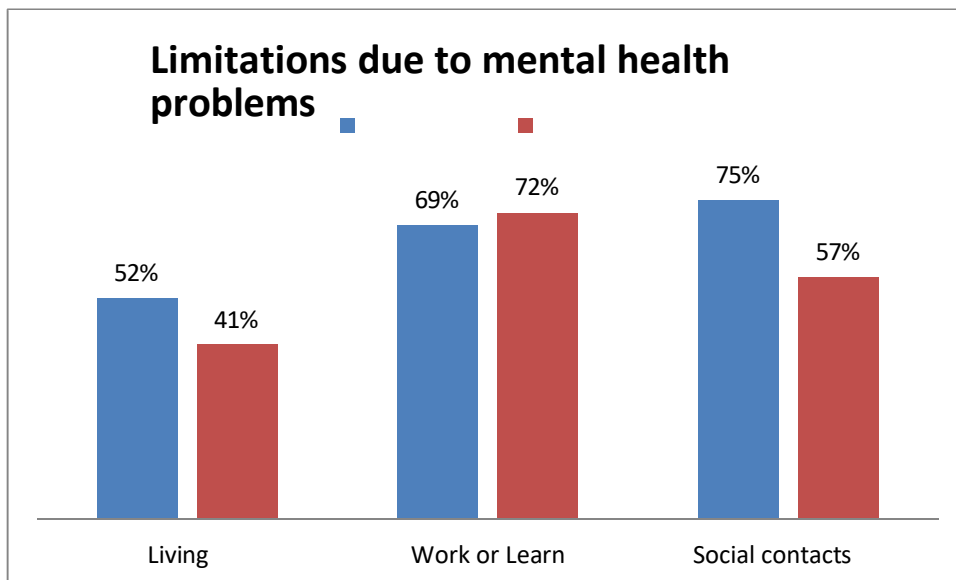


Figure 1: Limitations on living, social contacts, and working or learning.

Table 1 shows the extent to which participants suffered from concentration, memory, sleep problems and irritability. This was measured using the Short Complaints List (Appelo et al., 2007). The scale runs from 1 to 5, where 1 represents 'no trouble' and

5 for 'very bothered'. Only small changes are seen on the post-measurement. These changes are not significant.

Table 1: results of the KKL list

	Pre-measurement	After-measurement
	M (SD)	M(SD)
Concentration problems	3,0 (1,2)	2,8 (1,3)
Memory problems	2,6 (1,2)	2,7 (1,4)
Irritability	2,1 (1,1)	2,2 (1,1)
Sleep problems	2,7 (1,6)	2,8 (1,5)

3.5 Overall health and quality of life

General health

Table 2 shows the results of the RAND-36. The RAND-36 is a questionnaire that maps general health. The score ranges from 0 to 100, where a higher score indicates better health status. Looking at the different domains of the RAND-36, we see that participants slightly improved in some domains and slightly deteriorated in others. However, none of the changes are significant. However, we do see a trend on the mental health domain ($t=-1.8$; $p=0.08$). This increased, i.e. participants experienced better mental health at measurement.

Table 2: results of the RAND-36

	Pre-measurement	After-measurement
	M (SD)	M (SD)
Physical functioning	44,5 (9,7)	44,2 (9,1)
Social functioning	38,6 (12,4)	40,7 (9,8)
Role limitations (physical problem)	39,2 (16,1)	37,9 (15,8)
Role limitations (emotional problem)	31,8 (18,3)	28,8 (18,8)
Mental health	38,0 (10,7)	40,8 (12,4)**
Vitality	43,4 (10,9)	44,2 (11,9)
Pain	49,8 (9,8)	51,0 (9,5)
Overall health perception	40,5 (8,4)	41,1 (9,5)
Health change	61,3 (27,3)	64,5 (24,8)

** $p<0,1$

Quality of life

To map quality of life, we adopted the questions used in the South Limburg Care Monitor. Scores on the items ranged from 1 (not at all satisfied) to 7 (very satisfied). Regarding the total score, a small improvement in quality of life can be seen (table 3). However, this change is not significant. There is one significant change on the assistance domain ($t=2.4$; $p=0.02$). Participants are less satisfied with the assistance they receive at the post-measurement than at the pre-measurement. Regarding the change on the financial situation domain, we can speak of a positive trend ($t=-1.8$; $p=0.09$).

Table 3: quality of life results

Satisfaction with:	Pre-measurement M (SD)	After-measurement M (SD)
Living situation	5,1 (1,7)	5,2 (1,8)
Social relations	4,1 (1,8)	4,4 (1,9)
Day care	4,5 (1,8)	4,7 (1,5)
Financial situation	4,2 (2,1)	4,9 (1,8)**
Mental health	4,1 (2,0)	4,3 (1,8)
Physical health	4,3 (1,9)	3,9 (1,9)
Assistance (N=27)	5,8 (1,3)	5,3 (1,6)*
Life as a whole	4,7 (1,7)	4,6 (1,6)
Average item score^A	4,4 (1,3)	4,6 (1,3)

* p<0.05, ** p<0.1

^Atotal score of 7 items, assistance not included

3.6 Physical movement

Table 4 shows the results of the SQUASH, a questionnaire to assess levels of physical activity. The table shows the average number of minutes the target group moves per category. We see that after the training, the participants moved about 0.5 hours less per week. This decrease seems to be mainly due to participants moving less in their leisure time (decrease of 86 minutes). At work and school, on the other hand, participants started moving more. However, the differences found are not significant probably due to the high standard deviation.

Table 4: Average minutes of physical activity per week

	Pre-measurement M (SD)	After-measurement M (SD)
Commuting/school traffic	29,3 (68,6)	50,8 (134,1)
Leisure	270,0 (280,2)	182,3 (152,4)
Household activities	187,6 (193,0)	131,3 (108,2)
Physical activities at work and school	303,9 (398,6)	394,8 (484,2)
Total physical activities	790,8 (631,6)	759,2 (621,2)

The average number of days on which participants engaged in strenuous activities for at least half an hour remained almost the same. In the pre-measurement it was 4.0 on average and 4.1 in the post-measurement. This difference is not significant.

Degree of physical activity

In the post-measurement, we find the largest group of participants in stages 4 to 5. That is, these people exercise regularly or exercise for half an hour 5 times a week while in the pre-measurement the largest group is in stages 1 to 3, not exercising to occasionally. The analyses show that this shift is significant ($t=-3.1$; $p=0.00$). More participants started exercising and/or moving after Cognitive Fitness training.

Table 5: Degree of Physical Activity

	Pre-measurement	Post-measurement*
Not exercising and not starting yet either	3%	7%
Not playing sports but want to start	38%	3%
Occasional sports	17%	28%
Half an hour a day 5 days a week	35%	35%
Exercised intensively 3 times a week	7%	28%

*p<0,05

3.7 Physical parameters

Blood pressure and weight

Blood pressure was measured three times with an automatic blood pressure monitor. From these, the average was calculated. After training, both the upper and lower pressures decreased significantly by 4 mmHg (see table 6). The upper pressure decreased from 127 mmHg to 123 mmHg (t=3.1; p=0.00) and the lower pressure from 77 mmHg to 73 mmHg (t=2.4; p=0.02).

The participants' weight did not change. Participants weighed about 80 kg during both the pre-measurement and post-measurement. This equates to an average BMI of 26.5.

Table 6: Results of physical parameters

	Pre-measurement (SD)	Post-measurement (SD)
Blood pressure in mmHg		
-pressure	76,9 (12,4)	72,7 (10,1)*
-overprint	127,5 (15,3)	123,1 (15,3)*
Weight in kg	80,2 (16,9)	80,2 (17,0)
Length in cm	174,5 (11,0)	N/A
BMI	26,5 (6,2)	26,5 (6,2)

*p<0,05

3.8 Neurocognitive research

Memory

Table 7 shows the results of the 15 Words Test, a test to assess verbal learning and short-term memory. After attending the training, participants' short-term memory was found to be significantly improved (t=- 6.2; p=0.0). At the pre-measurement, participants could remember an average of 35 words and at the post-measurement, an average of 42. On all individual tests, an improvement was seen. On all individual tests, the changes are significant except for test 5. See table 7 for t and p values.

Table 7: number of words 15 word test (SD)

	Pre-measurement M (SD)	Post-measurement M (SD)	t-value	p-value
Test 1	4,5 (1,6)	5,9 (2,0)	-5,87	0,00*
Test 2	5,8 (2,3)	8,0 (2,9)	-5,37	0,00*
Test 3	7,2 (2,7)	8,9 (3,0)	-4,67	0,00*
Test 4	8,2 (2,3)	9,5 (2,8)	-3,46	0,00*
Test 5	9,2 (2,3)	9,7 (2,7)	-1,41	0,17
Recall	6,8 (2,8)	8,0 (3,3)	-3,4	0,00*
Total number of words tests 1-5	35,0(9,9)	42,0 (12,5)	-6,2	0,00*

* p<0,05

Cognitive flexibility

Table 8 shows the results of the WCST test, a test that measures the ability to adapt a thinking strategy to changing circumstances. At the post-measurement, participants have less difficulty adapting their thinking strategy than at the pre-measurement. During the post-measurement, participants give significantly fewer perseverative answers ($t=2.1$; $p=0.05$) and make fewer perseverative errors ($t=2.5$; $p=0.02$) than in the pre-measurement. A high number of perseverative answers and errors indicates an inflexible cognitive strategy: the participant does not change his erroneous strategy under the influence of feedback. Regarding the total number of errors, a trend is visible ($t=1.7$; $p=0.09$). In the post-measurement, participants make fewer errors than in the pre-measurement.

Table 8: WCST results

	Pre-measurement M (SD)	After-measurement M (SD)
Completed categories	4,0 (2,7)	4,5 (3,6)
Total number of correct answers	79,4 (18,8)	82,9 (20,5)
Total number of errors	47,9 (19,8)	42,1 (23,3)**
Perseverative responses	48,5 (18,6)	37,6 (21,9)*
Perseverative errors	26,7 (14,4)	17,2 (13,6)*

* p<0.05, ** p<0.1

Information processing

Table 9 shows the results of the trail making test. This is a test that measures the speed of information processing. The speed at which the test is taken says something about the speed at which a person can process information. The participants made both test A and test B faster at the post-measurement. We see an improvement of almost 4 seconds in test A and an improvement of over 17 seconds in test B. These improvements are not significant but we can speak of a trend (test A: $t=1.9$; $p=0.06$ and test B: $t=1.2$; $p=0.08$).

Table 9: speed (seconds) Trail-making test A and B

	Pre-measurement	After-measurement
	M (SD)	M (SD)
Trail making A	39 (23,0)	35 (26,7)**
Trail making B	109 (79,2)	93 (71,3)**

** $p<0,01$

4 Experiences and satisfaction of participants

This chapter presents a picture of participants' appreciation of Cognitive Fitness. For this purpose, interviews were held with 28 participants of the training programme. These included participants who completed the entire training programme as well as participants who stopped the training programme in the meantime. This chapter also includes the results of a survey completed by 23 participants after the training. These are mainly participants who completed the training.

4.1 *General impression*

Participants are extremely positive about the Cognitive Fitness training. They enjoy both physical and mental exercise. The combination of exercise, thinking and relaxation makes the training very varied and varied. According to the participants, the training was well put together. One participant said: 'It is so nice how the trainers connect the different parts: exercise, reflection and relaxation. It always had a clear place'. The participants found the training very surprising. It often involved exercises they had never seen or done before.

One participant said that being introduced to Cognitive Fitness was both confrontational and enriching for her. "You become aware of how far you have deteriorated but it is also nice to know that you can pick it up again". Other participants also indicated that it was sometimes confrontational to notice that they had regressed. But in addition, they were also greatly surprised because they were able to do things they had not expected beforehand. Juggling, for instance, made a big impression on some participants. One participant said: 'I will always remember juggling. While practising I knocked over a vase and almost destroyed the whole house. But now it's going well. I always wanted to learn but never got around to it. It's great that I can do it now.'

Many participants said during the interview that they really looked forward to the training sessions. One participant said: 'I always liked it so much when it was Friday again. I was always curious to see what exercises they had come up with next'. However, some participants had to get used to the training a bit, especially to a group of new people. This made them a little apprehensive about the training sessions in the beginning. One participant says: 'At first I had to get used to the training. It was a good lesson for me to persevere anyway. It became really fun. Almost all participants left the training with a good feeling. Especially the physical effort gave them a lot of satisfaction.'

When asked if they would recommend the training to other people, participants answered with a definite yes! One participant explained why 'The training is fun and

original. You do exercises that are good for you and you work on your fitness'. Another participant recommends the training 'because it is good for both body and mind'.

Only a few participants are less enthusiastic about the training. One participant reports that he simply does not like sports. He says that this is more down to him than to the training. Another participant says he could not keep up with the pace of the training. He would have liked more time for the exercises and more breaks in between.

The survey also clearly shows that participants are positive about the training. For example, 18 out of 23 (78%) participants rated the training as good to excellent. Not a single participant rated the training as inadequate. Participants gave the training an average mark of 8.3, the lowest mark being a 7 and the highest a 10. The most frequently mentioned mark was an 8 (43% of participants). The vast majority of participants (87%) want to participate in a follow-up training.

'After the training, you felt like you can get back on track'

'I always looked forward to the long travel distance. But once I got going it felt good and after the workout I felt tippy-toe'

'The training has a nice playful character. It brings out a bit of the childlike in you'.

4.2 Duration of training sessions & number of training sessions in the week

The vast majority of interviewees are satisfied with the duration of a training session (1 hour and 15 minutes). During the interviews, it clearly emerges that participants find the duration of the entire training (12 weeks) too short. Consequently, the vast majority of interviewees indicated that they would have liked to continue the training.

The interviewees are satisfied with the number of training sessions in the week. Only a few participants say they would like to train more often per week. The majority of interviewees find one training session a week sufficient. However, some of these interviewees said that one training session a week is actually not enough to really notice any effects. One participant said the following "Once a week is enough. I also have other things to do. It would be better if it were more often. Then you also do more homework exercises at home, so it gets into your system more'.

4.3 Level of training

Participants are generally satisfied with the level of training. This is also reflected in the survey results. Only one of the 23 participants finds the level of the training too high. The rest of the participants (96%) consider the level of the training 'good'. The vast majority of participants are satisfied with the pace of the training. Nevertheless, a number of participants, especially the slightly older ones, indicated during the interviews that they sometimes had difficulties with the rapid transition of the exercises. They found the time pressure of the exercises difficult and would have liked a little more time per exercise. One participant expressed this as follows: 'I don't cope well with pressure, it stresses me out. I would have preferred to do the exercises at my leisure. I don't like it when others are faster than me'. That some people found the pace of the training too fast, however, is not confirmed by the survey results. In fact, no participant indicated that the pace of the training was too fast. A few participants indicated that the level was too low for them. They would have liked something more challenging.

A large number of interviewees noted that there was a lot of level difference between the participants. However, most of them did not experience this as negative, because the trainers were able to make the exercises both easier and more difficult, allowing everyone to participate at his or her own level. A few indicated that they preferred to be in a group with people of the same level. One participant says the following "The level difference in the group was big. Because I have only just got the handicap, it was confrontational. I felt like I was inhibiting the other participants. I found that annoying, although the other participants may not have felt that way'.

4.4 Homework assignments

It is clear from the interviews that few participants did homework assignments. Many participants did the homework assignments in the first weeks of the training but stopped during the training. The main reason given was that the amount of homework was too much for them to handle. They also said they did not have time to do the assignments. One participant says, for example: 'I didn't get around to the homework assignments. Before you knew it, the week was already over. I did the exercises for the first three weeks, but then I didn't get around to it. I didn't find it boring to do but you had to sit down and find a suitable moment.

Interviewees indicated that too little time was spent on the homework exercises during the training sessions. This made some participants feel that the homework assignments were not that important. The exercises were too non-committal and therefore lacked the incentive to do the assignments at home. One participant commented, 'It would be nice if the homework exercises were discussed afterwards. If there

deeper into it then you also experience its importance more. I kind of miss the appreciation'.

The interviews suggest that participants made little use of the website. This is confirmed by the survey results. Only 11 of the 23 participants visited the website. The rest did not complete the question because they did not use the website. A number of participants indicated that they did not have internet or a computer, which made it impossible for them to view the website. Of the participants who did use the website, 7 out of 11 (64%) rated the website as 'satisfactory', 2 as 'moderate' and 2 participants rated the website as 'good'. More participants used the workbook. 20 out of 22 participants rated the workbook as 'sufficient', 'good' or 'outstanding'. The answer 'good' was completed most often (41%). Only 2 participants found the workbook 'moderate'.

4.5 The trainers

About the trainers, participants are all praise. The trainers were well-matched and described as enthusiastic, patient, calm and helpful. According to the participants, the good atmosphere in the group was largely due to the trainers. The exercises were well explained and participants received individual help if an exercise did not work out. Many participants commented that the trainers took people's limitations into account. One participant commented: 'The trainers took my disability into account. When juggling, they arrived with cloths instead of balls. Then I could do it. I really liked that'.

Satisfaction with the trainers is confirmed by the survey results: 20 out of 23 (87%) participants rated the trainers' approach 'good' to 'excellent'. The remaining 3 participants give the trainers a 'satisfactory'.

4.6 Group atmosphere and social contacts

Interviewees were very positive about the atmosphere in the group. There was a lot of laughter and people treated each other with respect. One participant commented 'It had a familiar feeling anyway. Everyone was motivated and I felt at ease'. A number of participants said that in the beginning they found it difficult that the training was done in a group instead of individually. They also had to get used to the partner assignments. However, this became easier as they got to know the group better and the atmosphere in the group was good. Participants agree that the trainers influence the atmosphere in the group in a positive way. Although the atmosphere in the group was good, only a few participants gained social contacts from the training. A few participants expressed regret about this. One participant said: 'Everyone arrived exactly on time and then left immediately, so there was no time to get to know each other properly. I think that's a pity'. A participant

Numerous participants report that the training made it easier for them to deal with social contacts in their own environment.

'The training has opened a door for me. I am quite a loner and find social contacts difficult. During the training you interact with people and do things together.

Because of the training, I now dare to address people more quickly and trust them'

4.7 Effects of training

What is striking is that almost all participants benefited from the training in their own way. For example, someone with autism says: 'I am autistic and often do the same things. Because of the training I try out more. I take a different route or I unpack the washing machine in a different way. This makes me feel good'. Another participant says he can plan his life better: 'I make better choices and I deal with problems differently. I also stay calmer and handle my anger better'. Yet another participant says he has more energy to do things: 'When I have been working all day, I always cook now. Before, I tended to spread a sandwich, for example.

'I am doing so well now. Things are really moving at a fast pace. I don't know if Cognitive Fitness has contributed to this. It seems to have because things are going well again since I started training'.

'I can relax a little better after a stressful situation. For this, I use the breathing exercises I learnt during the training'.

Besides the varied changes people experienced, there were also clear over-unities. 'I feel better in my skin' is a comment made by many participants during the interviews. Participants felt fitter, had more energy and started to do more things. Many participants indicate that the training has made them less inclined to put off activities they are reluctant to do. Instead of thinking about what could go wrong, they just get going. One participant says the following: 'I pick things up faster now. The training requires perseverance. I also have that at home now. I put on some music and get to work. Last night, for example, I mowed the grass. I didn't feel like it but I persevered anyway. I learned that through the Cognitive Fitness training'. Another participant says: 'I feel I can deal with problems more easily. I see problems more as a challenge and don't immediately think I can't do it'.

In addition, many participants say they gained more self-confidence as a result of the training. Because the training consists of so many different components, there was always a component someone was good at. Many interviewees said they were sometimes surprised at what they could do. One participant said the following "What I found remarkable is that after physical exertion, I was able to lay the miko sticks correctly while I am not mathematically inclined at all. Then maybe there is a connection between be- ways and intelligence. That gives a kick and it gives me hope!" Participants also noticed clear progress during the training, the exercises came easier and easier. All this together made many participants feel more confident as a result of the training.

'I feel more confident and as a result I undertake many more things'
'I want to start travelling again. The training has helped me pick up these plans again. I feel happier, stronger and more confident'.

'I have become more sure of myself. In the past, I was sometimes uncertain about statements I made. I was afraid I couldn't answer questions properly. During the training, questions were asked that you had to think about. Now I am no longer afraid to answer questions'

In terms of physical fitness, some participants also notice positive changes. For example, they have gained more strength and can sustain physical exertion for longer. One participant says, for example: 'My condition has improved. I notice this because I can do the fitness exercises for longer. I also notice it in daily life. For example, I get less tired during exercise. You also feel it's healthy afterwards'. On the other hand, there are also many participants who do not feel that their fitness has improved as a result of the training. They say they should have trained more often during the week and done their homework exercises. Participants also find it difficult to indicate whether their fitness improvement is due to the training because they also have other occupations and activities in their daily lives.

Many participants have become more aware that exercise is good. When I go to the supermarket, for instance, I first think about whether I will go by bike or by car. Before, I was much more likely to take the car. Some participants also started to weigh more as a result of the training. The pedometer that participants got at the start was a good incentive for some people to exercise more. It became a sport for some participants to take as many steps per day as possible. Many interviewees said they would like to move more. Although they do not know if this will succeed. They indicate that a follow-up training could certainly help them with this.

Participants were also asked whether their cognitive skills, such as concentration and memory, improved as a result of the training. Most participants do not think their memory and/or concentration improved. For this, they think they should have trained more often and more intensively. Nevertheless, there are also a number of participants, who do see changes in

have noticed, especially in terms of their concentration. One participant says: 'I feel I can listen better because I am more occupied with what I am doing at that moment. I can concentrate better and don't get distracted. When juggling, you have to keep your attention. I now also apply this in daily life, for example when I write an e-mail. Another participant says: 'I can concentrate better now. It seems like I have gained more brains. As if something was switched off that is now switched on again'.

4.8 Areas for improvement according to participants

Participants were also asked what could be improved about the training. The following areas for improvement were suggested by the participants:

Location & time of training

Some interviewees were not satisfied with the room where the training was given.

Participants indicated that they preferred to train in a more sporty environment.

Another concern is day on which the training is given. Many interviewees say that they do not like Friday, the end of the week, for training. In doing so, they indicate that they have less energy at the end of the week. Furthermore, the time of day, at the end of the week, is not ideal for many participants. One participant explains: "Because I don't work, every activity is an interruption of your daily rhythm. This makes you look forward to things. Especially if it's in the afternoon".

Homework exercises

The interviewees indicated that more attention could be paid to the homework exercises.

Some participants felt that the exercises were not well explained during the training, making it unclear how exactly the exercises should be performed. Participants also liked it when the homework exercises were discussed afterwards. According to them, this ensures more commitment. One participant said the following about this: 'To integrate some of the homework exercises more into the training sessions. This allows you to see if people do the exercises at home and to help them if the exercises are not well understood. In addition, this can motivate people to do the exercises at home'.

Defence exercises

Some participants indicated that certain exercises (such as boxing exercises and defence exercises with a rubber bar) triggered unpleasant memories for them. They recommend that in follow-up training, each exercise should be carefully considered to what it might trigger in people with mental health problems.

4.9 Experiences of trainers and supervisors

An evaluation meeting was held after the training. Those present were the researchers, supervisors from Kwintes and SWBU and the trainers. A telephone interview was held with a supervisor from Altrecht to discuss experiences and points for improvement.

Supervisors' experiences

The representatives of Kwintes, SWBU and Altrecht are all very enthusiastic about the Cognitive Fitness training. The concept really appeals to them, the training has a good structure and is characterised by a fresh approach. According to the supervisors, every participant did have a positive experience because there are many different components and exercises. This makes them go home with a good feeling and motivates them to keep coming. The facilitators found it very nice to see that the group became so close-knit and they feel that the participant stimulated each other in a positive way. According to the facilitators, the good atmosphere was partly due to the trainers. The facilitators are therefore very positive about the trainers. The trainers took good account of the level of the participants and ensured easy accessibility and a relaxed atmosphere. The trainers indicate that the presence of personal trainers is very important. Especially for this target group, a trusted person gives a safe feeling. Finally, they emphasise that fun must remain paramount during the training.

It is indicated that a large group of people dropped out. The reasons are diverse: people drop out because of psychotic and anxiety symptoms or are too busy with other activities. This certainly does not always have to do with motivation. According to the counsellors, it is often a combination of different reasons. Only the supervisors at Kwintes indicated that they see a clear difference between people from the residential form and itinerant clients. For people from the residential form, it was still too hard even though they could participate at their own level. This was partly due to physical limitations.

Only at Kwintes did the training take place in a gym. At Altrecht, the training was given in a sewing workshop and at SBWU in a disco room of a community centre. The co-workers at the latter two institutions would like to see the training given in an environment with a more sporting feel where there is sufficient light and space.

In addition, it became clear during the meeting that the homework assignments were not well taken up by the participants. There were a few who fully completed all the homework assignments. For many people it was too difficult, especially the e-learning part. Those present found this very unfortunate, precisely because engaging in Cognitive Fitness exercises during the week can enhance the effect of the training. Finally, Friday does not appear to be the most favourable day. The energy level is experienced a lot lower by the participants then. The late hour is also unfavourable.

Trainers' experiences

The trainers enjoyed delivering the training sessions. They found it a fun and social event. They did notice a clear level difference, both between the groups and within the group. The Kwintes group was older and had more limitations, which meant they often had to be creative with the exercises.

They noticed that many people were insecure. They indicated that at times it was quite difficult to find a balance in exciting people on the one hand and letting them experience success on the other. They also noted that there was a difference between the participants in terms of physical fitness. Some participants did sport daily and others hardly did so.

The trainers indicated that there was little room to give attention to the homework assignments in an hour and a quarter. They therefore suggested making the training a quarter-tier longer so that more time could be spent explaining and discussing the homework exercises.

The trainers experienced big level differences between the participants and also per institution. They tried to offer the exercises in such a way that everyone could participate.

5 Conclusion, discussion and recommendations

At three mental health institutions in the Utrecht region, the training cognitive fitness in long-term mental health care took place in the spring of 2011. In this chapter, we discuss the results of this study, make comments and make recommendations.

5.1 Conclusion

It is known from literature that people with long-term mental disorders often experience problems in cognitive functioning and lifestyle in addition to their mental health problems. This is confirmed in this study. Many participants do not exercise enough, more than half of the participants struggle with overweight and half of the participants rate their health as moderate to poor. Many also report memory and concentration problems. This confirms once again how important it is to pay attention to both lifestyle and cognitive functioning in this target group. The Cognitive Fitness training programme addresses this by combining physical exercise with exercises to improve memory, concentration and coordination.

Initial results are positive:

1. **Appreciation:** In the various mental health institutions, the training was received with great enthusiasm. The information sessions were well attended and the researchers encountered few problems in recruiting participants. Participants were extremely positive about the Cognitive Fitness training and rated the training with the average of over an eight. The atmosphere in the group was positive, there was a lot of laughter and people treated each other with respect. The training is varied and people can participate at any level. In addition, as many as 89% want to continue with follow-up training.
2. **Effects:** At the end of the training, participants are better off in a number of ways than prior to the training. We see that memory and cognitive flexibility improved after attending the training. Besides improvement in cognitive skills, we also see that blood pressure, both low and high, decreased significantly and that participants report that they have become more physically active, although they do not move more minutes per week. We also see an improvement (trend) regarding mental health and speed of information processing, though not significantly. Positive findings also emerge from the qualitative evaluation. Participants indicated in the interviews that their well-being increased as a result of the training. Many participants say they "feel better about themselves" as a result of the training. They feel fitter and have more energy after the training. Participants indicate that they show less procrastination; they are less reluctant to undertake activities and just get on with it.

There were also some reservations about the training:

1. Dropout: For many participants it proved difficult to keep up the training. In the end, a small majority of the participants (n=22) completed the training, i.e. attended at least 6 training sessions. Although the trainers adapted the exercises to the level of the group, some participants (especially from Kwintes) indicated that the pace was high and that they had trouble keeping up with the exercises. Staff from this institution also indicated that the training was too demanding, especially for people from the residential form. In addition, it turned out that the psychological problems present were often a reason for stopping the training.
2. Homework: Participants were less satisfied with the homework assignments. Not enough time was spent on these during the training, so it remained unclear how they should be done. Most also found it difficult to carry out the assignments in daily life.

5.2 Discussion

Below, we want to qualify some of the results found in more detail.

It should be noted that this was a study without a control group. We therefore do not know for sure whether the changes can actually be attributed to the training. This applies in particular to the neuropsychological tests. We know from research that neuropsychological tests are sensitive to learning effects (Jelicic, 1999). When taken repeatedly, subjects know what to expect and may improve their solution strategies. Two types of tasks appear to be susceptible to a learning effect: tests aimed at executive functioning and tests that measure memory. The tests used for this study (15 words test, Trail making Test and the WCST) are also susceptible to learning effects.

As for blood pressure, we see that both the upper and lower pressures decreased significant by 4 mmHg. Blood pressure is known to decrease as fitness improves (Cornelissen, 2005). In this study, we see that the target group became more physically active, which could possibly be related to the found reduction in blood pressure. However, there may also be other explanations why blood pressure fell. Stress has an increasing influence on blood pressure. At the post-measurement, participants knew what to expect. It may be that this made them experience less stress during the training and therefore their blood pressure was lower.

The participants' weight remained almost the same. This is actually not a surprise because the training was not tailored to healthy eating and weight reduction. For that matter, programmes that do focus on weight reduction see modest improvements. For example, Vreeland et al (2003) report a weight reduction of 2.7% and a BMI reduction of 2.8% and Appello et al (2005) report an improvement of respectively 2.2% and 2.8. Possibly the mechanism of action that could lead to weight reduction in this training also needs more time. It is known from literature (Ganley, 1988) that psychological complaints and low social support are incentives for much and

long-term overeating. Overweight occurs in more than half of the participants in this study. Participants indicated in the interviews that their well-being increased as a result of the training, although this is not supported by the completed quality of life questionnaire. An increase in well-being would have a positive impact on obesity and mental health in the longer term.

Regarding the active status of sport and exercise, we see that a shift has taken place. In the post-measurement, the largest group of participants is found in phases 4 to 5. This means that these people sport occasionally to very regularly, while in the pre-measurement the largest group was in phases 1 to 3, not sporting to occasionally. Participants therefore started to exercise more. This change was to be expected as the participants were still participating in the training in the month prior to the post-measurement. But it is possible that the cognitive fitness training also encouraged more sports and exercise in addition to the weekly cognitive fitness training, as the training hour was not in itself sufficient for the changes found. However, with regard to the mean number of minutes of exercise per week, we see no difference.

Somewhat out of tune are the changes in quality of life. On the sub-aspect of satisfaction with social care, people rated themselves lower after the training, and higher (not significantly) on the aspect of finances. Both changes seem to have little to do with the nature of the training and we cannot quite place them.

Thus, no effect was found on a number of outcome measures. This does not necessarily mean that there are no effects. It frequently happens that studies have too little power to observe effects (Altman & Bland, 1995). This is usually due to too small a number of participants in the study group. This comment can also be made with this study.

5.3 Recommendations

Both the participants themselves and the trainers and supervisors of the participants made recommendations for the continuation of the cognitive fitness training.

Here, we summarise the main recommendations point by point:

1. The experiences are so positive that further development of the offer and follow-up research is desirable.
2. To demonstrate the effectiveness of the training more thoroughly, a randomised controlled trial will have to be conducted in which one group is offered the intervention and the other group is not.
3. A known effect of training courses is that they have a beneficial effect in the short term, but changes are difficult to make stick. For more lasting effects, training should be prolonged, for instance through an open follow-up group.
4. The homework assignments may be given a more prominent place during the training so that there is room for feedback from the assignments and there may be more focus on making the homework assignments.

5. If weight reduction is an intended effect of the training, a section on healthy eating and conscious eating behaviour should be included.
6. Participants' personal supervisors should be more involved in the training. This could lead to more motivation to go to the training every week (and thus fewer dropouts). In addition, the supervisor can play a role in making the weekly homework assignments. Together with more attention to homework assignments, changes can thus be more easily incorporated into daily life.
7. To reduce drop-outs in future training sessions, we recommend making the groups more homogeneous. This will allow everyone to participate at their own level and thus perhaps limit dropouts.

Acknowledgements

First of all, we would of course like to thank the enthusiastic participants for participating in this survey. Showing up to the measurements was not so obvious for everyone. For instance, one participant had a disturbed day and night rhythm, another had a fear of the street and yet another experienced many physical limitations. Nevertheless, these individuals appeared on the pre-measurement. One participant was already very sporty. She went running to the measurements and training sessions. This was very special to see. Sport is her passion and life and exercising helps her cope better with her mental disabilities. We would also like to thank the staff of the various institutions for their sporting commitment during the training sessions. Every training session was accompanied by an instructor who also participated in the training. As a result, there was always a trusted person present for the participants. They also helped us enormously in the logistics phase of the study. We would also like to thank the Mental Health Fund for providing the grant for this project. Not only did they make this project possible, they also paid extra attention to this project by releasing a page on their website on which stories of experience, homework assignments and photos were posted (<http://www.psychischegezondheid.nl/cognitievefitness>). Finally, our thanks go to the two trainers of Cognitive Fitness, Edward and Perry. With no experience in the mental health sector, they delivered the training as if they worked with this target group on a daily basis. With great enthusiasm, empathy and flexibility, they gave the participants a fantastic training. The participants themselves had high praise for the way the training was delivered. An average rating of 8.3 says it all! The trainers themselves look forward to training other mental health counsellors as Cognitive Fitness trainers. This course will start in spring 2012. As researchers, we applaud this initiative, on to exercise for a better brain in the mental health sector!

6 Literature

Appelo M, Louwerens JW, de Vries I. (2005). Less heavy with psychopharmaceuticals. Pilot study to the effects of a new health programme. *MGv* 60: 411-427.

Altman, DG & Bland, JM. (1995). Absence of Evidence is not Evidence of Absence. *British Medical Journal*, 311, 485.

Berg EA. (1948). A simple objective technique for measuring flexibility in thinking *J. Gen. Psychol.* 39: 15-22.

Campfort van D, et al. (2010). The therapeutic value of exercise for people with schizophrenia. *Journal of psychiatry* 52(2010)8, 565-574.

Cornelissen, VA and Fagard RH. (2005). Effects of endurance training on blood pressure, blood pressure-regulating mechanisms, and cardiovascular risk factors. *Hypertension* 46, 667-75.

Daumit GL, Goldberg RW, Anthony C, et al (2005). Physical Activity Patterns in Adults With Severe Mental Illness. *Journal of Nervous and Mental Disease* 193: 641-646.

Delespaul P, Gunther N, Drukker M, van Os J, et al. (2008). South Limburg Care Monitor. Demand-oriented Mental Health Care tool for care and management. University of Maastricht.

Eling P, De Haan EHF, Hijman R, & Schmand B. (2003). *Cognitive neuropsychiatry*. Amsterdam: Boom.

Ganley RM (1988). Emotion and eating in obesity. A review of the literature. *Int J Eat Disord* 8:343-61.

Ten Have M, Graaf R de, Monshouwer K (2010). Sports and mental health. Results of the 'Netherlands Mental Health Survey and Incidence Study (NEMESIS). Utrecht: Trimbos Institute.

Jelicic, M. Henquent C. Derix M. (1999). Is repeated neuropsychological testing problematic? *Psychopraxis* 01:72-75.

Keefe RSE, Fenton WS (2007). How should DSM-V criteria for schizophrenia include cognitive impairment? *Schizophrenia Bulletin* 33: 912-920.

Lange A, Appelo MT. (2007). *The Short Complaints List (KKL). Manual*. Houten: Bohn Stafleu van Loghum.

Laske C, Banschbach S, Stransky E, Bosch S, Straten G, Machann J, Fritsche A, Hipp A, Niess A, Eschweiler GW. Exercise-induced normalisation of decreased BDNF serum concentration in elderly women with remitted major depression. *Int J Neuropsychopharmacol.* 2010 Jan 13:1-8. [Epub ahead of print].

McGurk SR, Mueser KT, Pascaris A. (2005). Cognitive Training and Supported Employment for Persons With Severe Mental Illness: One-Year Results From a Randomized Controlled Trial. *Schizophrenia Bulletin* 31: 898-909.

Midin M, Razali R, Zamzam R, Fernandez A, Hum LC, Shah SA, Radzi RS, Zakaria H, Siniyah A. Clinical and cognitive correlates of employment among patients with schizophrenia: a cross-sectional study in Malaysia. *Int J Ment Health Syst.* 2011 May 30;5:14.

Pajonk FG, Wobrock T, Gruber O, et al. (2010). Hippocampal Plasticity in Response to Exercise in Schizophrenia. *Arch Gen Psychiatry* 67: 133-143.

Saan RJ, Deelman BG. (1986). *The 15-word tests A and B. A preliminary manual (Internal report)*. Groningen: MSF, Department of Neuropsychology.

Schmand B, de Koning I. (2003). Trailmaking Test A and B. Explanation of administration and norms. Amsterdam: Netherlands Institute of Psychologists, Neuropsychology section.

Sitskoorn M (2004). Cognition, movement and brain plasticity. *Neuropraxis* 8:71- 76.

Skrinar GS, Huxley NA, Hutchinson DS, Menninger E, Glew P. The role of a fitness intervention on people with serious psychiatric disabilities. *Psychiatric Rehabilitation Journal.* 2005;29(2):122-127.

Slooff CJ, Sijtzema H, Touw KP, et. al (2008). Disease management in patients with psychotic disorders. *Mental Health Monthly*, 63, 7-19.

Wendel-Vos G, Schuit A. *SQUASH short questionnaire to assess health enhancing physical activity*. Bilthoven: RIVM, 2004.

Tiihonen J, Lönnqvist J, Wahlbeck K, et al (2009). 11-year follow-up of mortality in patients with schizophrenia: a population-based cohort study (FIN11 study). *Lancet* 374(9690):620-7.

Vreeland B, Minsky S, Menza M, Rigassio Radler D, Roemheld-Hamm B, Stern R. (2003). A programme for managing weight gain associated with atypical antipsychotics. *Psychiatric Services* Aug;54(8):1155-7.

Wendel-Vos W, Schuit J, SQUASH, Short QUESTIONNAIRE to ASSES Health enhancing physical activity, Centre for Chronic Disease Epidemiology, National Institute for Public Health and the Environment, Bilthoven, 2002.

World Health Organization. Obesity: preventing and managing the global epidemic Report of a WHO Consultation. Geneva: WHO, 2004.

Zee Kl van der, Sanderman R. (1993). Measuring general health status with the RAND-36, a manual. Groningen: University of Groningen, Northern Centre for Health Issues.



This report describes the results of a pilot study on the effects of Cognitive Fitness in people with persistent mental illness.

People in long-term care often face

problems at the area of cognitive functioning (planning, attention, memory) and lifestyle (low exercise and obesity). The Cognitive Fitness training seeks to address these issues. The training combines exercise with exercises to improve memory, concentration and coordination. The Trimbos Institute studied the effects of and experiences with the training.

From three mental health institutions, Altrecht, Kwintes and SBWU, 40 people participated in the pilot. They were extremely positive about the training and rated it with the average of over an eight. There are also results indicating possible effects of the training. The results show an improvement in cognitive skills, both memory and cognitive flexibility improved. In addition, blood pressure dropped significantly and participants became more physically active. With regard to mental health and speed of information processing, an improvement was also seen, but not significantly. The experiences are so positive that further development of the offer and follow-up research (controlled study) is desirable.