



Satu Viertiö

# Functional Limitations and Quality of Life in Schizophrenia and Other Psychotic Disorders

**RESEARCH 60**

Satu Vieriö

# **Functional limitations and quality of life in schizophrenia and other psychotic disorders**

**ACADEMIC DISSERTATION**

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*To all my close ones*

## Abstract

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The evidence of the decreased functional capacity, especially everyday functioning of people with psychotic disorder in clinical settings is substantial. However, there is not much research about it in the general population. The aim of the present study was to provide information on the magnitude of functional capacity problems in persons with psychotic disorder compared with the general population. The study estimated the prevalence and severity of limitations in the vision, mobility, everyday functioning and quality of life of persons with psychotic disorder in the Finnish population and determined the factors affecting them.

This study is based on the Health 2000 Survey, which is a nationally representative survey of 8028 Finns aged 30 and older. It consisted of a home interview where the participants were asked about their vision, mobility, everyday functioning, social functioning and need and receipt of assistance. The interviewer also assessed the functional capacity of the interviewees. The participants were given a health examination at their own health centre including a detailed medical examination with functional capacity tests. Habitual visual acuity for near and distance was measured and mobility and cognitive tests were done. Health-related quality of life was measured with two preference-based questionnaires, the 15D and EQ-5D. The psychotic diagnoses of the participants were assessed in the Psychoses in Finland survey, a substudy of Health 2000.

The everyday functioning of people with schizophrenia is studied widely, but one important factor, mobility has been neglected. The ability to walk and climb stairs is important in performing everyday tasks and helpful in maintaining social relationships. Persons with schizophrenia and other non-affective psychotic disorders, but not affective psychoses had a significantly increased risk of having both self-reported and test-based mobility limitations as well as weak handgrip strength. Schizophrenia was associated independently with mobility limitations even after controlling for lifestyle-related factors and chronic medical conditions.

Another significant factor associated with problems in everyday functioning was reduced visual acuity. This was confined only to participants with schizophrenia. They had their vision examined significantly less often during the five years before the visual acuity measurement than the general population. In general, persons with schizophrenia and other non-affective psychotic disorder had significantly more

limitations in everyday functioning and deficits in verbal fluency and in memory than the general population. More severe negative symptoms, depressive symptoms, older age, verbal memory deficits, worse expressive speech and reduced distance vision were associated with limitations in everyday functioning.

Of all the psychotic disorders, schizoaffective disorder was associated with the largest losses of quality of life and health-related quality of life, and bipolar I disorder with equal or smaller losses than schizophrenia. However, the subjective loss of quality of life and health-related quality of life associated with psychotic disorders may be smaller than the objective disability, which warrants attention. Depressive symptoms were the most important determinant of poor quality of life in all psychotic disorders.

In conclusion, subjects with psychotic disorders need regular somatic health monitoring. Since self-reported mobility limitations were already prevalent at a young age in persons with schizophrenia, mental health care professionals should also pay attention to mobility limitations in persons with psychotic disorder. Even though the present study setting did not allow for the investigation of how much of the visual impairment was due to refractive errors, visual problems might be easily corrected. Also, health care workers should evaluate the overall quality of life and depression of subjects with psychotic disorders in order to provide them with the basic necessities of life.

Keywords: schizophrenia, psychotic disorders, functional capacity, vision, mobility, everyday functioning, health-related quality of life, population-based sample

## Tiivistelmä

Satu Viertiö. Functional Limitations and Quality of Life in Schizophrenia and Other Psychotic Disorders [Skitsofreniaan ja muihin psykooseihin sairastuneiden toimintakyvyn rajoitukset ja elämänlaatu]. Terveyden ja hyvinvoinnin laitos (THL), Tutkimus 60. 147 sivua. Helsinki 2011.

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Psykoosisairauksia sairastavien toimintakykyä on tutkittu kliinisissä aineistoissa, mutta väestötutkimukset tästä aiheesta ovat harvinaisia. Tämän tutkimuksen tarkoituksena oli tuottaa tietoa psykoosiin sairastuneiden toimintakyvyn rajoitusten laajuudesta verrattuna samanikäiseen yleisväestöön. Tutkimus arvioi psykoosisairauksista kärsivien näkökykyä, liikkumiskykyä, arkielämän toimintoja ja elämänlaatua, niissä ilmenevien ongelmien esiintyvyyttä ja vakavuutta sekä ongelmiin vaikuttavia tekijöitä.

Tämä tutkimus perustui Terveys 2000 -tutkimukseen, joka on Suomen 30 vuotta täyttäneitä väestöä edustava 8028 henkilön väestötutkimus. Tutkimukseen kuului kotikäyntihaastattelu, jossa osallistujilta kysyttiin mm. näkökyvystä, liikkumiskyvystä, arkielämän toiminnoista, sosiaalisista toiminnoista sekä avun tarpeesta ja saannista. Kotikäynnin yhteydessä haastattelija teki myös oman arvionsa osallistujien toimintakyvystä. Toimintakykytestit tehtiin yksityiskohtaisessa terveystarkastuksessa, jossa tutkittiin mm. näkökykyä, liikkumiskykyä ja kognitiivinen suoriutuminen. Terveysteen liittyvä elämänlaatu mitattiin 15D- ja EQ-5D-kyselyillä. Osallistujien psykoosidiagnoosit määritettiin Terveys 2000:n syventävänä jatkotutkimuksena toteutetussa Psykoosit Suomessa -tutkimuksessa käyttäen DSM-IV-tautiluokituksen diagnostisia kriteereitä.

Psykoosiin sairastuneiden liikkumiskykyä on aikaisemmin tutkittu vähän, vaikka rajoitukset esimerkiksi kävelemisessä ja portaiden nousussa voivat vaikeuttaa jokapäiväisten askareitten tekemistä ja sosiaalisten suhteiden ylläpitämistä. Tutkimuksessa havaittiin, että skitsofrenia ja muut ei-mielialaoireiset psykoosit olivat yhteydessä sekä itse ilmoitettuihin vaikeuksiin että mitattuihin liikkumiskyvyn rajoituksiin, ja myös heikkoon lihasvoimaan. Mielialaoireisia psykooseja sairastavilla ei ollut merkittävästi enempää vaikeuksia kuin yleisväestöllä. Skitsofrenian yhteys liikkumiskykyvaikeuksiin oli tilastollisesti merkitsevä elämäntapatekijöiden ja kroonisten sairauksien huomioon ottamisen jälkeenkin.

Skitsofreniaa sairastavien lähi- ja kaukonäkö olivat huomattavasti heikommat kuin yleisväestössä. Tässä huolimatta he olivat käyneet näöntarkastuksissa viimeisten viiden vuoden aikana merkittävästi harvemmin kuin yleisväestö.

Skitsofreniaa ja muita ei-mielialaoreisia psykooseja sairastavilla oli huomattavasti enemmän rajoituksia arkielämän toiminnoissa, sanasujuvuudessa ja kielellisessä muistissa kuin yleisväestöllä. Vakavammat negatiiviset oireet, masennusoireet, korkeampi ikä, kielellisen muistin ongelmat, puheen tuottamisen ongelmat ja heikentynyt kaukonäkö olivat yhteydessä vaikeuksiin jokapäiväisten askareitten tekemisessä ja sosiaalisissa toiminnoissa.

Psykoosisairauksista huonoin elämänlaatu oli skitsoaffektiiivista häiriötä sairastavilla. Seuraavaksi huonoin se oli skitsofreniaa sairastavilla, sitten tyyppin I kaksisuuntaista mielialahäiriötä sairastavilla. Psykoosisairauksista kärsivät kokivat kuitenkin elämänlaatunsa paremmaksi kuin toimintakykyvajausten perusteella olisi voinut olettaa. Ilmiötä saattaa selittää sairauteen sopeutuminen. Masennusoireet olivat suurin elämänlaadun heikentymisen selittäjä.

Johtopäätöksenä voidaan todeta, että psykoosisairauksia sairastavat tarvitsevat säännöllisiä terveystarkastuksia ja toimintakyvyn arviointia. Koska itse ilmoitettuja rajoituksia liikkumiskyvyssä oli jo nuorehkoilla skitsofreniaa sairastavilla, hoitavien henkilöiden tulee kiinnittää huomiota myös liikkumiskykyyn. Vaikka tässä tutkimuksessa ei voitu tutkia sitä, kuinka paljon heikentynyt näkökyky johtui taittovirheistä, näkökyvyn ongelmat voivat joissain tapauksissa olla helposti korjattavissa asianmukaisilla silmälaseilla. Myös elämänlaatu ja masennuksen hoito ovat asioita, joihin terveydenhuollon pitää kiinnittää huomiota psykoosisairauksien hoidossa.

Avainsanat: skitsofrenia, psykoottiset häiriöt, toimintakyky, näkökyky, liikkumiskyky, arkipäivän toimintakyky, terveyteen liittyvä elämänlaatu, väestöpohjainen otos

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Original publications

## List of original publications

- I **Viertiö S.**, Laitinen A., Perälä J., Saarni, S.I., Koskinen S., Lönnqvist J., Suvisaari J.: Visual impairment in persons with psychotic disorder. *Social Psychiatry and Psychiatric Epidemiology* 2007(42):902-8.
- II **Viertiö S.**, Sainio P., Koskinen S., Perälä J, Saarni S.I., Sihvonen M., Lönnqvist J., Suvisaari J.: Mobility limitations in persons with psychotic disorder: findings from a population-based survey. *Social Psychiatry and Psychiatric Epidemiology* 2009 (44):325-332.
- III **Viertiö S.**, Tuulio-Henriksson A., Perälä J., Saarni S.I., Koskinen S., Sihvonen M., Lönnqvist J., Suvisaari J.: Activities of daily living, social functioning and their determinants in persons with psychotic disorder. *European Psychiatry* 2011 Mar 3. (Epub ahead of print).
- IV Saarni S.I., **Viertiö S.**, Perälä J., Koskinen S., Lönnqvist J., Suvisaari J.: Quality of life of people with schizophrenia, bipolar disorder and other psychotic disorders. *The British Journal of Psychiatry* 2010 (197):386-94.

## Abbreviations

15D	The 15D health-related quality of life instrument
ADL	Activities of daily living
BD	Bipolar Disorder
BD I	Bipolar I Disorder
BDI	Beck Depression Inventory
BMI	Body mass index
CHD	Coronary heart disease
DMS-IV-TR	Diagnostic and Statistical Manual of Mental Disorders, 4 <sup>th</sup> edition.
EQ-5D	The EuroQoL health-related quality of life instrument
HRQoL	Health-related quality of life
IADL	Instrumental activities of daily living
ICD-10	International Classification of Diseases, 10 <sup>th</sup> edition
M-CIDI	Munich Composite international diagnostic interview
MDD	Major depressive disorder
MSSS	Major Symptoms of Schizophrenia Scale
OECD	Organisation for Economic Co-operation and Development
ONAP	Other non-affective psychotic disorder
PIF	Psychoses in Finland survey
QALY	Quality-adjusted life years
QoL	Quality of Life
SANS	Scale for the Assessment of Negative Symptoms
SAPS	Scale for the Assessment of Positive Symptoms
SCID	Structured Clinical Interview for DSM-III-R with Psychotic Screen
SF-36	Medical Outcomes Study Short Form HRQoL instrument
TTO	Time Trade-Off
VA	Visual acuity
VAS	Visual analogue scale
WHO	World Health Organisation

# 1 Introduction

The term functional capacity refers to the capability of performing tasks and activities that people find necessary or desirable in their lives. Limitations in functional capacity cause problems in everyday living. Physical disorders may cause problems in functional capacity by affecting mobility or the senses in a way that causes difficulties in performing everyday tasks. Increasing attention has been paid to the measurement of the functional capacity of people with mental illness (Patterson and Mausbach, 2010), but the problems are still not widely enough recognised in the treatment of persons with psychotic disorders.

Functional capacity consists of different elements: activities of daily living (ADL), instrumental activities of daily living (IADL), social functioning, cognitive functioning, mobility and the senses, particularly vision and hearing. ADL means the ability to perform basic self-care functions, such as eating and getting out of bed. IADL functions, such as cooking and shopping, are necessary for independent housekeeping. Symptoms related to psychotic disorders may also complicate social functioning, that is the ability to function in society and with other people (San et al., 2007).

The ability to move around at home or outside of the home has a major impact on one's everyday life. Chronic conditions may cause problems in walking and stair climbing, thereby diminishing the social environment and reducing possibilities to live an independent life (Bhattacharya et al., 2008). Psychotic disorders are associated with low muscle mass (Saarni et al., 2009), which together with diminished postural balance may cause problems in mobility (Rantanen et al., 1999).

Eyesight is an important sense when considering coping in everyday life. Impaired vision is associated with problems in ADL and mobility in the general population (Laitinen et al., 2007, Salive et al., 1994). Vision has a significant effect on maintaining social relationships. (Carabellese et al., 1993)

Quality of life (QoL) consists of many areas and health is only one of its determinants. Health-related quality of life (HRQoL) is a narrower concept than QoL (Saarni, 2008). It is the part of QoL that can be influenced by health and health care. HRQoL is often considered in terms of how it is negatively affected, with illness causing impairment and functional limitation and finally disability (Verbrugge and Jette, 1994).

Psychotic disorders are severe mental disorders that are associated with impairments in cognitive abilities as well as medical comorbidity. So-called positive symptoms, delusions and hallucinations, are almost invariably present in psychotic disorders and cause problems mainly in social functioning. Disorganised speech and behaviour are also common, complicating the communication with other people. Negative and depressive symptoms are the biggest threats to functional capacity. Together with cognitive deficits they have been found to be the most important predictors of limitations in functional capacity (Bowie et al., 2006, Harvey et al., 2006).

The main purpose of the present study was to investigate the functional capacity of persons with psychotic disorder in a general population and to find factors that are associated with functional limitations. Usually the problems of functional capacity are studied within the patient group, in which case it is not possible to study how large the reductions are compared to the population of the same age. This study was part of an extensive population-based survey that included a comprehensive assessment of the health and functional capacity of the participants. This made it possible to investigate the factors behind the functional limitations.

# 2 Review of the literature

## 2.1 Psychotic disorders

Psychotic disorders are severe mental health disorders that have impaired reality testing as their core feature. Psychotic symptoms include delusions, hallucinations, disorganised speech and bizarre or catatonic behaviour. Hallucinations and delusions are often called positive symptoms. So-called negative symptoms, e.g. loss of pleasure, loss of initiative, poverty of speech and affective blunting, are associated with poor functional capacity and difficulties in social relationships. The third dimension of symptoms is disorganisation, referring to disorganised speech and behaviour and inappropriate affect. (APA, 1994)

In this study, psychotic disorders are examined using three diagnostic categories: schizophrenia, other non-affective psychotic disorders (ONAP) and affective psychotic disorders. The diagnostic criteria and epidemiological features of psychotic disorders are shortly presented below.

### 2.1.1 Schizophrenia

The diagnostic criteria of schizophrenia according to the Diagnostic and Statistical Manual for Mental Disorders, fourth edition (DSM-IV), are presented in Table 1.

**Table 1. DSM-IV criteria for schizophrenia**

- 
- A. Characteristic symptoms: Two (or more) of the following, each present for a significant portion of time during a 1-month period (or less if successfully treated):
1. delusion
  2. hallucinations
  3. disorganised speech (e.g. frequent derailment or incoherence)
  4. grossly disorganised or catatonic behaviour
  5. negative symptoms, i.e. affective flattening, avolition, or anhedonia

Note: Only one Criterion A symptom is required if delusions are bizarre or hallucinations consist of a voice keeping up a running commentary on the person's behaviour or thoughts, or two or more voices conversing with each other.

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- B. Social/occupational dysfunction: For a significant portion of the time since the onset of the disturbance, one or more major areas of functioning such as work, interpersonal relations or self-care are markedly below the level achieved prior to the onset (or when the onset is in childhood or adolescence, failure to achieve expected level of interpersonal, academic, or occupational achievement).
  - C. Duration: Continuous signs of the disturbance persist for at least 6 months. This 6-month period must include at least 1 month of symptoms (or less if successfully treated) that meet Criterion A (i.e. active-phase symptoms) and may include periods of prodromal or residual symptoms. During these prodromal or residual periods, the signs of the disturbance may be manifested by only negative symptoms or two or more symptoms listed in Criterion A present in an attenuated form (e.g. odd beliefs, unusual perceptual experiences).
  - D. Schizoaffective and Mood Disorder exclusion: Schizoaffective Disorder and Mood Disorder With Psychotic Features have been ruled out because either (1) no Major Depressive, Manic or Mixed Episodes have occurred concurrently with the active-phase symptoms; or (2) if mood episodes have occurred during active-phase symptoms, their total duration has been brief relative to the duration of the active and residual periods.
  - E. Substance/general medical condition exclusion: The disturbance is not due to the direct physiological effects of a substance (e.g. a drug of abuse, a medication) or a general medical condition.
  - F. Relationship to a Pervasive Developmental Disorder: If there is a history of Autistic Disorder or another Pervasive Developmental Disorder, the additional diagnosis of Schizophrenia is made only if prominent delusions or hallucinations are also present for at least a month (or less if successfully treated).
- 

DSM-IV is the official diagnostic system used in the United States and DSM-IV criteria are the most commonly used diagnostic criteria in psychiatric research. In Finland and elsewhere in Europe, the official diagnostic system is the International Classification of Diseases, tenth revision (ICD-10) (WHO, 1993). The two systems are not identical in diagnosing schizophrenia. DSM-IV requires that the total duration of symptoms is at least six months, including one month of active symptoms, while ICD-10 requires only a one month period of psychotic symptoms. Social and occupational dysfunction is required in DSM-IV but not in ICD-10. The prodromal phase of schizophrenia is not included in ICD-10, as it is in DSM-IV.

Schizophrenia is the most common psychotic disorder. In the Psychoses in Finland study (PIF) the lifetime prevalence of DSM-IV schizophrenia was 0.87% (Perälä et al., 2007) and in a Swedish population-based study, 0.84% (Bogren et al., 2009). After taking into account register diagnoses of those who did not participate in the PIF study, the prevalence of schizophrenia rose to one per cent (Perälä et al., 2007). An earlier Finnish study, the Mini-Finland health survey, found a lifetime prevalence of 1.3% (Lehtinen et al., 1990) according to the criteria of the Present State Examination, which are slightly broader than the DSM-IV criteria. A systematic review of prevalence studies worldwide found a lower median lifetime prevalence worldwide, only 0.40% (Saha et al., 2005). The incidence of schizophrenia peaks in young adulthood and is higher in males than in females before the age of 30 (Sham et al., 1994). Early age of onset is associated with greater functional impairment (Patterson and Mausbach, 2010). After the age of 30, the incidence is higher in females than in males (Sham et al., 1994). The lifetime risk is higher in men than in women; a meta-analysis reported that the incidence risk ratios for men to develop schizophrenia relative to women was 1.31-1.42, depending on which studies were taken into account (Aleman et al., 2003).

Schizophrenia has been described as the most severe psychotic disorder, with a significant effect on the person's everyday life and functional capacity. Persons with schizophrenia are seldom employed full-time. In the PIF study that was based on a representative general population study of Finns aged 30 and over, 79.8% of those with schizophrenia were pensioned, compared to 32.2% of the general population (Perälä et al., 2007). In the Northern Finland 1966 birth cohort, 54% of persons with schizophrenia were either on disability pension or on sick leave at the age of 35 (Lauronen et al., 2007). Labour market outcomes differ between countries and tends to be worse in developed than in developing countries (Marwaha and Johnson, 2004). However, occupational status varies greatly also in low- and middle-income countries (Cohen et al., 2008).

Schizophrenia also leads to deficits in social functioning, one indication of which is that people with schizophrenia are less often married than the general population. In a Finnish study of 2221 hospital-discharged patients, 11% of the patients were married and 17% were divorced or separated (Salokangas et al., 2006a). In the PIF study 19.6% of people with schizophrenia were married or cohabiting, while 56.5% had never been married (Perälä et al., 2008). In a cross-sectional multicentre study covering all the Nordic countries, where the mean duration of illness was 15 years, 70% were living independently, while 26% were living in supported housing (Hansson et al., 2002). According to the World Health Organisation (WHO) ten-country study, fewer patients live alone in developing countries than in industrialised countries. The same study showed that the marital status of persons

with schizophrenia also varies greatly between countries (from 5% to 48% of men were married and from 22% to 76% of women) (Jablensky et al., 1992).

Schizophrenia tends to be regarded as a lifetime chronic illness. This is reflected in the fact that there are no established criteria for recovery from schizophrenia. The symptom-based criteria for remission were published a few years ago (Andreasen et al., 2005, van Os et al., 2006), but recovery is a broader concept. Recovery means the ability to function in society (ability to work and have social relationships) and being relatively symptom-free, which is still not yet common. Defining good and poor outcomes is not straightforward, but both of the dimensions – that is psychiatric symptoms and functioning – are needed in understanding the outcome (Lipkovich et al., 2009). The prognosis of schizophrenia and related disorders depends on the social and cultural environment. In developing countries (in Africa, Asia and Latin America) persons with psychotic disorder have better functional outcomes than in industrial countries (mainly Europe and the USA) (Hopper and Wanderling, 2000).

### **2.1.2 Other non-affective psychotic disorders**

Other non-affective psychotic disorders comprise schizophreniform disorder, schizoaffective disorder, delusional disorder, brief psychotic disorder and psychotic disorder not otherwise specified.

In the DSM-IV diagnostic criteria for schizoaffective disorder, it is required that a mood episode (major depressive, manic or mixed episode) and the active-phase symptoms of schizophrenia occur together and were preceded or are followed by at least two weeks of delusions or hallucinations without prominent mood symptoms (APA, 1994). The lifetime prevalence of schizoaffective disorder according to the PIF study is 0.32%, the prevalence being higher in women (0.47%) than in men (0.14%) (Perälä et al., 2007). Patients with schizoaffective disorder have better overall functioning than patients with schizophrenia but poorer than patients with bipolar disorder (Grossman et al., 1991). The clinical distinction of schizoaffective disorder from schizophrenia and mood disorders has raised questions in psychiatry. A literature review by Cheniaux et al. (2008) did not succeed in making a clear distinction between schizoaffective disorder patients and patients with schizophrenia or mood disorder. The disorders were compared according to sociodemographic data, family morbidity, symptomatology, other clinical data (such as age of illness onset, suicidal behaviour, comorbidity with substance abuse and response to drug treatment), dexamethasone suppression test and brain imaging. The two most probable interpretations of the relationship of schizoaffective disorder with schizophrenia and mood disorder were that patients with schizoaffective disorder are a heterogeneous group, with some patients resembling patients with schizophrenia and others resembling those with bipolar disorder, or that the disorder is a middle

point of a continuum between schizophrenia and mood disorder. ICD-10 and DSM-IV differ in their definitions of schizoaffective disorder and the reliability of the diagnosis is sometimes arguable (APA, 1994, WHO, 1993).

The symptoms of schizophreniform disorder are identical to those of schizophrenia except that the total duration of the illness is at least one month but less than six months and impaired social or occupational functioning during some part of the illness is not required. Full recovery in six months is required (APA, 1994). The lifetime prevalence of schizophreniform disorder in the PIF study was 0.07% (Perälä et al., 2007); thus, in a long follow-up it is a rare disorder. It is equally prevalent among men and women. Only 10.5% of schizophreniform disorder diagnoses remained stable after 24 months in a study by Salvatore et al. (Salvatore et al., 2009). Approximately two thirds of patients diagnosed with schizophreniform disorder progress to a diagnosis of schizophrenia (APA, 1994).

In delusional disorder, there are one or more nonbizarre delusions that persist for at least one month without other active-phase symptoms of schizophrenia. Auditory or visual hallucinations are not allowed, but tactile or olfactory hallucinations may be present if they are related to the delusional theme. Apart from the direct impact of the delusions, psychosocial functioning is not markedly impaired. The delusions are not due to the direct physiological effects of a substance or a general medical condition (APA, 1994). Patients with delusional disorder are less frequently hospitalised, their outcome is better and overall symptomatology is not as severe as in schizophrenia, although delusional symptoms may be as severe (Suvisaari et al., 2009). In the PIF study, the lifetime prevalence of delusional disorder was 0.18% (Perälä et al., 2007).

A brief psychotic disorder is a disturbance that involves the presence of at least one of the positive psychotic symptoms: delusions, hallucinations, disorganised speech or grossly disorganised or catatonic behaviour. An episode lasts at least one day but less than one month, with a full return to premorbid level of functioning (APA, 1994). The corresponding diagnostic group in ICD-10, acute and transient psychotic disorders, consist of four disorders. They differ based on how much the symptoms resemble schizophrenia (WHO, 1993) and are a diagnostically unstable group of disorders (Singh et al., 2004). Brief psychotic disorder is rare; its lifetime prevalence in the PIF study was 0.05% (Perälä et al., 2007).

A psychotic disorder not otherwise specified (NOS) means psychotic symptomatology about which there is inadequate information to make a specific diagnosis or about which there is contradictory information. One example of this group comprises persistent auditory hallucinations in the absence of any other

symptoms. In the PIF study lifetime prevalence was 0.45% (Perälä et al., 2007). The prevalence estimation depends on how much information can be obtained from the symptoms. Psychotic disorder NOS is commonly used when there is enough information to confirm the presence of psychosis, but not enough information about factors such as the temporal relationship between affective and psychotic symptoms or about the possible effect of substance use on the symptoms.

### **2.1.3 Affective psychotic disorders**

The third diagnostic category used in the present study is affective psychotic disorder, which includes major depressive disorder (MDD) with psychotic features and bipolar I disorder (BD I). In MDD, psychotic symptoms occur within a major depressive episode. Mood-congruent delusions or hallucinations (delusions of guilt, delusions of deserved punishment, nihilistic delusions etc.) are consistent with the depressive themes and mood-incongruent delusions or hallucinations (persecutory delusions, delusions of thought insertion, delusions of control etc.) do not have any apparent relationship to depressive themes (APA, 1994). The lifetime prevalence of MDD with psychotic features was 0.35% in this study (Perälä et al., 2007). While MDD is more common among women than in men (Pirkola et al., 2005, Suvisaari et al., 2009a), there seems to be no gender difference in the prevalence of MDD with psychotic features (Perälä et al., 2007). MDD with psychotic features is associated with worse long-term outcomes than MDD without psychotic features, such as more readmissions to hospital and more unnatural deaths (Lee and Murray, 1988). On the other hand, Coryell et al. (1987) found that outcome differences between psychotic and nonpsychotic depression lessen and disappear over time.

The essential features of BD I are a clinical course that is characterised by the occurrence of one or more manic or mixed episodes. BD I can have psychotic features if there has been at least one manic, mixed or depressive episode with delusions or hallucinations according to the DSM-IV diagnostic criteria (APA, 1994). The lifetime prevalence of BD I has varied from 0.2% to 3.3% in different general population studies (Grant et al., 2005, Kessler et al., 2005, Pini et al., 2005). In the PIF study, the lifetime prevalence was relatively low, 0.24% (Perälä et al., 2007). The age of onset peaks in late adolescence and declines steadily thereafter (Grant et al., 2005). Most studies show that BD I is equally common in men and women (Pini et al., 2005). Outcome in BD I is worse than in other mood disorders (ten Have et al., 2002), but better than in schizophrenia. In a Canadian population survey 42.4% of the bipolar patients were married (Schaffer et al., 2006) and in the Australian National Study of Low Prevalence Psychotic Disorders 27.7% were married and 67% were currently unemployed (Morgan et al., 2005). In a relatively new review the unemployment of bipolar patients varied from 13% to 74% and most of the patients were living independently (Huxley and Baldessarini, 2007).

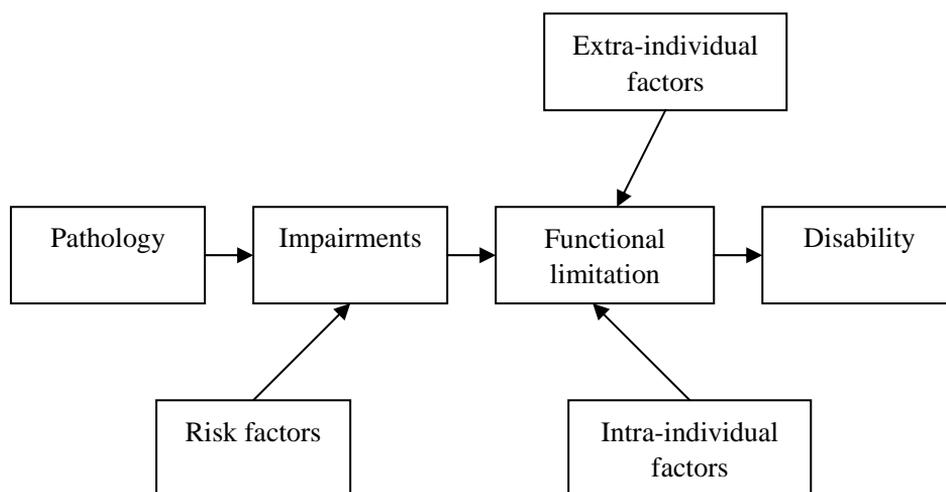
## 2.2 Functional capacity

Functional capacity has been represented through several kinds of models. A sociomedical model of disability is called the disablement process, which is based on the model by Nagi (1965) and further extended by Verbrugge and Jette (1994), among others. The model is constructed of four distinct but interrelated concepts: pathology, impairment, functional limitation and disability (Figure 1). Active *pathology* may generate an *impairment*, which is a structural abnormality in the body system. *Functional limitations* comprise one theme of this study. They are reductions in performing physical and mental actions in daily life. Physical actions include overall mobility and strengths, senses like vision and hearing and communication. Mental actions include cognitive and emotional functions (Verbrugge and Jette, 1994). Both physical and mental actions may be challenging for a person who has suffered from a prolonged psychotic disorder.

Another main theme of this study is *disability* in performing activities, which refers to difficulty in performing social roles and tasks expected of an individual in any domain of life e.g. work, education, social events and self-care. In the model by Verbrugge and Jette (1994) functional limitations stand for the reduced capability to perform actions without reference to situational requirements and disability stands for the reduction in the ability to perform expected social role activities. Commonly research has concentrated on personal care (activities of daily living), keeping up the household (instrumental activities of daily living) and work. It is possible to study disability through dependency, which indicates severe difficulty and the need for someone's help to do an activity. Another approach, used in the present study, is simple self-report or proxy report about the level of difficulty (no difficulty, some difficulty, a lot of difficulty or unable to do) (Verbrugge and Jette, 1994). Risk factors that may cause impairments are longstanding behaviours or characteristics, which may be socioeconomic, social, lifestyle-related, behavioural, psychological, environmental and biological. Intra-individual factors that affect functional limitations are lifestyle and behaviour changes, psychosocial characteristics and activity adaptations. Extra-individual factors include medical care, rehabilitation, medication, external support and environment.

In 2001, WHO published the International Classification of Functioning, Disability, and Health (ICF), a classification of health-related domains, which is meant to be used as the international standard to describe and measure health and disability (WHO, 2001). ICF was preceded by the International Classification of Impairments, Disabilities and Handicaps (ICIDH) (WHO, 1980). These two classifications have different perspectives to functioning. The older version used negative terms (impairment, disability and handicap), whereas the newer version includes body

functions (e.g. sensory functions), body structures (anatomic parts of the body), activities (execution of tasks or actions by individuals) and participation (e.g. communication, mobility, self-care, domestic life, interpersonal relationships, social and civil life), environmental factors and personal factors. However, the classification is exhaustive and comprehensive and should be transformed into practice-friendly tools in order to be useful in clinical practice (Rauch et al., 2008).



**Figure 1. A model of the disablement process (Verbugge and Jette 1994)**

### **2.2.1 Limitations in functional capacity in the general population and their determinants**

Studies of functional limitations mostly concern elderly people. In the United States, disability among the elderly decreased from the 1980s to the 1990s (Bhattacharya et al., 2008, Freedman et al., 2002, Schoeni et al., 2001). Schoeni et al (2008) found that the reasons for the improvement in functional capacity were better medical care (treatment of cardiovascular disease, increases in cataract surgery and in knee and joint replacements as well as more effective medication) and socioeconomic factors (better education and diminishing of poverty). Functional limitations of the working-aged population have been studied much less, but Bhattacharya et al. (2008) found that disability increased in younger age groups in the United States between 1984 and 1996, mainly because of the rising prevalence of obesity and chronic diseases, such as hypertension and diabetes. The declining trend in disability among the elderly from the 1980s has now reversed and older Americans are increasingly

disabled (Seeman et al., 2010). In Finland, functional limitations in activities of daily living and mobility have diminished from the 1970s to year 2000. The proportion of people on disability pension has also declined from 1980 to 2005. Among working-aged Finns older than 55 years, the proportion of people who are on disability pension has dropped from 33.1% to 20.8% (Koskinen et al., 2006).

Problems with vision are strongly associated with other functional limitations (Laitinen et al., 2007). Habitual VA is measured with the subject's own spectacles, not with best refraction correction and high-contrast letter-tests in optimal lighting conditions (i.e. optimal visual acuity) (Laitinen et al., 2005). The prevalence of habitual visual impairment increases significantly particularly after 75 years of age (Laitinen et al., 2005). 81.4% of the participants in the Health 2000 Survey who were older than 74 years had visual acuity (VA) for distance  $\geq 0.5$  (VA required for a driving licence) compared to 99.4% of those under the age of 44. The prevalence of good to moderate VA for near vision (VA  $\geq 0.5$ ) among those older than 74 years is 83.3% compared to 99.5% among those under the age of 44. Self-reported vision and measured visual function correlated moderately but statistically significantly ( $r=0.27-0.40$ ,  $P<0.0001$ ). Also, eye diseases increase with age. In the same Health 2000 Survey, 34% of participants aged 65 and older had a cataract, 13% had glaucoma, 12% had age-related maculopathy and 2% had diabetic retinopathy (Laitinen et al., 2009).

Difficulties in mobility generally increase in stages with ageing. Running may already be difficult in middle age, while even moving around at home may be challenging to persons aged 75 or older (Sainio et al., 2006). Most of the mobility limitations start to become more common after 65 years. Difficulties in stair climbing and walking are the most common form of impaired functional capacity in the Finnish population (Koskinen et al., 2006). In a review study, Stuck et al. (1999) found a large number of mediating factors to functional limitations, including cognitive impairment, depression, comorbidity, few social contacts, low level of physical activity and vision impairment. Prior exercise activity and social networks predicted better physical performance also in MacArthur Studies of Successful Aging (Seeman et al., 1995). Sainio et al. (2007) found that low education leading to chronic diseases, obesity, smoking and physical workload are risk factors for mobility limitations in the general population. In the longitudinal Maastricht Aging Study persons with low occupational level at baseline showed a greater functional decline than persons with a high occupation (Bosma et al., 2007). The effect of mental health problems, especially depression, has been studied in older populations and persons who report depressive symptoms have higher risk of functional decline (Bruce et al., 1994, Penninx et al., 1998).

Activities of daily living (ADL) are basic self-care skills necessary for independence. The term “activities of daily living” was introduced decades ago. The first use of the term is credited to at least two different sources: Deaver and Brown in 1945 (Nagi, 1991) or Buchwald in 1949 (Collin, 1997). Instrumental activities of daily living (IADL) are needed for independent housekeeping and are more demanding than ADL. In 1969 Lawton and Brody (1969) introduced the term “instrumental activities of daily living” to include more complex tasks involved in domestic and community participation. The capability to perform ADL decreases substantially with age. Indexes such as ADL and IADL are generally used to measure the functional limitations of older adults and persons recovering from physical disabilities, such as accidents and big operations (Häkkinen et al., 2007, Katz et al., 1963). Chronic conditions like arthritis, diabetes and cerebrovascular diseases are found to be strong predictors of limitations in ADL, along with old age and decreased visual acuity (Dunlop et al., 2002).

The assessment of social functioning in the general population has been rather scarce in Finland until recently. One reason has been the lack of suitable tools for assessment. In a report entitled “Use of Measures of Functional Capacity in the Assessment of Service Needs among Older People”, Voutilainen and Vaarama (2005) found that 63-80% of municipalities do not use any measure to assess social functioning. Social functioning is not clearly defined in the literature and various methods are used to measure it, such as interviews, rating scales and self-reports (Yager and Ehmann, 2006). Usually social functioning is measured when it is related to specific disorders, such as fibromyalgia, epilepsy or cancer.

Cognitive functioning, its determinants and its association with functional limitations in the general population have been studied in children and adolescents (Bergen et al., 2007, Sameroff et al., 1987, Seidman et al., 2000) and in the elderly (Artero et al., 2001, Bosma et al., 2007), but more rarely among the working aged. In the longitudinal follow-up it has been found that cognitive decline over time without dementia increases with aging and is associated with deterioration in performing activities of daily living (Artero et al., 2001). A longitudinal study from the Netherlands found that persons with a low occupational level at baseline showed a greater functional decline than persons with a high occupational level, but this was largely explained by intellectual abilities and not by socioeconomic and developmental factors from early life (Bosma et al., 2007). A Scottish longitudinal study following participants from the age of 11 to old age found that cognitive functioning is stable across the lifespan and higher intelligence in early life protects intelligence in old age (Gow et al., 2010). Persistent depressive symptoms are an associated risk factor for cognitive deficits in late midlife and old age (Köhler et al., 2010, Singh-Manoux et al., 2010). Because the age profile of populations changes as

life expectancy increases and fertility rates fall, the number of people with dementia could double in the United Kingdom and also in other western countries over the next 30 years (Beddington et al., 2008). This gives rise to pressure to identify resources to prevent the cognitive decline of the populations.

Quality of life (QoL) basically refers to good life but there are no strict definitions of it. The multi-dimensional definition includes three dimensions in QoL: 1) subjective positive experience and happiness, 2) ability to function and 3) availability of certain lifestyles and material resources (Lehman, 1997). WHO defines QoL as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (1998). Health-related quality of life (HRQoL) narrows consideration to those aspects of QoL that are affected positively or negatively by health and medical health care intervention.

There are hundreds of instruments to measure QoL, though many of them are sparsely used (Garratt et al., 2002). Technically the measures can be disease-specific or generic. They can be self-reports filled by patients or structured interviews. The instruments used in the Health 2000 Survey are the 15D and the EQ-5D, which are generic self-report preference-based HRQoL measures. With generic measures it is possible to assess health utilities, which form the quality component of quality-adjusted life years (QALY). Health utility is a term used in health economics. Utilities are values that reflect the strength of the preference that people have for particular health states and they are measured on an interval scale with 0 reflecting death and 1 reflecting perfect health (Torrance, 1987). QALYs enable the comparison of the cost effects of different illnesses (Dolan, 2000). The QALY is combined from the value of the health states and their duration and every QALY is equivalent to one year of life in full health (Dolan et al., 2005).

HRQoL is not the same for everyone. Different people find different areas of life important, depending on their own illnesses and disabilities and also gender (Bowling, 1996). In a survey of households in Great Britain, Bowling found that those who reported a chronic illness considered that the most important effects of their illness on their lives were the ability to get out and go out shopping, being able to work and effects on social life.

Subjective QoL means global life satisfaction as defined by the respondent. It is measured by asking the individual to rate their current QoL as a whole, on a visual-analogue scale (VAS) from 0 to 10, anchored at best and worst possible QoL.

## 2.3 Functional limitations in persons with psychotic disorders

Symptoms associated with psychotic disorders may cause functional limitations. However, many of the factors associated with decreases in functional capacity in the general population, such as chronic conditions, lifestyle-related factors and obesity, are associated with psychotic disorders as well (Bushe and Holt, 2004, Cornblatt et al., 2007, Marder et al., 2004, Perälä et al., 2008). In addition, treatment may also sometimes have a negative effect on functioning. Antipsychotic medication may cause side effects that affect functioning and prolonged hospitalisations may also decrease functional capacity. All these factors may have a notable effect on functional capacity in an individual with a psychotic disorder.

Negative, positive and disorganised symptoms are manifestations of schizophrenia and other psychotic disorders, and all of them may have unfavourable effects on functioning. Cognitive deficits are also common and may complicate everyday functioning. Their effect on functional capacity will be reviewed in more detail in Chapters 2.3.4 – 2.3.6.

Psychotic disorders are commonly associated with general medical comorbidity (Marder et al., 2004). Cardiovascular diseases (Suvisaari et al., 2010, Fusar-Poli et al., 2009), diabetes (Suvisaari et al., 2008, Bushe and Holt, 2004) and metabolic syndrome (De Hert et al., 2009, John et al., 2009, Suvisaari et al., 2007) are more common in people with schizophrenia and other psychotic disorders than in the general population. Although psychosis is associated with numerous physical health problems, many patients do not get adequate treatment for physical health problems (Nasrallah et al., 2006). Druss et al (2001) showed that the quality of medical care is lower in patients with schizophrenia and their excess death rate to myocardial infarction could decline with better medical care.

People with psychotic disorders often have an unhealthy lifestyle. Their diet contains more fat and less fibre than in the general population (Brown et al., 1999). Smoking is more common (Salokangas et al., 2006b) and exercise infrequent (Roick et al., 2007). Smoking is one of the major causes of excess mortality in these disorders (Brown et al., 2010). An unhealthy lifestyle and the side effects of antipsychotic medication contribute to the high prevalence of obesity in persons with psychotic disorder (Saarni et al., 2009), which in turn may affect functional capacity.

The side effects of antipsychotic medication may also contribute to functional limitations. Antipsychotics – both typical and atypical – are associated with body weight gain (Allison et al., 1999), although there are significant differences in long-

term weight gain among atypical antipsychotics (Parsons et al., 2009). Salokangas et al. (2007) found that low body mass index (BMI<25) was associated with poor functioning in men. Nevertheless, obese individuals tend to have worse physical functioning and general health (Strassnig et al., 2003).

Extrapyramidal symptoms are common side effects, particularly of typical antipsychotics and may cause functional limitations. Extrapyramidal side effects are related to the dopamine receptor antagonism of antipsychotic medication (Marder et al., 2004). The most common acute expressions are akathisia, which appears as restlessness, and acute dystonia, which means episodic, prolonged spasms of the muscles of the head and the neck. Symptoms of Parkinson's syndrome, such as rigidity, bradykinesia, shuffling gait and tremor, may occur during the first 5 to 30 days of treatment when the dosage is high. Chronic extrapyramidal syndrome, tardive dyskinesia, may occur following prolonged antipsychotic treatment. In tardive dyskinesia, patients may have repetitive, involuntary and purposeless mouth and tongue movements, facial grimacing and rapid eye blinking or irregular movements of the limbs (Saddock et al., 2009). Extrapyramidal side effects can increase the stigma associated with schizophrenia, as they can cause patients to appear peculiar and make social interaction difficult (Marder et al., 2004). Some atypical antipsychotics (clozapine, risperidone and ziprasidone) have been found to have a positive therapeutic impact on psychosocial outcome in a review of 31 studies (Corrigan et al., 2003). However, a randomised controlled trial of the effect on QoL, comparing atypical (other than clozapine) and typical antipsychotics found no disadvantage in using typical rather than atypical antipsychotics, despite the hypothesis (Jones et al., 2006).

Most of the patients with schizophrenia usually spend at least some time in hospital, some even for years. A longitudinal study followed discharged patients with schizophrenia for up to 45 months and found that patients with longer stays performed worse in everyday tasks and socially (Harvey et al., 2010a). Deinstitutionalisation is the process of discharging persons with severe mental health problems from long-stay psychiatric hospitals to community mental health services. In Finland this process has been one of the fastest in the world and has posed challenges to the mental health care system (Salokangas and Saarinen, 1998). Patients discharged at the beginning of the 1990s were older, more disturbed and had been ill for a longer time than patients discharged in the early 1980s. At three years follow-up they also were more impaired in ADL and more often on disability pension and their social withdrawal had increased, but they were living more often independently (Honkonen et al., 1999). A later study by Honkonen et al. (2007) showed that the competitive employment rate of discharged patients with schizophrenia declined in the 1990s. The results from a Finnish series of studies

concerning psychiatric services in the early 1990s stress the importance of more targeted, active and home-based services for the most severely ill psychiatric patients (Korkeila, 1998). Deinstitutionalisation also requires good co-operation between the psychiatric services and primary health care (Korkeila, 1998).

### 2.3.1 Measurement of functional capacity in persons with psychotic disorder

Measuring the functional capacity of individuals may be challenging and it is difficult or even impossible to perfectly measure actual performance in the real world. Several measures of functional capacity have been developed for use with individuals with psychotic disorder, but a “gold standard” instrument for measuring functioning has not been generated (Mausbach et al., 2009). Most of the indexes that measure skills needed to function independently measure ADL, IADL and social functioning. Sensory functions and mobility are usually not part of everyday functioning in these indexes. Table 2 reviews several instruments of functional capacity.

**Table 2. Review of functional assessment instruments**

<b>Instrument</b>	<b>Abbreviation</b>	<b>Author</b>	<b>Description</b>
The Index of Activities of Daily Living	ADL	(Katz et al., 1963)	Originally direct observation of independence in feeding, dressing, bathing, going to toilet, transfer and continence made by professional observers. Also self-report.
Instrumental Activities of Daily Living	IADL	(Lawton and Brody, 1969)	Rating of independence in ability to use telephone, shopping, cooking, housekeeping, laundering, transportation, medication and finance by professional observers, with assistance from the family, friends or institutional employees.
Levels of Functioning	LOF	(Strauss and Carpenter, 1972)	Clinician-administered rating to assess the duration of non-hospitalisation for psychiatric disorders, frequency and quality of social contacts, quantity and quality of useful work, absence of symptoms, ability to meet one’s own needs, and fullness of life.
Behavioral Assertiveness Test-Revised	BAT-R	(Eisler et al., 1975)	Measures assertive behaviour across multiple role-play scenes. Administered in a studio arranged as a living room.
Social Adjustment Scale	SAS	(Weissman, 1978)	45-min interview to assess community functioning, family functioning, interpersonal relations and work.

Psychogeriatric Dependency Rating Scales	PGDRS	(Wilkinson and Graham-White, 1980)	42-item scale to assess three dimensions of mental health: orientation, behaviour and physical capacity. Assessment by clinician.
Specific Level of Function Scale	SLOF	(Schneider and Struening, 1983)	Caretaker report of a patient's behaviour and functioning in physical functioning, personal care skills, interpersonal skills, social acceptability, community activities and work skills.
Independent Living Skills Survey	ILSS-I	(Wallace, 1986)	Assesses 12 areas of skills personal hygiene, appearance and care of clothing, care of personal possessions and living space, food preparation, care of one's own health and safety, money management, transportation, leisure and recreational activities, job seeking, job maintenance, eating behaviours, and social interactions. Report by a knowledgeable informant.
Independent Living Skills Survey Self Report	ILSS-SR		Simplified version of the ILSS-I suitable for busy clinical settings. 20-30-minute questionnaire. An interview version for individuals who have reading difficulties.
Direct Assessment of Functional Status	DAFS	(Loewenstein et al., 1989)	Performance-based measure for evaluating everyday functioning with seven simulated daily activities: time orientation, communication, transportation, finance, shopping, grooming and eating
The Life Skills Profile	LSP	(Rosen et al., 1989)	39-items, 5 scales: self-care, nonturbulence, social contact, communication and responsibility. Can be completed by family members, community house managers and professional staff
Social Functioning Scale	SFS	(Birchwood et al., 1990)	Seven-scale self-report questionnaire covering social interaction, participation in community activities, independent living and work functioning.
Functional Needs Assessment	FNA	(Bombrowski et al., 1990)	Assesses basic ADL, including self-care and care of living quarters based upon performance in front of an examiner.
Maryland Assessment of Social Competence	MASC	(Bellack et al., 1994)	Performance-based measure with four skill domains: performing problem-solving behaviours in an interpersonal context, generating responses to social problem situations, evaluating the effectiveness of responses and evaluating the effectiveness of one's own problem-solving behaviour.

Mulnomah Community Abilities Scale	MCAS	(Barker et al., 1994)	17-item instrument rated by the clinician on the basis of an interview with the patient: assesses social competence, behavioural problems, independent living skills and overall adjustment to community living.
Social-Adaptive Functioning Evaluation	SAFE	(Harvey et al., 1997)	17 items measuring social-interpersonal, instrumental, and life skills functioning. Rated by observation, caregiver contact and interaction with the subject.
Test of Grocery Store Shopping	TOGSS	(Hamera and Brown, 2000)	Evaluates the outcome of grocery shopping intervention in an actual grocery store and includes 10 grocery items.
Social Skills Performance Assessment	SSPA	(Patterson et al., 2001b)	A role-play instrument that evaluates social functioning across meeting a new neighbour and asking a landlord for assistance with a leaky ceiling.
UCSD Performance-Based Assessment	UPSA	(Patterson et al., 2001a)	Role plays that assess skills in five areas: household chores, communication, finance, transportation and planning recreational activities.
Multidimensional Scale of Independent Functioning	MSIF	(Jaeger et al., 2003)	Semistructured interview with the patient and family members, employers, rehabilitation and housing counsellors and clinical staff. Rates independent functioning in work, education and residential domains and provided in dimensions of role position, support and performance.
Brief Scale of Everyday Functioning	UPSA-Brief	(Mausbach et al., 2007)	Two subscales (communication and finance) from UPSA

**Direct observation** of a patient's activities in natural settings appears to be the best way to assess functioning. However, it has disadvantages too. As the observer has to follow the patient's activities throughout his or her daily routine, it is time consuming and demanding (McKibbin et al., 2004b).

In **self-report**, the interviewer asks the patient to assess his or her own functioning. It is a simple, inexpensive and time-saving method. However, it has also been criticised because it may be influenced by the possible poor insight and decreased cognitive functioning of patients with psychotic disorder (Atkinson et al., 1997). The reliability of the results may be problematic. Some patients may underestimate and others overestimate their real-world performance. In a study by Bowie et al. (2007), accurate self-raters had better social skills than both underestimators and overestimators, and overestimators were the ones who had the greatest cognitive and functional impairments. Self-report is sometimes the only way to assess functioning

in areas where usually only the patient has access. Katz's index is an instrument that can be used both for self-report and in direct observation (Rush et al., 2000).

**Proxy report by a caregiver** may differ significantly from the self-report of the patient. Sainfort et al. (1996) found that patients and health providers had moderate agreement on symptoms and function, but little to no agreement on social relations and occupation. Sometimes the reason for these differences is the patient's poor insight; also when the caregiver does not know the patient well enough, he or she might not observe the behaviour of the patients correctly. Family members' ratings are usually closer to the patient's ratings than a non-relative proxy's (Becchi et al., 2004).

In their review, McKibbin et al. (2004b) found eight **performance-based assessment** instruments, that have been used in assessing the functional capacity of patients with schizophrenia. Seven of them measure activities that are addressed in the present study too, like household management, transportation, communication, eating, grooming and social skills. One of them, the UCSD Performance-Based Assessment (UPSA) (Patterson et al., 2001a) is the most widely used instrument in the research literature and is sometimes considered to be the best measure (Mausbach et al., 2009). Performance-based instruments measure functional capacity in a controlled situation. They are often performed as role-plays where the observer plays the role of a neighbour or someone else with whom the patient should deal with, or they may include tasks like going to the grocery store or preparing a meal. Performance-based instruments are less dependent on the patient's insight. Nevertheless, because of the controlled situation, these measures may not correlate perfectly with actual functioning in daily life.

A **semistructured interview** with a patient belongs to a new generation of instruments for the assessment of real-world functioning in schizophrenia (Miles et al., 2010). Interviews with family members, employers, rehabilitation and housing counsellors and clinical staff are also used to obtain a more accurate picture of the functional capacity of the patient. Ratings are calculated for three environments (work, education and residential) and for each of the three domains (role position, support and performance). Interaction between interviewer and participant may have a certain effect, especially when the interview is long. The characteristics of the interviewer, e.g. age and gender, the personal interaction between the interviewer and respondent and the behaviour of the interviewer may have an impact (Maynard et al., 2002).

### 2.3.2 Visual acuity

Problems in visual acuity (VA) among people with severe mental illness have been studied since the 1950s. Unfortunately, many of the early studies had methodological weaknesses, such a control group that was not defined properly or the lack of a control group, psychiatric diagnoses were assessed inaccurately or visual acuity was measured inexactly (Prager and Jeste, 1993). One of the first studies found that the VA of persons with psychotic disorder was not worse than that of the non-psychotic controls (Wolin et al., 1964), but later studies have shown that reduced VA is more common among persons with psychotic disorder than among the non-psychotic (Punukollu and Phelan, 2006, Smith et al., 1997, Ungvari et al., 2002). Nevertheless, difficulties in VA still seem to be under-recognised and often untreated in persons with a psychotic disorder (Punukollu and Phelan, 2006). Some antipsychotics are associated with increased risk of eye diseases such as cataracts (Isaac et al., 1991) and retinopathy (Toler, 2004). Blurred vision is one of the anticholinergic side effects that can be caused by both typical and some atypical antipsychotics, such as clozapine, olanzapine and quetiapine (Lieberman, 2004). A review of studies concerning vision in psychotic disorders is presented in Table 3.

**Table 3. Studies and results concerning vision in psychotic disorders and other mental health problems**

Authors	Study design and sample	Diagnostic system	VA measurement	Measures of outcomes and analysed associations	Results
(Wolin et al., 1964)	USA 90 psychotic patients 60 controls	Not reported	Snellen chart Objective optokinetic technique		No statistical difference between study and control groups
(Callison et al., 1971)	USA 11 male inpatients with schizophrenia 11 mental defective patients No controls	Not reported	Snellen chart	Visual acuity	Near vision: 18% good, 18% fair, 64% poor Far vision: 27% good, 64% fair, 9% poor
(Cooper and Porter, 1976)	USA 54 paranoid patients 57 affective patients No controls	Not reported	Snellen chart	Uncorrected VA for distance, corrected VA when glasses worn, VA for near vision, with and without glasses	VA for distance is considerably worse in the paranoid group. No difference in near vision.

(Smith et al., 1997)	Australia 23 inpatients with chronic schizophrenia No controls	DSM-III-R	Qualified ophthalmologist examined VA, pupil dilation and slit lamp examination	Visual acuity Occurrence of toxic side effects of antipsychotics	69.5% had problems with VA requiring correction. 82.6% had one or more ocular disorders
(Ungvari et al., 2002)	Hong Kong 428 inpatients with mainly schizophrenia (91.1%) No controls	DSM-IV	Snellen chart Pinhole method	Distant visual acuity (DVA)	75% had impaired ( $\leq$ 0.5) DVA 39% had refractive error (myopia)
(Punukollu and Phelan, 2006)	UK 31 inpatients on acute general adult wards, 42% psychotic illness No controls	ICD-10	Snellen chart Pinhole method	Visual acuity Reported eye problem	65% VA 6/9 or less 55% reported eye problem 61% had not been to an optician in 5 or more years

### 2.3.3 Mobility

The overall mobility of persons with psychosis has not been widely studied. Most studies concentrate on exercise programmes developed for persons with severe mental illness (Gorczyński and Faulkner, 2010). The gait disturbances of people with chronic psychotic disorders, such as shorter strides and smaller gait speed than healthy controls, may affect mobility. The biggest deficits are shown to be in patients treated with conventional neuroleptics (Putzhammer et al., 2004). In a population-based study, several chronic conditions and sociodemographic factors have been shown to be associated with mobility limitations (Sainio et al., 2006). Some of them, like obesity, cardiovascular diseases, diabetes and smoking are commonly associated with psychosis. People with a psychotic disorder exercise relatively little and this lack of strain may cause difficulties in mobility.

### 2.3.4 Everyday functioning

Everyday functioning relates to the skills needed to function independently. The functional skills that are most often assessed are ADL and IADL. Although ADL and IADL were originally created to measure the independence of the elderly after physical trauma or operation (Katz et al., 1963, Lawton and Brody, 1969) these instruments are also used to measure physical functioning in psychiatric disorders (APA, 2000b, IsHak et al., 2002). Everyday functioning is usually studied using outpatients with schizophrenia and healthy control groups. The functioning of persons with schizophrenia has been found to be worse than that of controls

(Klapow et al., 1997, McKibbin et al., 2004a, Sciolla et al., 2003). A review of cross-sectional studies concerning everyday functioning is presented in Table 4.

Of symptoms in schizophrenia, negative symptoms have been most often associated with decreased functioning in everyday life (Evans et al., 2003, Palmer et al., 2002, Patterson et al., 2001b) but there is also a study of older patients with schizophrenia, in which the severity of symptoms, both negative and positive, was not related to decreased functioning, whereas extrapyramidal symptoms were (Patterson et al., 1998). There have also been results where positive symptoms explained functioning as much as negative ones (Godbout et al., 2007). Also depressive symptoms have found to be associated with worse everyday functioning (Jin et al., 2001, Sciolla et al., 2003).

Cognitive deficits are an important predictor of declining everyday functioning (Evans et al., 2003, Kurtz et al., 2001, Leung et al., 2008, McClure et al., 2007, Palmer et al., 2002, Patterson et al., 2001a, Patterson et al., 1998, Rempfer et al., 2003, Sciolla et al., 2003). Cognitive deficits in psychotic disorders are reviewed in detail in 2.3.6. The sociodemographic variables that have been found to be predictors of better functioning are female gender, younger age, higher educational level, short duration of illness and older age at onset of illness (Hintikka et al., 1999, Evans et al., 2003, Patterson et al., 1998, Siegel et al., 2006).

The relationship between the two most reported predictors of functional limitations – negative symptoms and cognitive deficits – has raised questions. It has been asked, whether they are caused by the same factor. Harvey et al. (2006) concluded that they may be separable, even if they are not totally independent. Leung et al. (2008) suggest that the neuropsychological status of elderly outpatients with schizophrenia is a bigger predictor of functional outcome than symptoms or the interaction of those two. Findings from a recent meta-analysis support a model in which negative symptoms at least partially mediate the relationship between cognition and functional outcome (Ventura et al., 2009).

One new research frame, used mainly by Bowie et al., is confirmatory path analysis to examine the direct and indirect prediction of the domains of real-world functioning (Bowie et al., 2006, Bowie et al., 2008, Bowie et al., 2010). This research group uses the term “real-world functioning” instead of “everyday functioning” to stress the difference between functioning in optimal circumstances and actual functioning in everyday life. In these models they try to predict three domains of real-world functioning: interpersonal skills, community activities and work skills with functional competence (performance in a structured test), neuropsychological functioning and symptoms. They found that the effect of

neuropsychological performance was mediated through the effect of cognitive functioning on functional competence, which in turn predicted the real-world functioning. Negative symptoms predicted interpersonal skills directly, without mediation through functional competence. Also depressive symptoms directly predicted interpersonal and work skills (Bowie et al., 2006). In a later study they added social competence along with functional competence and specific neuropsychological tests. All neuropsychological domains predicted functional competence but only processing speed and attention/working memory predicted social competence (Bowie et al., 2008). When they compared schizophrenia and bipolar disorder, there was greater disability in schizophrenia, but cognitive deficits predicted worse functioning in both disorders (Bowie et al., 2010).

**Table 4. Review of cross-sectional studies and results concerning everyday functioning and cognitive performance in psychotic disorders**

Authors	Study sample	Diagnostic system	Assessment of functioning	Assessment of cognition	Results
(Bellack et al., 1989)	USA 58 inpatients with negative or non-negative SCH 29 inpatients with BD 16 inpatients with SCHAFF No controls	DSM-III-R	RTP	None	Negative schizophrenia was associated with poor social functioning. The three other groups did not differ from each other.
(Dickerson et al., 1996)	USA 88 outpatients with SCH or SCHAFF No controls	DSM-III-R	SFS	Abstraction/flexibility, verbal IQ, spatial organisation, memory, verbal fluency, attention/concentration, visual motor, aphasia	Patients' overall social functioning was best predicted by a combination of negative symptoms and aphasia.
(Velligan et al., 1997)	USA Study I: 112 chronic inpatients with SCH or SCHAFF Study II: 41 inpatients with SCH No controls	SCID-P DSM-III-R	FNA	Orientation, abstracting ability, short-term memory	Symptomatology predicts small amount of ADL. Cognition predicted over 40% of the variance in scores on the FC.

(Harvey et al., 1997)	USA 208 geriatric patients with chronic SCH No controls	DSM-III-R	SAFE	MMSE CERAD	Each cognitive measure was correlated with global social-adaptive deficits, with minimal variation in the magnitude of correlations.
(Harvey et al., 1998)	USA 97 chronic inpatients with SCH 37 patients with SCH 31 geriatric patients with SCH No controls	DSM-III-R	SAFE	MMSE CERAD	Cognitive impairment is a predictor of both overall outcome and specific adaptive deficits. Differences in negative symptoms were smaller than in cognitive impairment among the groups.
(Patterson et al., 1998)	USA 102 outpatients with SCH or SCHAFF 66 controls	DSM-III-R DSM-IV	DAFS	MMSE DRS	Patients had significantly greater disability than NC except for grooming and eating. Greater cognitive deficits were related to lower FC.
(Harvey et al., 2000)	USA 165 geriatric patients with SCH 165 controls		None	MMSE Verbal fluency, serial learning, delayed recall, confrontation naming, constructional praxis	Patients underperformed NC by 1 to 3 standard deviations on measures of memory, praxis and verbal skills.
(Jin et al., 2001)	USA 202 outpatients with SCH from low severity to high severity No controls	DSM-III-R DSM-IV	QWB IADL SF-36	MMSE DRS Verbal, psychomotor/processing speed, abstraction/cognitive flexibility, attention/working memory, retention, motor skills, verbal learning	Patients with more severe depression had worse everyday FC, except for physical functioning and health-related quality of well-being.
(Patterson et al., 2001b)	USA 83 patients with SCH or SCHAFF 52 controls	DSM-IV	SSPA SAS-M QWB DAFS	DRS	Social performance was related to severity of negative symptoms and cognitive deficits, not of positive or depressive symptoms. SSPA was correlated with QWB and ADL, not to a self-reported measure of social functioning

(Kurtz et al., 2001)	USA 93 inpatients with SCH No controls	DSM-III-R	PGDRS	MMSE CERAD	Patients with greater cognitive impairment had higher levels of rated impairment on the orientation and physical, but not behaviour subscale
(Dickerson et al., 2001)	USA 74 outpatients with SCH 26 outpatients with bipolar I disorder No controls	DSM-IV	SFS Quality of Life Interview	Verbal and delayed memory, visuo-spatial constructional, language, attention, aphasia, information subtest, sequencing subtest	The groups did not differ significantly on 36 of 41 measures. Individuals with BD have many social and cognitive deficits as severe as those with schizophrenia.
(Palmer et al., 2002)	USA 83 outpatients with SCH and 46 controls	DSM-IV	DAFS QWB	Verbal, psychomotor/ processing speed, abstraction/cognitive flexibility, attention/working memory, verbal learning, delayed recall, motor skill	SCH patients had worse FC than NC. Severity of negative symptoms was inversely correlated with FC. Worse cognition was generally associated with worse FC.
(Twamley et al., 2002)	USA 111 outpatients (67 SCH, 29 SCHAFF, 14 MDD with psychotic features, 1 psychosis NOS) No controls	DSM-III-R DSM-IV	UPSA	DRS Verbal ability, attention/working memory, psycho-motor ability, motor learning, abstraction/cognitive flexibility, executive functioning	Dementia and more severe negative symptoms were significantly associated with worse performance. Generalised cognitive abilities were associated with everyday FC.
(Sciolla et al., 2003)	USA 137 outpatients with SCH or SCHAFF 77 controls	DSM-IV	DAFS QWB SF-36	MMSE DRS	Patients had greater disability than NC in all areas expect for bodily pain. Best predictors for being in the SCH group were physical and emotional functioning and pain.

(Evans et al., 2003)	USA 93 outpatients with SCH or SCHAFF 73 controls	DSM-III-R DSM-IV	DAFS	Speed of information processing /psycho-motor speed attention/ working memory, abstraction/ flexibility, learning, delayed recall, verbal, motor	NP significantly predicted most ADL/IADL, except eating, time orientation and grooming.
(Rempfer et al., 2003)	USA 73 in- and outpatients with SCH and SCHAFF No controls	DSM-IV	TOGSS	Verbal memory, executive functioning, verbal fluency, sustained attention and visual motor skills	Accuracy was associated with fewer perseverative responses, better verbal memory and faster processing speed. Efficiency with better verbal memory, verbal fluency, sustained attention and executive functioning.
(McKibbin et al., 2004a)	USA 54 outpatients with SCH 22 controls	DSM-IV	WHODAS UPSA	DRS	Patients reported greater disability than NC. Disability was associated with severity of depressive symptoms but not with NP and everyday FC.
(Bowie et al., 2006)	USA 78 older ambulatory SCH patients No controls	DSM-IV	UPSA SLOF	MMSE Attention, motor skills, verbal learning, verbal memory, verbal fluency, several aspects of executive functioning.	NP predicted FC, which predicted real- world functioning. Depression predicted interpersonal (IS) and work skills, while negative symptoms affected IS independently of other predictors.
(McClure et al., 2007)	USA 181 older ambulatory patients with SCH No controls	DSM-IV	UPSA SSPA	Attention, motor skills, verbal learning and memory, verbal fluency, executive functioning	Processing speed, episodic memory and executive functions were associated with UPSA, working and episodic memory and verbal fluency associated with social competence

(Bowie et al., 2008)	USA 222 outpatients with SCH No controls	DSM-IV	UPSA SSPA SLOF	Attention/worki ng memory, verbal memory, processing speed, executive functioning	Both direct and mediated effects of NP on real-world outcomes. Only processing speed and attention/working memory predicted social competence (SC). SC and functional competence mediated the effects of NP on community activities and work skills, but only SC predicted interpersonal behaviours.
(Leung et al., 2008)	USA 182 outpatients with SCH 56 outpatients with SCHAFF No controls	DSM-IV	UPSA SSPA SLOF	Short and long delay recall, learning, recognition, verbal fluency,	NP status is a better predictor of functional outcome than symptom status or the interaction of the two factors.
(Leifker et al., 2009)	USA 194 older outpatients with SCH No controls	DSM-IV	UPSA SSPA SLOF	MMSE Attention, motor skills, verbal learning and memory, verbal fluency, executive functioning	For residential FC, everyday living skills were the most important predictor. Real-world disability is a complex array of ability deficits and symptoms.
(Aubin et al., 2009)	Canada 82 outpatients with SCH No controls	DSM-IV-TR	ILSS MCAS	Visuo-motor coordination and speed of response, visuo- spatial associative memory, planning and spatial working memory	Visuo-spatial associative learning, negative symptoms, education and familiarity with task are important factors for FC. Planning skills necessary for efficient task performance most determinant for community functioning.
(Schennach-Wolff et al., 2009)	Germany 262 inpatients with SCH spectrum disorders No controls	DSM-IV	GAF SOFAS SF-36	None	Younger age, employment, shorter duration of illness, shorter length of current episode, less suicidality and fewer negative symptoms predicted functional remission.

(Harvey et al., 2009)	USA and Sweden 146 Swedish outpatients and 244 New York outpatients with SCH No controls	DSM-IV	UPSA SLOF	Attention, verbal working memory, executive functioning, processing speed, verbal fluency, verbal learning	Scores on performance-based measures of everyday living skills were similar in two countries, but 80% lived independently in Sweden and 46% in New York.
(Bowie et al., 2010)	USA 161 outpatients with SCH 130 with BD No controls	DSM-IV	UPSA-B	Attention, verbal working memory, executive functioning, processing speed, verbal fluency	Greater disability in schizophrenia. NP predicted worse FC in all outcome domains in both disorders. Results support the shared role of NP in BD and SCH in <u>producing disability</u> .
(Miles et al., 2010)	Canada 156 outpatients with SCH and 71 controls	DSM-IV	Validation of MSIF	None	Schizophrenia patients showed moderate to severe impairments.
(Simonsen et al., 2010)	Norway 114 in- and outpatients with SCH spectrum disorder 120 with bipolar spectrum disorders 268 controls	DSM-IV	SFS GAF	Verbal memory, processing speed, working memory, verbal fluency and interference control	Current symptoms had greater independent contribution to functioning than NP across clinical groups.

SCH=schizophrenia, BD=bipolar disorder, SCHAFF =schizoaffective disorder, NP=neuropsychology, FC=functional capacity, RTP=Role-play test of social skills, DRS= Dementia Rating Scale, GAF=Global Assessment of Functioning, MMSE=Mini Mental State Examination, QWB= The Quality of Well-Being Scale

### 2.3.5 Social functioning

According to DSM-IV-TR (APA, 2000a), social functioning includes work, interpersonal relations and self-care. Generally it means the ability to function in society and communicate with other people. There are several overlapping terms which are used instead of ‘social functioning’, such as ‘social adjustment’ (how a person conforms to social expectations), ‘social dysfunction’ (an impaired ability to function in society), ‘social adaptation’ (one’s ability to live in accordance with interpersonal, social and cultural norms) and ‘social competence’ (the overall ability of a person to impact favourably on the social environment) (Burns and Patrick, 2007). Impaired social functioning is commonly associated with schizophrenia and it has been widely studied in recent years.

It is very common that persons with schizophrenia are considered as 'odd', unfit for society. Feelings of shame and blame are common in people with mental illnesses which are more stigmatised than other illnesses. The perceived stigma may worsen their social functioning. In a cross-sectional survey made in 27 countries, persons with schizophrenia reported the most experienced discrimination in making or keeping friends, from family members, in finding and keeping a job and in intimate relationships. This stigma was the fourth greatest in Finland (Thorncroft et al., 2009). The social functioning of persons with psychotic disorder is increasingly considered an important area of research and the early detection of social disability is crucial. It has been found that in 57% of studied first illness-episode cases, social disability emerged already a few years before first admission to hospital (Häfner et al., 1999). Those with impaired social functioning also tend to remain impaired. In a two-year follow-up of outpatients with schizophrenia, social functioning did not change significantly (Dickerson et al., 1999). Lower social functioning measured in a prodromal phase of schizophrenia remained low later on, regardless of treatment (Cornblatt et al., 2007).

Negative symptoms are strongly related to social functioning (Bowie et al., 2010, Bowie et al., 2008, Bowie et al., 2006, Breier et al., 1991, Dickerson et al., 1996, Green, 1996). Positive symptoms also have an influence on social functioning according to some studies (Breier et al., 1991), while others have not found an independent effect of positive symptoms on social functioning (Green, 1996, Patterson and Mausbach, 2010). Cognitive deficits predict social functioning as they predict functioning in general (Dickerson et al., 1996, Green, 1996, Laes and Sponheim, 2006, McClure et al., 2007, Patterson et al., 2001b). There are several scales for the assessment of the social functioning of persons with psychotic disorder (Burns and Patrick, 2007). It is important to know which tests are specific to social functioning and which reflect functioning in daily life more broadly (Dickinson and Coursey, 2002). Studies comparing social functioning in people with schizophrenia and bipolar I disorder have obtained mixed results. Some have found that patients in a stable phase with bipolar disorder and schizophrenia have a similar level of social functioning (Dickerson et al., 2001), while other studies comparing elderly outpatients have found better functioning in patients with bipolar disorder (Bartels et al., 1997). More severe and current negative symptoms in people with schizophrenia reduce social functioning when compared to people with bipolar disorder (Bellack et al., 1989, Simonsen et al., 2010).

Deinstitutionalisation has increased the importance of assessing social outcome. Salokangas found in a five-year follow-up study that social and functional outcome was better in those men with schizophrenia who were living with their spouses, than

in those who were living with their parents or alone (Salokangas, 1997). In contrast, women's functional state was best when they were living alone. Women living alone had better functioning than men, but the gender difference was reversed in patients living with their parents or spouses. A multi-centre study by Hansson et al. (2002) found that the social network of those persons with schizophrenia living independently, alone or with their family is better than of those living in sheltered housing.

People with schizophrenia are seldom fully employed, although competitive employment is an important goal for many patients. A recent review by Tsang et al. (2010) listed the variables most often studied and the significant predictors of employment were better cognitive functioning, higher education, less negative symptoms, more social support and skills, younger age, better previous work history and availability of rehabilitation services. In the meta-analysis that was part of the same review, marital status was the most significant predictor, even more significant than work history (Tsang et al., 2010). Current or past marriage was a predictor of competitive employment also in a Finnish study of discharged patients (Honkonen et al., 2007). Another review found that previous work history is the most consistent predictor of employment (Marwaha and Johnson, 2004). Previous studies have shown that good premorbid social functioning is one predictor of good vocational status (MacEwan and Athawes, 1997, Mueser et al., 2001). One big obstacle to employment is stigmatisation, both experienced and anticipated. Although people with schizophrenia certainly experience discrimination in seeking a job, they may also adopt stigmatising views of themselves as incompetent persons (Yanos et al., 2008). This internalised stigma or self-stigma is common and sometimes severe among people with schizophrenia (Brohan et al., 2010). They may also fear the loss of benefits and professional help (Marwaha and Johnson, 2004).

Social functioning is the area of functioning where gender has the biggest impact. Women have more social relationships, are better educated and live independently more often than men (Cotton et al., 2009, Shtasel et al., 1992). This is shown already in first-episode patients and may be due to the earlier age of onset among men and their typically more severe illness course.

### **2.3.6 Cognitive functioning**

Cognitive deficits are an important feature of schizophrenia and the individuals with the illness usually have impairments in a wide range of neuropsychologic domains (Heinrichs and Zakzanis, 1998). In a review by Heinrichs and Zakzanis (1998), the largest effect sizes were observed in a test assessing verbal memory, word fluency and attention, as well as in performance and full-scale IQ. In another review of first-

episode schizophrenia by Mesholam-Gately et al. (2009), the largest deficits were found in immediate verbal memory and processing speed. Deficits in memory and executive functions are most often associated with functional impairments (Bowie et al., 2008, Godbout et al., 2007, Rempfer et al., 2003). There are plenty of neuropsychological tests that have been used to assess the cognitive ability of persons with schizophrenia and in 2008 the National Institute of Mental Health conference identified the cognitive domains that should be the primary focuses in schizophrenia research: speed of processing, attention/vigilance, working memory, verbal learning, visual learning, reasoning and problem solving and social cognition (Nuechterlein et al., 2008). Because schizophrenia is a heterogeneous disorder and there is variability among patients in the level of impairment, it is understandable that different cognitive domains are also affected in individual patients (Bowie and Harvey, 2005).

Cognitive impairment in patients diagnosed with bipolar disorder is less severe and less studied than in schizophrenia (Harvey et al., 2010b). Two meta-analytic reviews found cognitive deficits in euthymic bipolar disorder patients in attention and processing speed, episodic memory and executive functions (Torres et al., 2007) and verbal learning, immediate and delayed verbal memory, abstraction, sustained attention, psychomotor speed and executive functions (Robinson et al., 2006). Cognitive impairment is found in both bipolar I disorder and bipolar II disorder patients and it is more severe among bipolar I patients (Simonsen et al., 2008).

Cognitive functioning in schizoaffective disorder is also much less studied compared to schizophrenia. A meta-analysis comparing people with schizophrenia, schizoaffective disorder and affective psychoses found evidence of more cognitive deficits in those people with schizophrenia who have more severe negative symptoms, but did not find qualitative differences between the groups (Bora et al., 2009). Schizoaffective disorder is often unstable over time and some patients might receive a different diagnosis later. A study by Heinrichs et al. (2008) found that although schizophrenia is cognitively a more severe disorder than schizoaffective disorder, regression analysis showed that group differences in cognitive performance are insufficient to separate these disorders.

Cognitive deficits in other psychotic disorders have been scarcely studied. For example delusional disorder is infrequent in clinical settings and that has hampered the research on the disorder. One small study did not find statistically significant differences in neuropsychological measures between middle-aged and elderly patients with delusional disorder and schizophrenia, although the severity of cognitive deficits was somewhat lower in the delusional disorder group (Evans et al., 1996)

### 2.3.7 Quality of life

An article that was based on the Health 2000 Survey compared HRQoL in 29 psychiatric and somatic disorders using 15D and EQ-5D, and showed that self-reported psychotic disorder was the fifth most severe disorder, after Parkinson's disease, anxiety disorders, depressive disorders and arthrosis of the hip and knee (Saarni et al., 2006). In the Netherlands Mental Health Survey and Incidence Study (NEMESIS), respondents with bipolar disorder reported significantly lower HRQoL scores than the general population in EQ-5D, but did not differ in the 36-item Short Form Health Survey (SF-36), except in the role-physical score (Hakkaart-van Roijen et al., 2004). The HRQoL has been studied mostly in clinical studies from which generalisation is difficult because the inclusion criteria vary in different studies. In studies where participants have been recruited from in- or outpatient units, participants with schizophrenia generally report lower HRQoL scores in EQ-5D than in the Health 2000 Survey (Knapp et al., 2008, Prieto et al., 2004). Higher EQ-5D scores were found in a British study of stable outpatients (Briggs et al., 2008) and in a German study of outpatients (König et al., 2007). In a literature review evaluating HRQoL among other outcomes, eight of nine studies comparing schizophrenia with bipolar disorder found better HRQoL for people with bipolar disorder (Dean et al., 2004). Another review found bipolar disorder to be either comparable to or milder than schizophrenia (Michalak et al., 2005). A study comparing the HRQoL of middle-aged and elderly community-dwelling patients with bipolar disorder and schizophrenia found no statistically significant differences between the diagnosis groups (Depp et al., 2006).

Bobes and Gonzales (2006) summarised the aspects of the QoL of patients with schizophrenia. According to their review, the QoL of people with schizophrenia is lower than that of the general population and that of people with other mental disorders. Young age, female gender, marriage, low level of education and living outside of institutions are associated with better QoL, and longer length of the illness with worse. Negative and depressive syndromes in particular are associated with lower QoL. Lower side effects and the combination of pharmacological and therapeutic treatment improve QoL. Patients who are integrated in community support programmes have better QoL than those who are institutionalised.

As schizophrenia is a heterogeneous disorder, the QoL of the patients is not similar. People with stable schizophrenia consider their QoL to be higher than their objective life conditions and functional disability would suggest. Schizophrenia patients in relapse, with extrapyramidal symptoms and severe drug side effects report much lower QoL (Lee et al., 2000, Sevy et al., 2001). Many studies have shown a

discrepancy between patients' judgements of their well-being and clinicians' assessments (Atkinson et al., 1997, Bengtsson-Tops et al., 2005, Lehman, 1983, Sainfort et al., 1996). However, the fact that people with schizophrenia report differently about their quality of life according to the stage of their illness is a sign of their capability to assess their situation.

In a study by Koivumaa-Honkanen et al. (1996) of 1204 psychiatric out- and inpatients, patients with schizophrenia were less dissatisfied with their life than patients with MDD or anxiety disorder. Depression was the strongest correlate of dissatisfaction in all of them, but the studied variables had the least bearing on life satisfaction in schizophrenia. According to another study from the same study sample (Koivumaa-Honkanen et al., 1999), adding depression to the multivariate model removed the significance of the other correlates most widely in schizophrenia and the change in the model was significant only in schizophrenia. Only perceived social support in addition to depression remained to explain life dissatisfaction in schizophrenia. Decreased QoL can already be present in persons who are vulnerable to psychosis, meaning those who have experienced psychotic-like symptoms or who have a first-degree relative with a psychotic disorder or at least a 30-point drop in their Global Assessment of Functioning score (Svirskis et al., 2007).

Hospital discharges and symptomatology used to be common outcome measures. They are however inadequate and simplistic, since hospital discharges may tell more about the mental health system than about the clinical status of the patient, and psychotic symptoms have a relatively low correlation with functioning or self-reported quality of life (Becker and Diamond, 2006). Modern treatment of schizophrenia and other psychotic disorders demands more extensive outcome measures and taking the quality of life of the patients into account. When these are assessed with self-report measures, they reflect the patients' own values and goals in life.

## 3 Aims of the study

The aim of this study was to estimate the prevalence and severity of limitations in the vision, mobility, everyday functioning and quality of life of persons with psychotic disorder in the Finnish population and to determine the factors affecting them.

The study consists of four original publications and the specific aims were described as follows:

1. To investigate in the general population the prevalence of impaired habitual visual acuity and self-reported difficulties in vision among persons with different psychotic disorders.
2. To investigate mobility limitations among subjects with psychotic disorder in a general population-based sample.
3. To investigate limitations in everyday functioning and their determinants among subjects with psychotic disorder in a general population-based sample.
4. To compare the loss of utility-based health-related quality of life and quality of life associated with psychotic disorders.

# 4 Material and methods

## 4.1 Study design and subjects

This study was based on the Health 2000 Survey, a nationwide population-based comprehensive survey of health and functional capacity that was carried out in Finland from autumn 2000 to spring 2001. The study was co-ordinated by the National Public Health Institute (since January 1<sup>st</sup> 2009 the National Institute for Health and Welfare) and several national institutes participated. It was approved by the ethics committee of the National Public Health Institute and the Hospital District of Helsinki and Uusimaa (Heistaro, 2008).

The Health 2000 Survey was based on a two-stage stratified cluster sampling design, where mainland Finland was divided into five strata, which were the university hospital districts. In the first stage of sampling, 80 health centre districts were selected, 16 districts from each stratum. In the second stage individual persons were selected by systematic sampling from those districts. The strata were divided into two sub-strata. The 15 largest health centre districts were included in the sample, and the remaining 65 health centre districts were selected by systematic probability proportional to size sampling. The sample sizes of the 15 largest health centre districts were proportional to population size. In the remaining 65 health centre districts the sample sizes were equal within each university hospital region, so that the total number of persons drawn from a university hospital region was proportional to the corresponding population size. (Heistaro, 2008)

The sample size was 8028 for people aged 30 and over living in the Finnish mainland. In the first phase, 6986 (87%) were interviewed at home by trained interviewers from Statistics Finland. The home interview included sociodemographic information, self-reported chronic diseases and health habits, use of health services, functional capacity and the need for and receipt of assistance. The interviewers left a basic questionnaire (Questionnaire 1) for the participants to fill in and bring to the health examination. The health examination took place at the participant's own health centre (n=6354, 79.7%) and included a thorough health examination including ECG, blood pressure, spirometry, bioimpedance, heel bone density and other measurements (including height and weight), laboratory tests, oral examination, functional capacity tests and clinical examination by a physician. The home examination (n=416, 5.2%) comprised many of the same measurements as the examination proper, and an abbreviated health interview was conducted if the main

health interview had not been carried out. Table 5 presents the phases of the Health 2000 examination.

**Table 5. Health 2000 examination**

<b>Duration</b>	<b>Station</b>
15 min	Reception
15 min	ECG, blood pressure and other measurements (including height and weight)
15 min	Spirometry, bioimpedance and heel bone density
15 min	Laboratory tests
15 min	Oral and dental examination (Dentist)
30 min	Testing of functional capacity
30 min	Clinical examination (Physician)
30 min	Mental health interview (M-CIDI)
15 min	Final interview

The measurement of functional capacity included measurement of visual acuity and hearing, handgrip strength and tests of cognitive functioning. Participants aged 55 or older performed chair rise and walking tests. The last part of the health examination was a structured computer-assisted mental health interview, the Munich version of the Composite International Diagnostic Interview (M-CIDI) (Wittchen et al., 1998, Wittchen and Pfister, 1997). Questionnaires 2 and 3 were handed to participants after the health examination to be filled in the examination site or filled in later and mailed. For those who could not participate in the health examination at their own health centre, including all participants living in institutions, a condensed interview and health examination were conducted at their homes or institutions.

If a person was not able to participate in any of the abovementioned parts of the survey, he or she was called and those consenting were interviewed by phone (n=454, 5.7%). The telephone interview was based on the home health interview and Questionnaire 1 but was shorter. For those who had not participated in any of the previous stages, a questionnaire was sent by mail (n=63, 0.8%), covering the same topics as the telephone interview. Counted on the basis of all persons from whom at least part of the information was obtained, the rate of participation was 93%. All the questionnaires and the interviews are available at <http://www.terveys2000.fi/>. (Heistaro, 2008)

#### 4.1.1 Screening and diagnostic assessment of psychotic disorders

The mental health interview (M-CIDI) that was used in the Health 2000 Survey is not adequate for diagnosing psychotic disorders (Kendler et al., 1996). Because of that another study focusing on severe mental disorders was done between 2002 and 2004. This study – called the Psychoses in Finland (PIF) – is a sub-study of Health 2000. Those with a possible psychotic disorder were screened and interviewed with the Research Version of the Structured Clinical Interview for DSM-IV-TR (SCID-I) (First et al., 2001). Participants were screened to participate in the SCID interview if they reported a diagnosed psychotic disorder, received a diagnosis of possible or definite psychotic disorder from the physician conducting the health examination, reported possible psychotic or manic symptoms in the CIDI or had other symptoms suggestive of psychotic disorder. Several registers were also used in screening for signs of psychotic disorders among the whole study sample (Perälä et al., 2007). Figure 2 presents the design of the PIF Study.

The positive screen findings described in detail in Perälä et al. (2007) included the following:

##### The Health 2000 examination

- 77 participants who reported in the health interview that they had been diagnosed with psychotic disorders
- 45 participants with possible or definite psychotic disorders as assessed by the physician who conducted the health examination

##### CIDI interview

###### *Section F screen for bipolar I disorder*

- 124 participants who reported that they had had a lifetime episode of elevated or irritable mood lasting at least four days plus had had at least three manic symptoms. The current occurrence of all manic symptoms was not required

###### *Section G screen for positive psychotic symptoms*

- 238 participants who reported any clinically relevant positive psychotic symptom (i.e. the symptom interfered with normal life or the person had discussed it with a health care professional), or at least three symptoms regardless of clinical relevance that may have occurred during the subject's lifetime

###### *Section P screen for other psychotic symptoms*

- 93 participants with symptoms of positive formal thought disorder, negative symptoms, behaviour that suggests the person is having hallucinations, or catatonic symptoms

- Four participants were selected to be re-interviewed because the interviewer comments on their behaviour at the interview were indicative of psychotic disorder

#### Registers

- 238 participants from the National Hospital Discharge Register because of a diagnosis of any psychotic or bipolar disorder
- 211 participants from the Medication Reimbursement Register of the Finnish Social Insurance Institution because of free medication for severe psychotic and other severe mental disorder
- 180 participants from the Pension Register of the Finnish Centre for Pensions because of disability pension due to any psychotic disorder, bipolar disorder or major depressive disorder
- 36 participants from the Finnish National Prescription Register of the National Insurance Institution who used moodstabilizing medication and did not have any physical condition, like epilepsy, that would have explained its use.

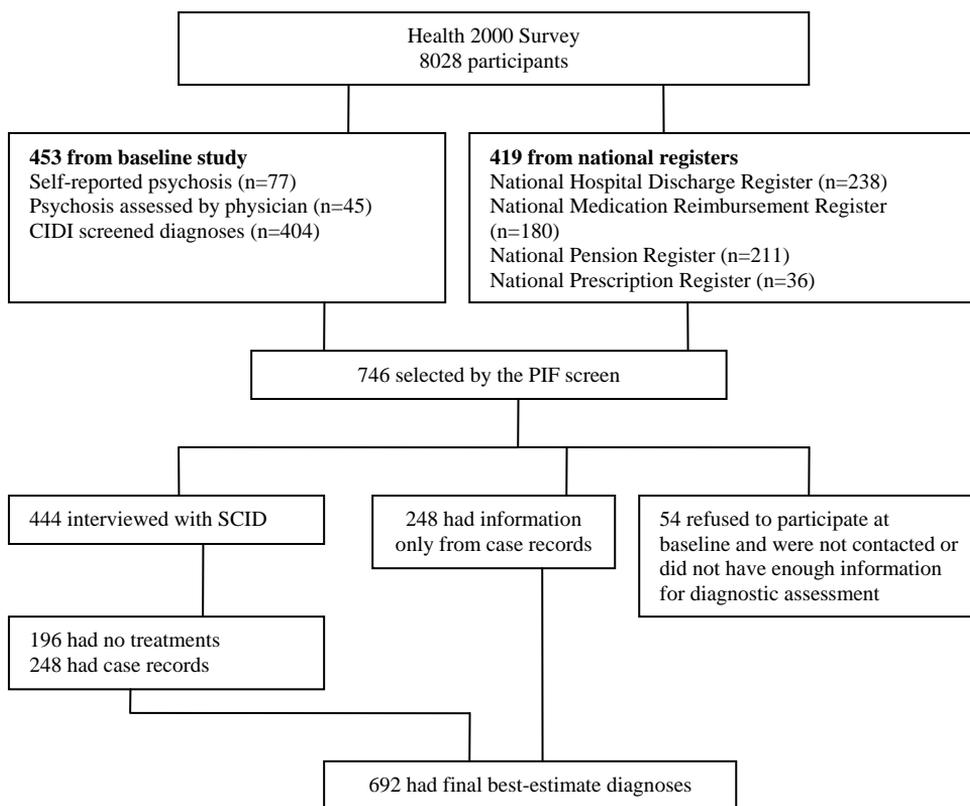
All case records were collected from hospital and outpatient treatments, including those not interviewed but excluding those who had refused to participate in the Health 2000 Survey. The final best-estimate diagnoses were made by three clinicians (Jaana Suvisaari, Jonna Perälä and Samuli I. Saarni) using DSM-IV-TR criteria. Of the 746 screen-positive participants, 444 were re-interviewed, while the rest were diagnosed based on case records alone. Kappa values between the raters ranged from 0.74 to 0.97 for different psychotic disorders and were either good or excellent regardless of whether the diagnosis was based on both the SCID interview and case records, or case records alone.

The presence of DSM-IV schizophrenia was confirmed in 67 persons. In addition, there were 10 persons with a register-based diagnosis of schizophrenia who either had refused to participate in the study or for whom there was not enough information to confirm the diagnosis. The measurements used in this study were from 61 of these individuals, which means that the participation rate of persons with schizophrenia was 79.2%. Of the 105 subjects with ONAP who belonged to the sample, the measurements were from 79 (75.2%) individuals, and of the 51 subjects with affective psychotic disorder the measurements were from 45 individuals (88.2%).

Lifetime symptoms of psychotic disorders were assessed with the Major Symptoms of Schizophrenia Scale (MSSS) (Kendler et al., 1993, Kendler et al., 1998). Because some symptoms were not covered by the MSSS, we added the global rating of

bizarre behaviour from the Scale for the Assessment of Positive Symptoms (SAPS) (Andreasen, 1984) and the global ratings of avolition-apathy and of anhedonia-asociality from the Scale for the Assessment of Negative Symptoms (SANS) (Andreasen, 1982). From these ratings, summary scores were formed for positive symptoms (delusions and hallucinations), disorganised symptoms (positive thought disorder and bizarre behaviour) and negative symptoms (negative thought disorder, avolition-apathy, anhedonia-asociality and affective deterioration). The interrater reliability of the symptom summary measures was assessed using intraclass correlations from 136 participants that had been rated by all three raters blind to each other's ratings. The intraclass correlations were excellent, 0.93 for positive symptoms, 0.89 for negative symptoms and 0.82 for disorganised symptoms.

In the present study, lifetime diagnoses of psychotic disorder were classified into schizophrenia, other non-affective psychotic disorder (ONAP) (schizophreniform disorder, schizoaffective disorder, delusional disorder, brief psychotic disorder, psychotic disorder not otherwise specified) and affective psychoses (major depressive disorder with psychotic features and bipolar I disorder).



**Figure 2. Design of the Psychoses in Finland Study (Perälä et al. 2007).**

## 4.2 Socio-demographic variables

The socio-demographic factors used in the analyses were age, gender and education. Age was used as a continuous variable in Studies I and III. In Study II age was categorised into two classes, 30-54 and 55-99 years, because functional capacity tests were done only to participants 55 years or older. In Study IV age was categorised as 30-44, 45-54, 55-64, 65-74, 75-85 and over 85 years. Education was obtained from the home interview and it was classified as basic ( $\leq 6$  years of primary education), secondary (7-11 years of primary education or  $\leq 6$  years of primary education plus vocational school) and high (7-11 years of primary education plus vocational school, matriculation examination or a higher vocational institution or university) (Heistaro, 2008).

## 4.3 Measures and assessments of functional capacity

### 4.3.1 Visual acuity

As part of the health examination, habitual visual acuity (VA) for distance was measured binocularly at 4 m with the participant's current glasses or contact lenses, if usually worn, using a modification of the logMAR letter chart published by Precision Vision (Ferris et al., 1982). Habitual near vision was tested with the near vision chart complying with the same principles as the distance VA chart. The test was performed at the participant's preferred reading distance. Illumination was optimised to 350 lux or more on far and near vision charts (Laitinen et al., 2005).

During the health interview the subjects were asked whether they had difficulties in reading newsprint or television subtitles, corresponding to difficulties in near and distance vision, using the following questions:

1. Is your eyesight good enough (with glasses) to read normal newspaper print?
2. Are you able to read television subtitles (with glasses) from a normal watching distance (approximately 3 metres)?

In Study I, binocular VA of  $\geq 0.8$  was defined as good and VA of 0.5-0.63 as moderate VA. Visual impairment was defined as binocular VA of  $<0.5$ . Visual acuity of 0.32-0.4 was defined as mildly impaired VA and VA of  $\leq 0.25$  as moderately to severely impaired VA, including blindness (Laitinen et al., 2005). In Study III VA of  $<0.8$  was defined as reduced.

### 4.3.2 Mobility

Self-reported functional capacity was asked in the home interview, where the questions on mobility were formulated as follows: "How do you nowadays manage the following activities?" Activities that were covered were overall mobility, moving about in the house, walking about 0.5 km and 2 km without resting, running about 100 m and about 0.5 km, climbing up one or several flights of stairs without resting, riding a bicycle and walking 100 m while carrying a 5 kg bag. The four response alternatives were: without difficulties, with minor difficulties, with major difficulties or not at all. The respondents were classified as having limitations if they reported any difficulties or were unable to perform the activity. Most questions were about activities required in everyday life, in which even small impairments may interfere with normal life. Therefore, we dichotomised variables in order to distinguish those who had at least some difficulties performing the activity from those who had no difficulties.

In the health examination, the tests of physical capacity were administered to subjects aged 55 or over. Trained study nurses supervised mobility performance tests. Walking ability was measured on a course of 6.1 m, which the examinee was advised to walk as fast as possible. Performance was considered limited if walking speed was below 1.2 m/s as that is the speed needed to cross the street safely (Langlois et al., 1997). The ability to rise from a chair was tested by asking the examinees to stand up from a standard-height chair without help of the arms. Performance in four additional tests was coded as normal or impaired: walking two metres on the flat, walking two metres on one's toes, climbing two steps up and down and squatting.

Handgrip strength was measured three times from all participants and the best value was recorded as the result. The results were standardised and expressed as age- and gender-adjusted Z-scores. The amount of exercise participants take was measured with the question: "How much do you exercise and strain yourself physically in your leisure time?", from which we created a dichotomised variable (no exercise at all or at least some exercise). (Aromaa and Koskinen, 2004)

#### **4.3.3 Everyday functioning**

In the health interview participants self-reported how they managed in their everyday life. Questions concerning daily living were based on measures developed by Katz et al. (Katz et al., 1963), Lawton and Brody (Lawton and Brody, 1969), and the OECD (McWhinnie, 1981). In this study the activities of daily living were: getting in and out of bed, dressing, eating, bathing and toileting. Instrumental activities of daily living were shopping, cooking, laundering, heavy cleaning and cutting toenails. Items of social functioning were: using the phone, taking care of matters together with other people, communicating with strangers, dealing with the authorities and financial institutions and travelling on public transportation. The questions were formulated as follows: "How do you nowadays manage the following activities?" The four response alternatives were: without difficulties, with minor difficulties, with major difficulties or not at all. The respondents were classified as having limitations if they reported any difficulties or were unable to perform the activity and the variables were dichotomised to distinguish those who had at least some difficulties performing the activity from those with no difficulties. (Heistaro, 2008)

#### **4.3.4 Cognitive functioning**

Cognitive functioning was examined in the health examination using selected tasks from the CERAD (The Consortium to Establish a Registry for Alzheimer's Disease) cognitive test battery by a nurse trained to use this instrument. In the test of verbal fluency, the subjects were asked to list as many animals as possible in one minute. In this test, performance deteriorates due to difficulties in verbal ability, semantic memory and executive functions (Morris et al., 1989). In the memory test, the subjects were shown 10 words one after another that they were to read aloud and commit to memory. If the subjects failed to remember all 10 words at the first trial, they were shown the words two more times. Due to an error in the CERAD instructions that had been given to the personnel the word list was not read three times to those participants who immediately or in the second trial remembered all 10 words. This was taken into account excluding these participants from the analyses.

The delayed recall of the words was tested by asking the subjects to repeat the same list after about five minutes. Participants unable to do the test because of severe dementia were not tested. Participants were also asked to estimate their present memory and whether poor memory causes any difficulties in their everyday life. (Heistaro, 2008)

#### **4.3.5 Health-related and subjective quality of life**

Health-related quality of life was measured with two established, generic, self-report and preference-based HRQoL measures: the EQ-5D (1990) and the 15D (Sintonen, 1994) as there is no gold standard for HRQoL measurement (Saarni et al., 2006, Tengs and Wallace, 2000).

The 15D has 15 dimensions with five categories of severity: mobility, vision, hearing, breathing, sleeping, eating, speech, elimination, usual activities, mental function, discomfort and symptoms, depression, distress, vitality and sexual activity. The 15D utility index (Sintonen, 1995) ranges between 1 (full health) and 0 (death). Subjects with 12 or more completed 15D dimensions were included in the study, and missing values were predicted with linear regression analysis using the other 15D dimensions, with age and gender as independent variables, as recommended (Sintonen, 1994). Changes of over 0.02-0.03 points on the 15D are considered clinically significant (Sintonen, 2001). To calculate the 15D utility index, we used valuations elicited from the Finnish population using the multi-attribute utility method (Sintonen, 1995).

The EQ-5D (Brooks, 1996) has five dimensions with three categories of severity: mobility, self-care, usual activities, pain or discomfort and anxiety or depression.

The most commonly used tariff, the UK time-trade-off (TTO) values were used to generate the EQ-5D utility index (Dolan et al., 1996, Kind et al., 1999). The EQ-5D TTO index ranges between 1 (full health) and -0.59 (0=death). States worse than death, such as vegetative states, may be given a negative value. TTO means how many life years the respondent would give up in order to be in full health in comparison to another health state. Only participants fully completing the EQ-5D questionnaire were included. Although there is no unequivocally agreed threshold for minimum clinically important change on the EQ-5D, thresholds around 0.07 points have been suggested (Walters and Brazier, 2005).

Subjective quality of life was measured by asking the participants to rate their current quality of life as a whole, for the last 30 days, on a scale from 0 (worst possible quality of life) to 10 (best possible quality of life).

#### **4.3.6 Interviewers' assessments**

At the end of the home interview the interviewers rated their general impression about the participants and their homes. They rated the interviewee's mobility limitations, need for help, eyesight, hearing, speech and understanding of speech and instructions. This information was useful because the interviewers were not health care professionals who are used to meeting people with mental disorders and therefore observed the participants from a layperson's point of view. All the interviewers were professionals from Statistics Finland, who have basic training for the job. On average, they had 11 years of experience of professional interviewing. They were able to compare the living environment of a mental health patient to the situation of an average citizen. The fact that the interview took place at home was an advantage because the assessments the interviewers made were not based solely on the participant's own report. (Heistaro, 2008)

### **4.4 Statistical methods**

The sampling design in Studies I, II and III was accounted for by using SUDAAN software (version 9.0) (SUDAAN, 2004) for SAS (versions V8 and V9.1), which is able to take account of two-stage cluster sampling design and calculates robust standard error estimates. Poststratification weights estimated by Statistics Finland were applied to adjust for nonresponse and for the oversampling of individuals aged 80 and over. Two-stage cluster sampling design was taken into account only in analyses made in the whole sample, not in the analyses made within the psychosis group, since there were too few participants per cluster. Some analyses were done with SAS version 9.1.3. (SAS, 1999) in Study II and Study III. Regression analyses

of Study IV were conducted using Stata 8.2 for Windows (StataCorp, 2003), and the other analyses using SAS 9.1.3. (SAS, 1999). Analyses accounted for the two-stage sampling design.

#### **4.4.1 Study I**

The prevalences of VA, self-reported eye diseases and self-reported vision problems among participants with different psychotic disorders and without psychotic disorder were calculated as percentages of the population. In each group, the prevalences of self-reported vs. measured problems were compared. Among persons with psychotic disorders, VA was compared in those who used vs. did not use antipsychotic medication, and in persons with vs. without comorbid type 2 diabetes. Differences between categorical variables were tested using the two-tailed  $\chi^2$ -test, or with Fisher's exact test, if the table had any cells with an expected frequency of less than five. Odds ratios for impaired distance and near VA, adjusting for age and gender, were calculated using logistic regression. The 95% confidence intervals for prevalences and proportions were calculated using the logit transformation to ensure that the confidence limits were between 0% and 100%.

#### **4.4.2 Study II**

The prevalences of self-reported and test-based impairments in mobility were calculated as percentages among participants with or without psychotic disorders and handgrip strength was compared among these groups. Differences between categorical variables were tested using the two-tailed  $\chi^2$ -test, or with Fisher's exact test, if the table had any cells with an expected frequency of less than five, and between continuous variables by using the *t*-test. Odds ratios for impaired mobility, adjusting for age and gender, were calculated using logistic regression. The 95% confidence intervals for prevalences and proportions were calculated using the logit transformation to ensure that the confidence limits were between 0% and 100%.

Logistic regression was used to further explore the odds of having mobility limitations in different diagnostic groups. Two types of limitations were assessed, based on their functional significance in everyday life: difficulties in stair climbing and in walking. Walking limitation was defined as walking speed less than 1.2 m per second, if walking speed was measured, or self-reported difficulty in walking 500 metres if the walking speed test had not been carried out. Besides psychiatric diagnoses, we included the following explanatory variables: age, gender, smoking, obesity (BMI  $\geq$  30 kg/m<sup>2</sup>), type 2 diabetes, coronary heart disease, heart failure, knee osteoarthritis and hip osteoarthritis. These variables were associated with mobility limitations in the Finnish general population (Sainio et al., 2007). Because

some of these conditions were too rare in persons with non-affective psychosis to be analysed separately, one variable for having either type 2 diabetes, CHD, heart failure, knee or hip osteoarthritis was formed. Heart failure and osteoarthritis were self-reported, while type 2 diabetes and CHD diagnoses were made using information from laboratory tests, ECG, symptoms, medication and registers (Kattainen et al., 2006, Suvisaari et al., 2008).

Among persons with psychotic disorder, we investigated whether the lifetime severity of positive, negative, disorganised and depressive symptoms predicted mobility limitations after adjusting for variables related to mobility in the general population.

#### **4.4.3 Study III**

The prevalences of self-reported impairments in everyday functioning among participants with or without psychotic disorder were calculated in percentages. Differences between categorical variables were tested using the two-tailed  $\chi^2$ -test and between continuous variables by using the *t*-test. Comparisons of self-reported and objective memory deficits were calculated using the *t*-test. Odds ratios for impaired mobility, adjusting for age and gender, were calculated using logistic regression. The 95% confidence intervals for prevalences and proportions were calculated using the logit transformation to ensure that the confidence limits were between 0% and 100%.

To estimate the effect of the psychotic disorder on limitations in everyday functioning, when taking the other variables affecting it into account, we made two sets of logistic regression models predicting ADL, IADL and social functioning. The first models controlled for age and gender and the second added obesity, chronic conditions (type 2 diabetes, CHD, heart failure, knee osteoarthritis and hip osteoarthritis), verbal fluency and memory, expressive and receptive speech, education, distance vision and near vision. Difficulties in ADL, IADL or social functioning were coded as present if the participant had difficulties in at least one of the items in that domain.

Another logistic regression was used to further explore the odds of having difficulties in everyday functioning within the non-affective psychosis group. We included the following explanatory variables: age, gender, obesity, chronic conditions, verbal memory, positive, negative, disorganised and depressive symptoms, and distance and near vision. In the model of social functioning we added expressive speech.

#### **4.4.4 Study IV**

To estimate the association between psychotic disorders and HRQoL or QoL, separate multiple regression models were made using each of the instruments (15D, EQ-5D, QoL) as dependent variables. To estimate the effects of covariates, four sets of regression models were created in a stepwise manner: the first models controlled for age and gender, the second added education, income and marital status, the third 25 somatic conditions and the fourth Beck's Depression Index (BDI). The covariates were entered as categorical variables except for BDI, which was entered as continuous. Linear regression for survey data was used to analyse subjective QoL. As the HRQoL measures have a ceiling effect (55.4% of respondents scored full health on the EQ-5D and 17.3% on the 15D) a Tobit model was used to account for this censoring (Austin et al., 2000, Tobin, 1958). To investigate which dimensions of HRQoL were affected by schizophrenia, schizoaffective disorder and bipolar I disorder, 15D profiles using linear regression were created to adjust the losses on each 15D dimension for age and gender. As the 15D preference-based scoring system scales all dimensions between 0 and 1, the losses are comparable. Spearman rank-order correlations as partial correlations adjusting for age and gender, were used to investigate the correlations between QoL/HRQoL ratings and clinician-rated symptom severity and outcome.

# 5 Results

## 5.1 Characteristics of the study sample

The mean age in all the diagnostic groups was over 50 years. Persons with ONAP were older and more often female than in the other groups. Participants with schizophrenia had the most severe lifetime positive, negative and disorganised symptoms, while participants with affective psychoses had the most severe depressive symptoms. The mean duration of illness was more than 17 years in schizophrenia and more than 22 years in ONAP, while it was 12 years in the case of persons with affective psychotic disorder. Most of the persons with schizophrenia had a chronic course of illness while in other diagnosis groups the course of illness was less chronic. Almost all participants had used antipsychotic medication at some point of their illness, and most of the persons with schizophrenia, almost a half of those with ONAP and a third of those with affective psychotic disorder had current antipsychotic medication.

More than half of persons with schizophrenia or ONAP had only basic education, while almost half of the persons with affective psychotic disorder had high education. Persons with schizophrenia and ONAP had less than 10 years of education, while persons with affective psychosis had almost 11 years, as much as the remaining study population.

Smoking was more common among persons with schizophrenia, while in other diagnosis groups it was as common as in the remaining study population. There were more obese people ( $BMI > 30 \text{ kg/m}^2$ ) in the schizophrenia and ONAP groups than in the remaining study population. Type 2 diabetes was more common in persons with schizophrenia than in the remaining study population, while other chronic conditions (CHD, heart failure and osteoarthritis of the hip or knee) were not. The higher mean age of those with ONAP is probably one explanation for the higher prevalence of heart failure and osteoarthritis of the hip or knee. The characteristics of the participants of this study are shown in Table 6.

**Table 6. Characteristics of the study sample by diagnostic groups (means and percentages).**

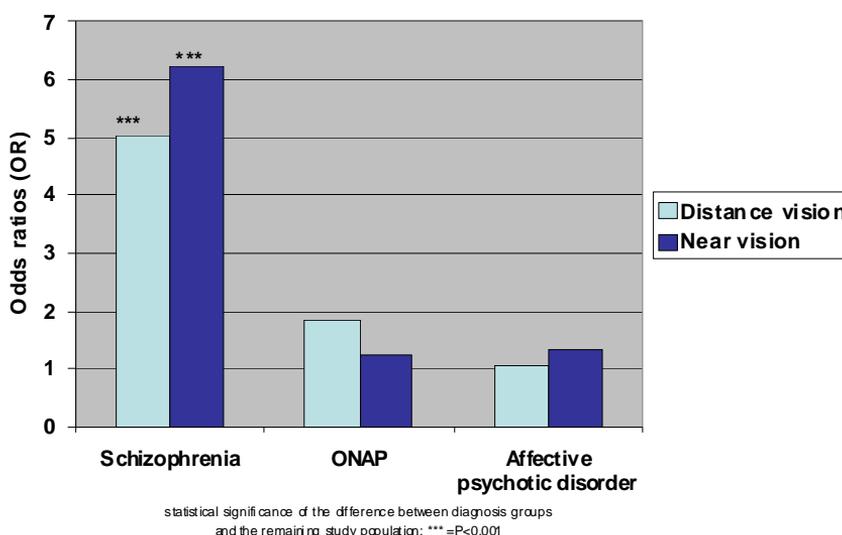
	Schizophrenia		Other non-affective psychotic disorder		Affective psychotic disorder		No psychotic disorder	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Number of participants</b>	61		79		45		6927	
<b>Age</b>	53.4	13.5	57.9	15.8	53.9	16.4	52.9	16.2
<b>Lifetime severity of symptoms</b>								
Negative (range 0-20)	10.7	3.9	6.2	3.6	4.9	2.7		
Positive (range 1-10)	6.8	1.4	5.4	1.5	4.2	1.4		
Disorganised (range 1-9)	5.4	2.0	3.5	1.8	0	0		
Depressive (range 1-5)	2.1	0.8	2.5	1.2	3.6	0.9		
<b>Duration of illness in years</b>	17.5	11.3	22.2	10.0	12.0	11.2		
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
<b>Men</b>	45.7		35.2		58.5		47.6	
<b>Course of illness</b>								
Single episode, full recovery	0	0	18.1	10.5-29.2	19.8	10.2-34.8		
Multiple episodes, full recovery	3.5	0.8-13.1	20.2	11.8-32.5	48.4	33.7-63.3		
Multiple episodes, partial recovery	26.6	16.9-39.3	39.4	27.5-52.7	29.2	16.7-46.0		
Chronic with exacerbations	66.2	52.8-77.4	22.3	13.1-35.3	2.7	0.3-16.5		
Chronic without exacerbations	3.7	1.0-13.2	0	0	0	0		
<b>Current use of</b>								
Antipsychotics	68.3	56.2-78.4	45.2	35.1-55.7	32.0	18.8-48.8	1.3	1.0-1.5
Antidepressants	21.1	12.9-32.5	32.9	22.9-44.7	33.6	21.5-48.2	5.1	4.6-5.6
Mood stabilisers	5.3	1.8-14.5	6.7	2.8-15.3	10.7	4.6-22.8	1.1	0.9-1.3
<b>Lifetime use of antipsychotics</b>	98.3	89.4-99.8	87.3	78.7-92.8	97.5	84.3-99.7		
<b>Education</b>								
High	19.9	11.6-31.9	20.9	13.3-31.2	42.9	29.3-57.6	40.5	39.1-42.0
Secondary	24.7	15.3-37.3	23.0	15.8-37.3	16.4	8.5-29.4	32.1	30.9-33.3
Basic	55.5	43.8-66.5	54.1	43.1-64.7	40.7	26.6-56.6	27.4	26.2-28.6
Years (mean)	9.6	3.6	9.7	4.5	10.8	4.2	11.0	4.2

Table 6. (Continued)									
<b>Smoking</b>									
Current smoker	43.7	31.4-56.9	28.4	19.7-38.9	29.4	17.5-45.0	27.2	26.1-28.2	
Ex-smoker	17.0	9.5-28.7	21.1	13.2-32.0	29.5	17.8-44.6	22.1	21.2-23.0	
Do not smoke	39.2	27.6-52.2	50.5	40.0-61.0	41.1	28.3-55.2	50.8	49.6-52.9	
<b>BMI kg/m<sup>2</sup></b>									
<20	3.7	0.9-13.6	5.4	2.1-13.4	0	0	3.7	3.3-4.2	
20-25	30.8	20.4-43.5	23.2	15.7-32.9	27.5	16.5-42.1	34.0	32.8-35.2	
25-30	30.6	20.5-43.0	28.9	19.6-40.4	45.6	31.8-60.0	40.4	39.2-41.6	
30-35	19.2	10.7-32.0	21.3	13.1-32.7	24.5	13.5-40.2	16.8	15.9-17.7	
>35	15.8	8.7-27.0	21.2	13.3-32.0	2.5	0.35-15.7	5.1	4.6-5.7	
<b>Chronic condition</b>									
Diabetes mellitus type 2	22.1	13.2-34.7	15.6	8.9-26.1	3.4	0.8-13.5	6.1	5.5-6.8	
Coronary heart disease	13.0	6.8-23.4	11.3	6.2-19.7	5.0	1.5-15.8	10.8	10.0-11.7	
Heart failure	5.8	2.1-14.7	11.5	5.8-21.6	0	0	4.5	4.0-5.0	
Osteoarthritis of the hip/knee	13.9	7.1-25.7	17.1	10.1-27.5	1.2	0.2-8.0	12.6	11.8-13.5	
<b>Distance vision</b>									
≥0.8+	70.1	56.7-80.7	78.1	67.2-86.1	86.0	72.0-93.7	87.6	86.8-88.4	
0.63-0.5	18.9	10.4-31.7	13.1	7.0-23.2	12.8	5.5-26.9	8.4	7.8-9.1	
0.4-0.25	9.2	3.9-20.2	6.9	2.8-16.0	1.2	0.2-8.5	2.2	2.0-2.7	
≤0.25	1.8	0.3-11.5	1.9	0.5-7.2	0	0	1.5	1.2-1.9	
<b>Near vision</b>									
≥0.8+	50.5	36.4-64.5	77.3	66.7-85.2	75.4	57.9-87.3	82.1	81.1-83.1	
0.63-0.5	35.5	23.8-49.3	17.1	10.0-27.7	23.0	11.6-40.6	13.7	12.9-14.7	
0.4-0.25	12.0	5.4-24.4	0	0	1.6	0.2-10.5	2.4	2.0-2.7	
≤0.25	2.0	0.3-12.6	5.6	2.1-14.3	0	0	1.8	1.5-2.1	

BMI=body mass index

## 5.2 Visual impairment of persons with psychotic disorder (Study I)

Persons with schizophrenia wearing glasses in the VA test had good distance VA ( $\geq 0.8$ ) (81%, 95%CI 59.8-92.4) almost as often as those in the remaining study population (89.7%, 95%CI 88.7-90.6). VA for near decreased significantly. 58.3% (95%CI 40.0-74.6) had good VA for near, compared to 83.7% (95%CI 82.5-84.8) in the remaining study population. Among participants who did not wear glasses in the examination, 63.6% (95%CI 46.5-77.8) of those with schizophrenia had good VA for distance and only 40.1% (95%CI 22.0-61.3) had good VA for near, when the corresponding prevalences in the remaining study population were 86.0% (95%CI 84.7-87.1) and 83.5% (95%CI 81.8-85.1). The same pattern was observed in the ONAP group, but only in distance VA. Persons with affective psychosis did not differ from the remaining study population in terms of distance and near VA (Table 2 in original Study I).



**Figure 3. Age- and gender-adjusted odds ratios of having visual impairment (VA < 0.5)**

After adjusting for age and gender, schizophrenia was associated with five-fold odds of having visual impairment (VA < 0.5) for distance (OR 5.04, 95%CI 1.89-13.48, P < 0.001) and six-fold odds of having visual impairment for near vision (OR 6.22, 95%CI 2.61-14.82, P < 0.001). The odds of having visual impairment were not increased in the ONAP and affective psychosis groups (Figure 3).

Participants with schizophrenia and ONAP, but not with affective psychosis, reported more difficulties in both distance and near vision than the remaining study population. Although those with schizophrenia had reported problems, they tended to report fewer problems than they actually had according to VA measurement.

Only 43.9% of persons with schizophrenia, compared with 69.7% in the remaining study population ( $\chi^2=13.79$ , df 1,  $P=0.0002$ ), had had their vision examined during the five years before the Health 2000 examination. Persons with ONAP had also had their vision examined significantly less often (59.0%) than persons in the remaining study population ( $\chi^2=3.87$ , df 1,  $P=0.049$ ), whereas those with affective psychosis had attended vision examinations almost as often as the remaining study population (63.9%).

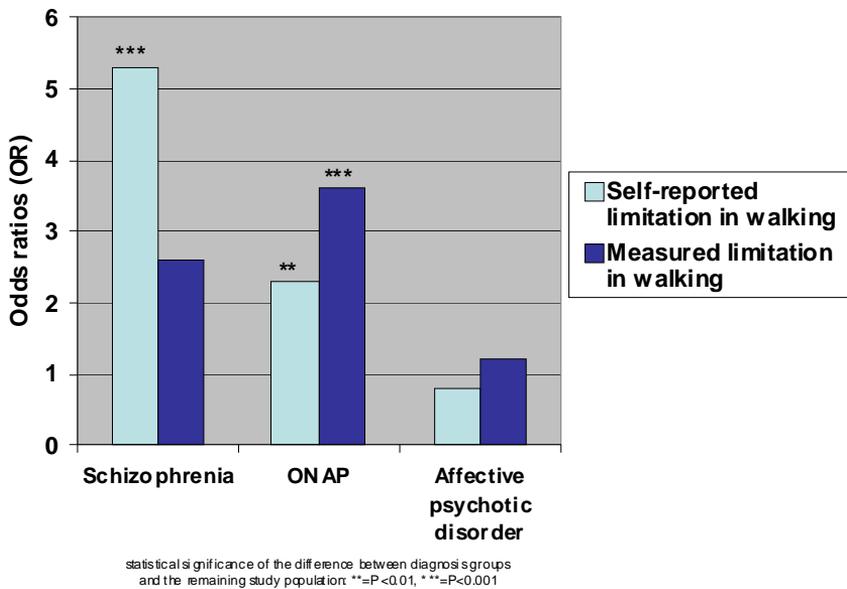
The diagnostic groups were combined when studying the impact of antipsychotic medication to have a larger sample size. After adjusting for age and gender, use of any antipsychotic medication was not associated with odds of having visual impairment ( $VA < 0.5$ ) for distance (OR 0.78, 95%CI 0.26-2.31,  $P=0.66$ ) or for near vision (OR 2.53, 95% CI 0.84-7.59,  $P=0.097$ ). In contrast, phenothiazine use was associated with significantly impaired near VA (OR 5.07, 95%CI 1.13-22.81,  $P=0.034$ ), but not with distance VA (OR 2.55, 95%CI 0.46-14.21,  $P=0.284$ ).

An association between diabetes and reduced VA in persons with psychotic disorder was not found.

### **5.3 Mobility limitations of persons with psychotic disorder (Study II)**

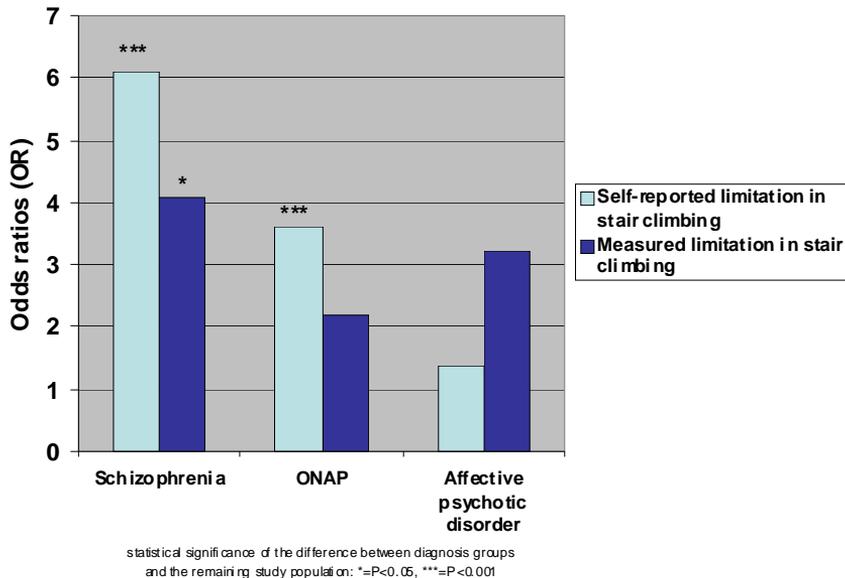
Persons with schizophrenia or ONAP reported many more limitations in mobility than those with affective psychosis, who did not differ significantly from the remaining study population. Impairments were already common in participants under 55 years in both diagnosis groups and in all functions of mobility. For example, people with schizophrenia had significantly increased odds of having difficulties in walking 500 metres (OR 7.28, 95%CI 2.7-19.37) and climbing one flight of stairs (OR 8.16, 95%CI 2.85-23.33), already under 55 years of age. In the ONAP group the odds were somewhat smaller, but still significantly increased. The handgrip strength of persons with schizophrenia and older persons with ONAP was notably weaker than in the other participants, but persons with affective psychosis did not differ from the remaining study population (Table 2 in original Study II).

Age- and gender-adjusted self-reported limitations in walking 500 metres and test-based limitations in walking (walking speed <1.2 m/s) are shown in Figure 4. Schizophrenia was associated with more than five-fold odds (OR 5.28, 95%CI 2.42-11.53) and ONAP with more than two-fold odds (OR 2.29, 95%CI 1.17-4.47) of having self-reported limitations in walking. ONAP was associated statistically significantly (OR 3.55, 95%CI 1.69-7.45) with measured limitations in walking, while schizophrenia was just under statistical significance (OR 2.64, 95%CI 0.96-7.26). The affective psychosis group did not differ significantly from the remaining study population (Table 3 in original Study II).



**Figure 4. Age- and gender-adjusted limitations in walking**

Figure 5 presents the self-reported limitations in climbing one flight of stairs and test-based limitations in walking two flights of stairs. Schizophrenia was statistically significantly associated with both self-reported (OR 6.06, 95%CI 3.05-12.02) and measured (OR 4.09, 95%CI 1.39-11.99) limitations in stair climbing, while ONAP was statistically significantly associated with self-reported limitations (OR 3.59, 95%CI 1.91-6.78). Affective psychotic disorder was not associated with limitations in stair climbing (Table 3 in original Study II).



**Figure 5. Age- and gender-adjusted limitations in stair climbing.**

After adjusting for factors other than age and gender related to mobility limitations in the general population, like smoking, obesity and chronic conditions, schizophrenia was still independently associated with significantly increased odds of having self-reported limitations in walking (OR 3.11, 95%CI 1.22-7.96) and climbing stairs (OR 4.65, 95%CI 2.15-10.03). Participants with ONAP had test-based difficulties in walking (OR 2.88, 95%CI 1.34-6.21) and self-reported difficulties in climbing stairs (OR 3.45 95%CI 1.76-6.74) (Table 3 in original Study II).

Next, we investigated whether the severity of psychiatric symptoms in persons with non-affective psychosis was associated with mobility limitations, after adjusting for those variables that have been found to be associated with mobility limitations in the total study population. Negative symptoms (OR 1.24, P=0.0475) and age (OR 1.21, P<0.0001) were independently associated with difficulty in walking, when the explanatory variables were lifetime severity of negative, positive, disorganised and depressive symptoms, smoking, obesity, type 2 diabetes, knee osteoarthritis, hip osteoarthritis, CHD and heart failure.

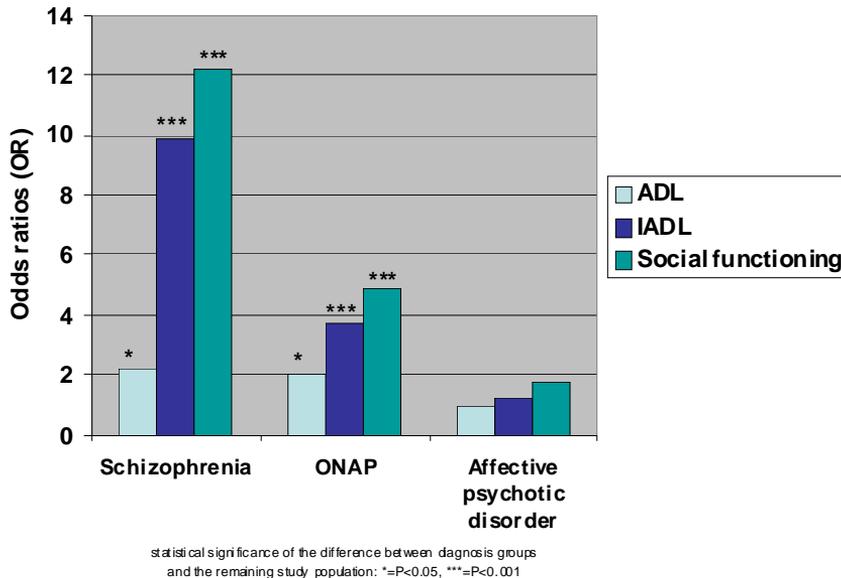
The difference in the amount of exercise between the diagnostic groups and those without psychotic disorder was seen only among persons aged 55 or older. Those with schizophrenia (53.1%,  $\chi^2=4.32$ , df=1, P=0.0377) and affective psychosis (63.2%,  $\chi^2=4.50$ , df=1, P=0.0340) reported more often than persons without

psychotic disorder (27.8%) that they do not exercise or strain themselves physically in their leisure time.

## **5.4 Everyday functioning of persons with psychotic disorder (Study III)**

Self-reported limitations in activities of daily living (ADL), instrumental activities of daily living (IADL) and social functioning were most common in persons with schizophrenia, followed by persons with ONAP. Persons with schizophrenia reported the largest limitations in IADL and social functioning. For example, 36.1% of persons with schizophrenia reported difficulties in cooking ( $\chi^2=16.36$ ,  $df=1$ ,  $P=0.0001$ ), 45.2% in heavy cleaning ( $\chi^2=11.36$ ,  $df=1$ ,  $P=0.0008$ ), 28.8% in communicating with strangers ( $\chi^2= 10.81$ ,  $df=1$ ,  $P=0.0010$ ) and 23.9% in dealing with the authorities and financial institutions ( $\chi^2=5.90$ ,  $df=1$ ,  $P=0.0152$ ). Participants with ONAP reported almost as many difficulties in IADL as those with schizophrenia, but in social functioning they reported fewer difficulties, although significantly more than the remaining study population. Participants with affective disorder did not report significantly more limitations than the remaining study population (Table 2 in original Study III).

Figure 6 presents the age- and gender-adjusted limitations of ADL, IADL and social functioning as combined domains. Schizophrenia and ONAP were statistically significantly associated with limitations in all domains. Persons with schizophrenia had almost 10-fold odds of having limitations in IADL (OR 9.85, 95%CI 4.85-20.02) and more than 12-fold odds of having limitations in social functioning (OR 12.24, 95%CI 5.55-27.03). Persons with ONAP had somewhat smaller odds of having limitations in these domains (OR 3.74, 95%CI 2.15-6.50 and OR 4.88, 95%CI 2.67-8.93, respectively). Affective psychotic disorder was not associated with limitations in either ADL, IADL or social functioning (Table 4 in original Study III).



**Figure 6. Age- and gender-adjusted limitations in ADL, IADL and social functioning.**

After adjusting for other factors that may affect functioning, such as age, gender, obesity, chronic conditions, verbal memory and fluency, expressive and receptive speech, education and vision, schizophrenia and ONAP remained significant determinants of impaired IADL and social functioning (Table 3 in original Study III).

In the logistic regression model, which analysed factors associated with difficulties in everyday functioning in the group of non-affective psychosis, age and depression were independently associated with difficulties in ADL, while age, negative symptoms, depression and verbal memory were associated with impaired IADL. Depression, distance vision and expressive speech problems were associated with difficulties in social functioning (Table 5 in original Study III).

After adjusting for age and gender, persons with schizophrenia performed more than five times weaker than those without psychotic disorder in verbal fluency (Beta - 5.60, 95%CI -7.26, -3.94) and statistically significantly also in immediate and delayed verbal memory (Beta -0.96, 95%CI -1.39,-0.54 and Beta -1.34, 95%CI -1.81,-0.88). ONAP was also significantly associated with lower performance in both verbal fluency and verbal memory. In contrast, only delayed memory was weaker in persons with affective psychotic disorder compared to those without psychotic disorder. Self-reported memory problems were not more common among persons with psychotic disorder, but those with schizophrenia reported more memory-related problems in their everyday life than those without psychotic disorder (OR 3.32,

95%CI 1.50-7.32), while other diagnostic groups did not (Table 3 in original Study III).

Persons with schizophrenia performed poorly in the memory test regardless of whether they reported subjective memory problems or not (means 4.09 and 4.35 words,  $t$ -test=0.58,  $P=0.5672$ ). In the ONAP group persons who reported subjective memory problems also performed worse in the memory tests (means 3.52 and 5.15 words,  $t$ -test=4.02,  $P=0.0002$ ). In the affective psychosis group, persons performed well in the memory test regardless of whether they reported subjective memory problems or not (means 4.57 and 5.08 words,  $t$ -test=0.86,  $P=0.3977$ ).

Persons with schizophrenia and ONAP had received assistance in their everyday activities more often (39.0%,  $\chi^2=15.33$ ,  $df=1$ ,  $P=0.0001$  and 24.6%,  $\chi^2=7.20$ ,  $df=1$ ,  $P=0.0074$ , respectively) than persons without psychotic disorder (9.5%). When we compared those subjects with schizophrenia and ONAP who had ADL limitations, 80.4% ( $\chi^2=1.48$ ,  $df=1$ ,  $P=0.2231$ ) and 85.0% ( $\chi^2=6.56$ ,  $df=1$ ,  $P=0.0105$ ) received assistance compared to 57.0% of those without psychotic disorder. In IADL limitations the proportions were 56.4% ( $\chi^2=4.13$ ,  $df=1$ ,  $P=0.0421$ ) and 47.7% ( $\chi^2=1.23$ ,  $df=1$ ,  $P=0.2682$ ) compared to 38.8% of those without psychotic disorder, and in limitations with social functioning they were 68.5% ( $\chi^2=0.28$ ,  $df=1$ ,  $P=0.5951$ ) and 59.8% ( $\chi^2=0.19$ ,  $df=1$ ,  $P=0.6636$ ) compared to 64.0% of those without psychotic disorder.

Interviewers estimated that persons with schizophrenia and ONAP needed more help than the remaining study population. About 31.2% ( $\chi^2=9.03$ ,  $df=1$ ,  $P=0.0027$ ) of those with schizophrenia and 8.5% ( $\chi^2=5.54$ ,  $df=1$ ,  $P=0.019$ ) of those with ONAP would have needed help according to the interviewer but were not provided with it, compared with 3.8% of the remaining study population.

## **5.5 Quality of life of persons with psychotic disorder (Study IV)**

Participants with a non-affective psychotic disorder other than schizophrenia had the lowest unadjusted HRQoL scores; the mean 15D score was 0.08 and the EQ-5D score 0.17 points lower than the mean of the population without psychosis. For schizophrenia these differences were 0.07 and 0.12, respectively (Table 1 in original Study IV). Adjusted with age and gender, schizophrenia, ONAP and affective psychotic disorder were all associated with decreases of 0.05-0.06 points on the 15D. On the EQ-5D the diagnoses had bigger differences: the decreases were 0.12 for schizophrenia, 0.11 for ONAP and 0.06 for affective psychotic disorder (Table 2 in

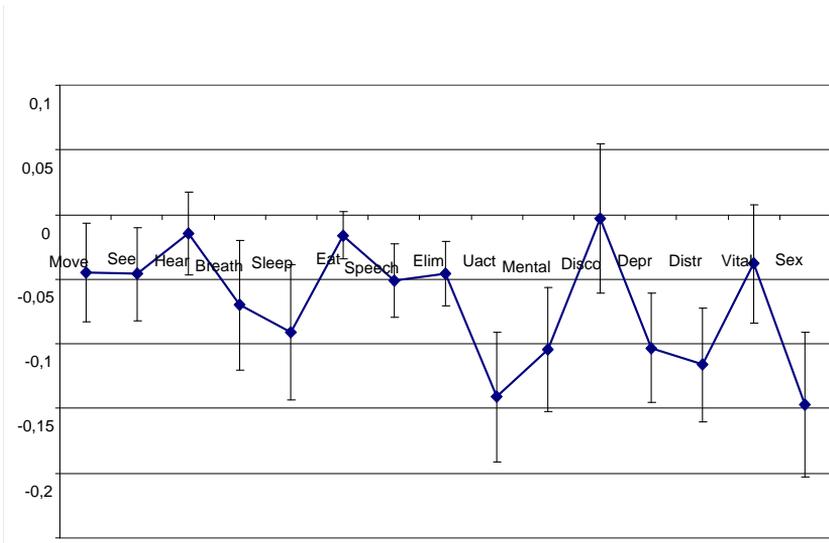
original Study IV). The HRQoL profiles of 15D are presented in Figure 7 as age- and gender-adjusted decreases from population averages.

Considering individual disorders, persons with schizoaffective disorder had the largest age- and gender-adjusted losses of HRQoL: -0.09 on the 15D and -0.15 on the EQ-5D. EQ-5D did not find any HRQoL losses for delusional or bipolar I disorder, although all disorders were associated with statistically significant decreases on the 15D (Table 3 in original Study IV).

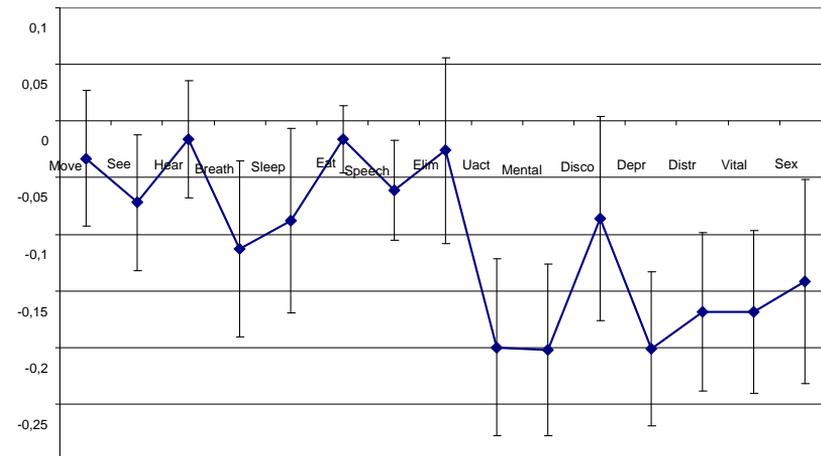
The ONAP group had the lowest unadjusted subjective QoL scores, 1.6 points below the population without psychosis and also had the largest reductions of QoL in all the regression models. Persons with schizophrenia had statistically significant reductions of subjective QoL only when adjusted for age and gender. The affective psychosis group was between the other groups. Of individual disorders, persons with schizoaffective disorder had the worst subjective QoL, whereas those with bipolar I disorder did not have a statistically significant reduction of QoL (Table 3 in original Study IV).

Current depression had a significant effect on HRQoL. Adding BDI into the models diminished the impact of disorders in EQ-5D and only schizophrenia and schizoaffective disorder were associated with statistically significant reductions of the 15D after controlling for the BDI. The situation was similar in the case of subjective QoL, except that for schizophrenia socioeconomic variables explained most of the reduction of QoL and delusional disorder was the only disorder still statistically significantly reduced after controlling for the BDI.

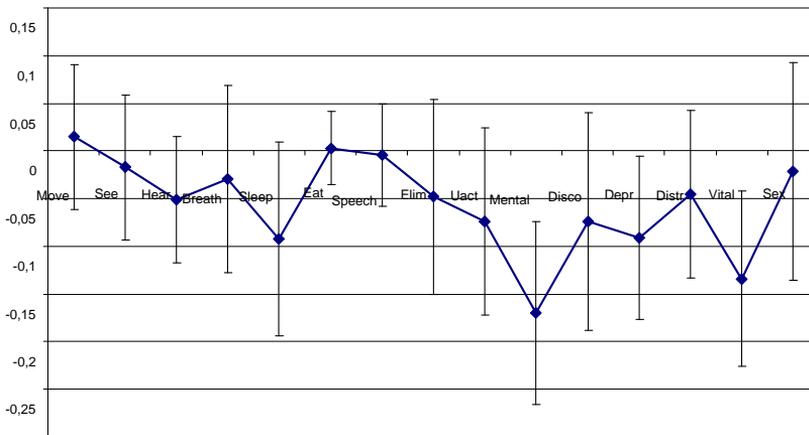
The Spearman correlations were calculated between QoL/HRQoL and clinician-rated positive, negative, disorganisation and depressive symptoms, course and outcome. For schizophrenia correlations were not statistically significant except between depressive symptoms and QoL. For schizoaffective disorder, there were large (<-0.5) negative correlations between negative symptoms, course, outcome and QoL/HRQoL. For delusional disorders none of the correlations were statistically significant. For bipolar I disorder, there were large negative correlations between depressive symptoms and HRQoL measures and moderate correlations (-0.3 to -0.5) between depression and QoL. Correlations were positive but not statistically significant between lifetime mania ratings and QoL/HRQoL scores. Negative correlations between course, outcome and QoL/HRQoL ratings were mostly moderate or large. For MDD with psychotic features, correlations were negative and large for negative symptoms and the EQ-5D and QoL and correlations between course, outcome and QoL/HRQoL ratings were negative and mostly moderate or large.



(a) Age- and gender-adjusted losses in schizophrenia



(b) Age- and gender-adjusted losses in schizoaffective disorder



(c) Age- and gender-adjusted losses in bipolar I disorder

15D dimensions are: Move=mobility, See=vision, Hear=hearing, Breath=breathing, Sleep=sleeping, Eat=eating, Speech=speech, Elim=elimination, Uact=usual activities, Mental=mental function, Disco=discomfort and symptoms, Depr=depression, Distr=distress, Vital=vitality, Sex=sexual activity

**Figure 7. Age- and gender-adjusted losses on different health-related quality of life dimensions (15D) with 95% confidence intervals in persons with (a) schizophrenia, (b) schizoaffective disorder and (c) bipolar I disorder compared to the remaining study population (0-level).**

# 6 Discussion

## 6.1 Principal findings

In this general population study, it was found that persons with schizophrenia often had impairments in their habitual distance and near vision. In contrast, those with ONAP or affective psychotic disorder did not have increased odds of impaired VA after adjusting for age and gender. Participants with schizophrenia reported fewer problems in reading newspaper print and television subtitles than they actually had according to the VA measurements. Persons with psychotic disorder who were currently using antipsychotics did not have more impaired VA than those who did not use antipsychotics, but phenothiazine use was associated with impaired near vision. Participants with schizophrenia or ONAP did not report more ophthalmologic diseases than the remaining study population. Existence of undiagnosed diseases is possible however, since persons with schizophrenia had had their vision examined during the past five years much less often than the rest of the study population. Although diabetes has a large impact on vision in the general population (Buch et al., 2004), this was not found to be the case in this study in participants with psychotic disorders. The reason for this may be the relatively small number of participants with psychotic disorder with comorbid type 2 diabetes and high prevalence of impaired VA in the schizophrenia group that may have masked the effect of diabetes.

According to the results of this study, persons with schizophrenia and ONAP have a considerably higher risk of mobility limitations than those without psychotic disorder. In the general population, difficulties in mobility are rare under the age of 55, but they are quite common among participants with schizophrenia in particular. They reported difficulties in all levels of mobility, even in walking short distances and climbing stairs. For example, problems in walking 100 metres while carrying five kilograms or climbing one flight of stairs are probably associated with some difficulties in everyday functioning due to poor physical condition. Handgrip strength was the only objective measure of physical condition in persons aged 30-54 years. In persons with schizophrenia, it was almost one standard deviation weaker than in the remaining study population, even in participants under 55 years. Such weak muscle strength is likely to have an impact on functional capacity. Persons with affective psychotic disorder did not differ from the remaining study population in mobility. Negative symptoms and age were independently associated with difficulty in walking in participants with schizophrenia and ONAP.

In everyday functioning, persons with schizophrenia and ONAP had considerable impairment across several measures. Participants with schizophrenia in particular had a multi-fold risk of difficulties in IADL and social functioning, but they had difficulties in ADL, too, in contrast to those with ONAP. The results of the cognitive tests showed the same pattern: persons with schizophrenia and ONAP performed significantly worse than those without psychotic disorder in both verbal fluency and verbal memory. Those with schizophrenia also reported significantly more problems in everyday life because of poor memory than the other groups. Participants with affective psychotic disorder did not differ from the remaining study sample, apart from cooking in IADL, taking care of matters together with other people and communicating with strangers in social functioning and in delayed verbal memory in cognitive tests. Thus, the functional capacity of persons with a lifetime history of affective psychosis is relatively well-preserved, whereas persons with schizophrenia and ONAP have impairments in most areas of everyday functioning.

Participants with schizophrenia and ONAP had difficulties in understanding speech and speaking understandably. These kinds of difficulties hinder relationships with other people, as was seen in this study, where problems in speaking understandably were independently associated with social functioning. Other factors associated with difficulties in social functioning were depression and distance vision. Age and depression were independently associated with difficulties in ADL, while age, negative symptoms, depression and verbal memory were associated with difficulties in IADL. Interviewers who met the participants in their homes were able to evaluate the need for assistance based on living conditions and the participant's behaviour at home. Those persons with schizophrenia and ONAP who had self-reported limitations had received assistance in their everyday activities more often than those without psychotic disorder, but the help they received was not sufficient enough.

Schizoaffective disorder was associated with the lowest HRQoL in all measures used, followed by schizophrenia and bipolar I disorder. Schizophrenia and bipolar disorder were associated with a relatively larger loss of HRQoL than subjective QoL, but the opposite was true for delusional disorder and MDD with psychotic features. The findings suggest that the subjective suffering reported by people with schizophrenia is smaller than the objectively measured functional disability related to the disorder. Current depression, measured with the Beck Depression Inventory, explained most of the loss of HRQoL and QoL found, which questions the utility of utility-based HRQoL measurements as sole outcome measures in psychotic disorders and also emphasises the importance of treating depressive symptoms in psychotic disorders.

## **6.2 Comparison to previous studies**

### **6.2.1 Visual acuity**

In this study, VA was measured with the participant's own glasses, while with two exceptions (Punukollu and Phelan, 2006, Ungvari et al., 2002) previous studies have measured VA with the best optic corrections. All recent studies have found a high prevalence of VA problems in people with schizophrenia (Smith et al., 1997, Ungvari et al., 2002). Although participants with schizophrenia did not report more ophthalmologic diseases, they may have had more undiagnosed diseases due to lack of regular examinations. A previous study found ocular abnormalities in 83% of Australian inpatients (Smith et al., 1997). Some antipsychotic drugs, particularly phenothiazines and quetiapine, may be associated with higher risk of developing ophthalmologic diseases (Isaac et al., 1991, Marder et al., 2004, Punukollu and Phelan, 2006, Ruigomez et al., 2000) and antipsychotic medication may also temporarily cause blurred vision as an anticholinergic side effect (Lieberman, 2004). Thus, the results are consistent with previous research and suggest: (1) visual impairment is common in persons with schizophrenia, (2) this may be caused by inadequately corrected refraction errors or possible undiagnosed ophthalmologic diseases, and (3) anticholinergic side effects of antipsychotic medication may cause impairment in near vision.

### **6.2.2 Mobility limitations**

Mobility of people with psychotic disorder has been scarcely studied. Most studies have concerned the effectiveness of physical activity and exercise programmes for people with psychotic disorder (Daumit et al., 2005, Osborn et al., 2007, Roick et al., 2007). In these studies exercise has been a way to treat the obesity and glucose dysregulation often associated with psychotic disorders, but the problems in mobility in itself have not been studied. In this study the prevalence of physical inactivity was high, as in most previous studies (Daumit et al., 2005, Osborn et al., 2007, Roick et al., 2007). The muscle strength of persons with schizophrenia was weaker than in the remaining study population and this is consistent with possibly the only previous study about the subject (Callison et al., 1971). Mobility is a neglected area of functioning research in psychiatry, although it is an important factor in everyday functioning. In a recent longitudinal study of elderly persons, geriatric impairments – e.g. muscle strength, physical capacity, vision and cognition – were more strongly associated with the onset on disability in ADL than chronic diseases and nearly as strongly associated with the onset of disability in mobility (Chaudhry et al., 2010).

### **6.2.3 Everyday functioning**

Everyday functioning of people with schizophrenia and other psychotic disorders has been studied widely. In most studies the impairments in activities of daily living have been explained by cognition and symptoms. An American research group (Bowie et al., 2010, Bowie et al., 2008, Bowie et al., 2006) found in their analyses that neuropsychological performance has both a direct and an indirect effect on everyday functioning. Depressive symptoms have a direct effect on interpersonal skills and work skills and negative symptoms have a direct effect on interpersonal skills but a mediated effect through neuropsychological functioning on work skills and community activities. A study from the same research group by Leifker et al. (2009) found that positive symptoms of hallucinatory behaviour and suspiciousness also predicted real-world residential outcomes.

The present study replicated previous findings regarding the relationship between everyday functioning and negative and depressive symptoms (Bowie et al., 2006, Green, 1996, Jin et al., 2001, Patterson et al., 1998, Simon et al., 2007). Depression was independently associated with difficulties in ADL, IADL and social functioning and negative symptoms were associated only with IADL. This study showed that reduced vision and problems in speaking understandably were also associated with social functioning. The findings related to reduced vision are particularly noteworthy, since vision might have been easily corrected with proper glasses. However, it may also be that poor functioning in itself is the reason for the incapability to acquire glasses.

As was the case in the present study, the needs of patients with severe mental illness are often unmet. Sometimes the health care personnel do not succeed in recognising the needs of the patients (Phelan et al., 1995). A Nordic multicentre study found that 18.7% of patients with schizophrenia have serious unmet needs in their daytime activities (Middelboe et al., 2001). Another study from the same sample found that health care personnel and patients agree most on the needs concerning functional skills (Korkeila et al., 2005).

### **6.2.4 Cognitive functioning**

In this study it was possible to use only simple cognitive measures for cognitive assessment, in contrast to many other studies, in which cognition was measured with a wide range of neuropsychological tests. Both verbal fluency and verbal memory were impaired in persons with non-affective psychotic disorder, and verbal memory was independently associated with difficulties in IADL. The results of this study

were in concordance with previous studies, since verbal memory and fluency have often been found to be impaired in persons with psychotic disorder (Bowie et al., 2008, Godbout et al., 2007, Heinrichs and Zakzanis, 1998, Mesholam-Gately et al., 2009). In a recent review by Bora et al. (2009) individuals with affective psychosis performed slightly, but not statistically significantly better than those with schizophrenia in verbal memory. In our study only delayed verbal memory was poorer in persons with affective psychotic disorder than in the remaining study population.

### **6.2.5 Quality of life**

Most previous studies measuring quality of life in persons with psychotic disorder have been clinical studies, where participants are currently in treatment (Knapp et al., 2008, Prieto et al., 2004). Compared to these studies, the HRQoL values were better in this population-based study.

The results of this study are in concordance with the previous literature in suggesting that, on average, schizoaffective disorder is associated with more severe impairment in HRQoL than schizophrenia (Narvaez et al., 2008). In previous studies, current depressive (Narvaez et al., 2008) or depressive/anxiety (Meijer et al., 2009) symptoms have had the strongest correlation with QoL, which was found in this study too, while correlations with positive, negative or disorganisation symptoms were not significant. Depression has also been found to be a strong correlate of life dissatisfaction using the Life Satisfaction Score (Allardt, 1973, Koivumaa-Honkanen et al., 1996, Koivumaa-Honkanen et al., 1999). The effect of depressive symptoms on EQ-5D scores was seen also in a study comparing treatment-seeking individuals, where those with bipolar disorder had significantly better scores than those with schizoaffective disorder (0.77 and 0.67 respectively), and where participants with schizoaffective disorder had more depressive symptoms (Kulkarni et al., 2008).

According to previous reviews, the HRQoL or QoL of people with bipolar disorder are lowered even in the euthymic phase, but clearly less than in the manic phase (Namjoshi and Buesching, 2001, Dean et al., 2004, Michalak et al., 2005). In reviews comparing schizophrenia and bipolar disorder, most studies show that bipolar disorder is either milder than schizophrenia or comparable to it (Dean et al., 2004, Michalak et al., 2005). A study of community-dwelling patients, using the Quality of Well-Being scale or SF-36, did not find statistically significant difference between the disorders (Depp et al., 2006). These results are in concordance with the results of this study, where participants with schizophrenia had somewhat lower scores in EQ-5D and subjective QoL, but only slightly lower scores in 15D.

## **6.3 Methodological discussion**

### **6.3.1 Strengths**

This study was based on a population-based sample and therefore it was able to provide information on the magnitude of the problems of those with psychotic disorder in the general population, which has public health relevance. The participants in the PIF study are a fairly representative sample of community-dwelling psychosis patients in Western countries in terms of their occupational status and living conditions. The great majority of persons with psychotic disorders had received treatment and their occupational outcome was poor. The participation rate in the Health 2000 Survey was high, which gives us a better opportunity to make generalisations from the results. Also sampling weights were used to adjust for sampling variability and errors caused by non-response. The purpose of sampling weights is to match the observed data to correspond to the distribution of the target population, and therefore our results can be generalised to the target population, i.e. the Finnish population.

Psychiatric diagnostics were based not only on the SCID-I interview but also on case records from hospital and outpatient treatments, which made the diagnostic procedure thorough and reliable. Three experienced clinicians made the final best-estimate diagnoses and the kappa values between the raters were either good or excellent regardless of whether the diagnosis was based on both the SCID interview and case records, or case records alone.

The data gathered in the Health 2000 Survey and the PIF Survey are extensive. Health 2000 is one of the very few general population surveys that have included both a detailed psychiatric assessment and an extensive medical examination. Generally the functional capacity of people with schizophrenia and other psychotic disorders is not studied with a population-based sample. This kind of research model gives us the opportunity to compare functional limitations in people with psychotic disorder to the general population.

### **6.3.2 Limitations**

Because of the relatively small sample of subjects with psychotic disorder, we were not able to study all potentially interesting or relevant associations. For example, we could not investigate the effect of individual antipsychotic drugs on VA. The affective psychosis group in particular was quite small and heterogeneous. The two disorders (MDD and BD I) included in the group are quite different by their nature and also outcome, and this makes the analysis of the results of this diagnostic group rather difficult in some respects. We could compare the severity and symptoms of

the non-respondents with those of the respondents, which revealed that people with more severe affective psychotic disorder seemed to be somewhat underrepresented. Likewise, the ONAP group consisted of different disorders that could not be investigated separately because of the small sample size. However, in Study IV we also compared the effect of individual psychotic disorders on quality of life, realising that the statistical power to detect differences between the groups was relatively low.

Because the study is cross-sectional, the problem of causality arises, especially in studying mobility limitations. We cannot determine whether inactivity and poor health cause impaired mobility or whether weakened mobility causes inactivity and poor health. Self-report questions and functional tests did not measure exactly the same functions, but both were available for participants aged 55 and older and found considerable limitations in mobility in persons with non-affective psychosis.

The HRQoL and QoL results represent the individual disability of participants. Therefore the results underestimate the total burden of psychotic disorders because mortality and the burden of caregivers are not taken into account. The mean age in all diagnostic groups was relatively old, over 50 years. Because psychotic disorders usually have an onset before the age of 30, the impact of psychoses may be relatively larger in young people when somatic conditions are rare.

Self-report is sometimes considered problematic when studying people with severe mental illness (Bowie et al., 2007, Harvey et al., 2007). Poor insight, cognitive impairment or psychotic symptoms may distort the way people see their situation. Persons with schizophrenia did not report as many problems in vision as the measured tests indicated, and they performed poorly in the memory test, regardless of whether they reported memory problems or not. However, in Study II it was possible to compare self-reported mobility and measured mobility and it was found that people with psychotic disorder are capable of reporting about their situation quite accurately. A Finnish study of psychiatric patients found that patients with schizophrenia self-assessed their work capacity and economic status closer to the objective assessment than patients with MDD or anxiety disorder (Koivumaa-Honkanen et al., 1999). Regardless of its limitations, self-report should remain in use as one way to study the functional capacity of people with psychotic disorder. It could be particularly useful in clinical care when there is a lack of time or resources for more detailed assessments.

## 6.4 Clinical implications

The functional limitations of people with psychotic disorder may have a severe impact on their life. The symptoms related to psychotic disorder are often difficult, and problems in everyday life, caused by reduced vision, difficulties in walking or performing housework, make it even more difficult for these people to cope in society and live independently.

It is important to pay more attention to the vision of persons with psychotic disorder and especially those with schizophrenia. The visual acuity for both distance and near should be examined yearly. This kind of monitoring could be done during an annual medical examination. If vision is found to be reduced, the patient should be referred to an ophthalmologist or optician and, if needed, patients should receive help in acquiring new glasses. An American consensus meeting also recommends annual visual examinations for patients with schizophrenia aged over 40 years and every second year for patients under 40 years (Marder et al., 2004).

Antipsychotic medication may have negative side effects that lower the quality of life. In this study, participants who used any antipsychotics did not have impaired VA significantly more often than the remaining study population, but phenothiazine use was associated with significantly impaired near VA. Since impairment in distance VA was not found, the most likely explanations for reduced VA are either blurred near vision due to anticholinergic side effects or uncorrected refractive errors. There is no reason to assume that the latter would be more common in subjects using phenothiazines than in users of other types of antipsychotics. Clinicians should be aware of these potential side effects of antipsychotic medication and consider changing to another antipsychotic if the patient has significant vision problems.

Impairments in walking and climbing stairs limit everyday life considerably. Mobility limitations should be one of the aspects assessed by health care providers when they meet with the patients. The reasons for mobility limitations should also be assessed. The reason can include physical illness, poor condition or the extrapyramidal side effects of antipsychotic medication. As in many prior studies, negative symptoms were associated with limitations in mobility in this study, too. It may be that the lack of initiative makes people physically inactive, which in turn may cause impaired mobility, after which it is even more difficult to start exercising. This kind of 'vicious circle' should be stopped in its early phase. If poor condition is the reason for mobility limitations, patients should be encouraged to exercise. It may be a challenge to spur people with psychotic disorder to become more active, but patients may also be more ready to consider lifestyle changes than clinicians realise (Archie et al., 2007).

Attention should be paid to performance in everyday skills. One part of the patients overestimated their functioning in everyday activities. When the patients were not aware of the actual need for help, the home interviewers were able to evaluate it. Home visits by health care personnel should be a part of treatment, as problems in functional capacity are easier to evaluate in a home setting than in the doctor's practice. Some of the problems in functional capacity can be quite easily corrected, such as reduced vision. The reasons for the functional capacity limitations of the patients should be evaluated individually and comprehensively.

Despite the symptoms related to their disorder and reductions in functional capacity, patients with psychotic disorder are still relatively satisfied with their well-being, which is a positive thing. There is a discrepancy between subjective HRQoL and objective disability in people with schizophrenia. It should be taken into account when the results of HRQoL tests are used for health policy or health economics purposes. Because current generic health utility instruments are not the best possible means of measuring the HRQoL of people with psychotic disorder, Brazier (2010) has suggested that a new psychotic-specific preference-based measure should be developed.

People with psychotic disorder need information about healthy lifestyles, and community psychiatric institutions could offer nutrition courses and exercise programmes, which could improve social contacts as well (Roick et al., 2007).

## **6.5 Implications for future research**

People with schizophrenia have reduced vision, compared to the general population, and the reasons for it may be numerous. To find out the causes of the reduced visual acuity of people with psychotic disorder, studies that include a thorough ophthalmologic assessment are needed.

To evaluate the reasons for mobility limitations, e.g. difficulties in walking and climbing stairs, there should be research on musculoskeletal disorders and diseases in persons with psychotic disorders. Although general medical conditions in persons with psychotic disorders have received a great deal of attention in recent years, this has been a neglected area.

Longitudinal studies are needed to understand the development of reduced functional capacity, such as visual impairment, mobility limitations and decreases in muscle strength, ADL and IADL. This demands studies that follow the functioning

of people with first-episode psychosis. It is important to find out, how much and what kinds of difficulties are already present in the first phases of the disorder, what are the factors that contribute to the decline in functional capacity and which are the most effective forms of rehabilitation.

Since current instruments for measuring health-related quality of life do not provide reliable information about the disability associated with psychotic disorders, new psychosis-specific preference-based measures should be created.

# 7 Conclusions

Based on the results of the present study, people with psychotic disorder and especially with schizophrenia, have a significantly lower level of functioning than the general population. Their limitations are considerable and appear in all levels of functional capacity that were investigated in this study: vision, mobility, everyday functioning and quality of life. Schizophrenia was associated with by far the most severe functional limitations, whereas persons with affective psychoses did not differ from the remaining study population in many of the functions examined. People with schizophrenia and ONAP had problems in almost all areas in functional capacity. It has been previously known that people with psychotic disorder have decreases in functioning, but this study showed the large magnitude of the various problems compared to the general population of the same age.

Some problems that we found could often be easily corrected, like problems in visual acuity. It is important to include the assessment of visual acuity in the annual medical examinations of patients with chronic psychotic disorders, and patients should also receive help in acquiring glasses.

The everyday functioning of people with psychotic disorder is studied extensively, but one important factor, mobility, has not been widely studied. Mobility limitations are one of the key determinants of functional disability in the general population, and therefore the high prevalence of mobility limitations in persons with schizophrenia and other non-affective psychoses was alarming. Physical activity should be one area of rehabilitation in persons with psychotic disorder, and the causes of mobility limitations should be carefully assessed.

Simple self-report scales are useful in clinical care. However, some patients overestimate their functional capacity, and therefore real-life functioning should be also assessed by home visits and other more intensive measurements. Improvement of everyday functioning is one of the key goals of rehabilitation of patients with psychotic disorders. In order to achieve this goal, it is important to assess carefully the causes of the limitations of each patient.

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