

Positive psychological interventions in the treatment of schizophrenia

A systematic review of the effects of positive psychology on well-being and symptoms of people with schizophrenia

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Abstract

Schizophrenia is a mental disorder that often takes a chronic course and is characterized by severe symptoms with high negative impact on affected individuals, their environment and society. Traditional treatments for schizophrenia primarily focus on the reduction of symptoms but still the chance for relapse is high and rates of full recovery remain low. Therefore, there is a need for new treatments that possibly lead to a better outcome of schizophrenia. The relatively new field of positive psychology offers an approach that has to be considered in this context. Positive psychological interventions (PPI's) aim to improve well-being by focusing on participants' strengths, resources, skills and what works well in their lives. By now little is known about the effectiveness of PPI's on well-being and psychopathology of schizophrenia patients. Hence, this literature review focuses on available PPI's in the treatment of schizophrenia. Through a systematic search strategy a small number of eligible studies was found ($n=17$) and examined in terms of various intervention characteristics, effectiveness and acceptability. Even though the quality of the reviewed studies is low and consequently, results should be interpreted with care, overall results show high levels of acceptability of PPI's in comparison with control groups and positive effects on well-being as well as schizophrenia symptoms. One high quality study reported even long-lasting positive effects of the evaluated PPI on quality of life (effect sizes: $p = 0.035$, 0.058 and 0.014 , respectively; Cohen's $d = 0.29-0.34$), so that it can be concluded that PPI's are promising measures in the treatment of schizophrenia patients. Future large-scale research is needed in order to examine which PPI-components work best and are most effective for schizophrenia patients. Also additional modes of delivery such as online- and self-help programs should be taken into consideration when evaluating PPI's as treatment for schizophrenia.

Introduction

Schizophrenia: symptoms, comorbidity & epidemiology

Around 5.5 per 1000 people come down with schizophrenia at some point in their lifetime (Goldner, Hsu, Waraich & Somers, 2002). Goldner et al. (2002) suggest that this number reflects the actual worldwide variation in the distribution of schizophrenia. Other authors estimate a median lifetime prevalence of 4 per 1000 persons (McGrath & Susser, 2009). The disorder seems to appear more often in men than women and also occurs earlier in male patients (Picchioni & Murray, 2007). Usually the onset of schizophrenia is at late adolescence or early adult life. Nearly 40% of the male patients have an onset of schizophrenia by the age of 19, whereby this is the case in only 23% of the female patients (van Os & Kapur, 2009; Loranger, 1984).

Schizophrenia is a mental disorder that often takes chronic course and is characterized by so-called negative and positive symptoms. Symptoms are negative if they include emotions and behaviours that healthy people do have but that are missing in individuals with schizophrenia. These deficits include blunted affect, apathy, flat expressions or little emotion, inattentiveness, poverty of speech, inability to experience pleasure (anhedonia), lack of desire to form relationships and lack of motivation (Nguyen, Frobert, McCluskey, Golay, Bonsack & Favrod, 2016; Robinson et al., 1999; Velligan & Alphs, 2008). Negative symptoms are mostly less responsive to medication and more contributing to a bad quality of life of schizophrenics than positive symptoms (Velligan & Alphs, 2008). Symptoms are positive if they are normally not experienced by healthy people, they are excessed or distorted normal functions such as disordered thoughts and speech, psychosis, including olfactory, auditory, visual, gustatory and/or tactile hallucinations and delusions (Nguyen et al., 2016; Darjee, Ofstegaard & Thomson, 2017; Kneisl & Trigoboff, 2009).

Also cognitive abilities and their possible deficits are highly relevant in schizophrenia and form a core symptom and important predictor of treatment success and outcome (Bozikas & Andreou, 2011; Goldberg, Keefe, Goldman, Robinson & Harvey, 2010). In schizophrenia cognitive deficits can affect working memory, long-term memory, episodic memory, attention, processing-speed, executive functioning and learning (van Os & Kapur, 2009; Goldberg et al., 2010; Kurtz, Moberg, Gur & Gur, 2001). According to Kohler, Walker, Martin, Healey and Moberg (2010) individuals with schizophrenia do have difficulties in the perception of (facial) emotions what often leads to poor social functioning and quality of life. Another critical symptom among schizophrenia is that about 30 to 50% of the affected individuals do not accept the fact that they have an illness and therefore often do not adhere well to treatment (Baier, 2010). Aside from these symptoms, psychiatric comorbidities are very common in individuals suffering from schizophrenia: substance abuse, depressive and anxiety symptoms, PTSD, panic disorder and OCD often co-occur (Buckley, Miller, Lehrer & Castle, 2009). Smoking cigarettes and using cannabis is very common among individuals with schizophrenia (Gregg, Barrowclough & Haddock, 2007; De Leon & Diaz, 2005). Furthermore individuals with schizophrenia have an increased risk for physical health problems – the disorder is associated with obesity, unhealthy

diets, alcohol use, sedentary lifestyles, excessive smoking and possible adverse effects of antipsychotics, resulting in decreased life expectancy, up to twenty-five years lower than life expectancy of the general population (Laursen, Munk-Olsen & Vestergaard, 2012).

Schizophrenia: impact & costs

Schizophrenia is relatively low in prevalence but regarding the severe consequences for affected individuals, their family and relatives and taking into account the often only partially effective and acceptable treatments, it is a leading cause of disability and health expenditure worldwide and thereby raises great public interest and concern (Murray, Jones, Susser, van Os & Cannon, 2002; DeVylder, 2015).

Schizophrenia has great impact on the individual level: as already mentioned life expectancy is considerably lower for schizophrenia patients due to co-occurring psychiatric and physical morbidities (Laursen et al., 2012). Due to many studies mortality is also higher in patients because of a high risk of suicide and selfharming behavior that is associated with schizophrenia (Harris & Barraclough, 1997; Inskip, Harris & Barraclough, 1998; Modestin, Zarro & Waldvogel, 1992; Erlangsen, Eaton, Mortensen & Conwell, 2012). According to De Hert, McKenzie and Peuskes (2001) 10% of the schizophrenia patients commit suicide. Inskip et al. (1998) report a lifetime suicide mortality of 4-5%. One important factor that has to be considered in schizophrenia patients is quality of life, including satisfaction in different areas of life, based on criteria such as social functioning, activities and physical health (Huppert, Weiss, Lim, Pratt & Smith, 2001). Based on their study Skantze, Malm, Dencker and May (1990) concluded that many schizophrenia patients have a low quality of life, even if they have good physical- and living conditions. Another relevant factor is that mentally ill people, schizophrenics included, are at higher risk of becoming victims of violent and non-violent crime and that they more often commit violent crimes than the general population (Maniglio, 2008; Valença & Moraes, 2006). Furthermore, the disorder usually has an additional impact on relatives and friends of the affected individual. These people do often worry about the future, financial position and safety of the affected relatives, especially when living close to them (Thornicroft et al., 2004).

Besides the costs for affected individuals and their relatives, schizophrenia has an impact on society. Thornicroft et al. (2004) stated that schizophrenia accounts for 1.1 % of the global burden of disease. An enormous cost factor on both, economic and individual level is the low employment rate of schizophrenics. Compared to the general population for which rates vary from 84-93%, only 5-23% of the patients do have an employment. Long-term unemployment obviously can lead to financial problems – in Europe most of the schizophrenia patients receive welfare benefits or get financial supplements from family members (Thornicroft et al., 2004). Additionally Folsom et al. (2005) mentioned schizophrenia as a risk factor for homelessness. In their study they found 20% of the schizophrenics were homeless.

Thus schizophrenia is a disorder with severe (chronic) symptoms that often affects individuals already early in life and has high impact on the patients and their respective environments as well as on society.

Schizophrenia: prevention & treatment

Regarding the symptoms and the severe consequences of schizophrenia there is a great need for effective prevention- and intervention methods. Aside from psychopharmacological treatment with antipsychotic drugs, schizophrenic (psychotic) episodes can be prevented and treated through different psychotherapeutic and psychosocial measures (DeVylder, 2015; Morrison et al., 2014). Several studies reported the efficacy of cognitive behavioral therapy and general support therapy in the prevention of episodes of schizophrenia (Addington, Epstein, Liu, French, Boydell & Zipursky, 2011; Morrison et al., 2004; Morrison et al., 2007). Additionally family focused therapy, including psychoeducation, stress management, communication training and problem-solving skills training have been shown effective in the prevention of schizophrenic episodes, respectively relapse (Miklowitz et al., 2014; Pharoah, Mari, Rathbone & Wong, 2010).

When diagnosed with schizophrenia, patients can be treated through a number of different measures that were found to be effective and are recommended in the treatment of the disorder: *assertive community treatment* has been found to reduce homelessness and hospitalizations (Dixon et al., 2010); *supported employment* assists affected individuals in obtaining and maintaining an employment (Dixon et al., 2010); *(social) skills training* has been found to help individuals in the improvement of social interactions (Smith, Bellack, & Liberman, 1996); *cognitive behavioral therapy* helps in reducing symptom severity and coping with symptoms (Dickerson, 2000; Dixon et al., 2010); *token economy interventions* seem to be effective in targeting behaviour (Dixon et al., 2010); *family-based therapy* has been found to reduce symptoms, stress, relapse and hospitalization rates and to benefit medication adherence (Dixon et al., 2010); and *cognitive remediation* as well as *metacognitive training* can help to improve cognitive abilities and reduce cognitive and positive symptoms (Eichner & Borna, 2016; Medalia & Choi, 2009).

Despite these (partially) effective prevention and intervention measures the rates of full recovery from schizophrenia still remain comparatively low and chance for relapse after recovery is vast. Therefore, there always remains a need for discovering new methods that could improve outcomes of schizophrenic episodes and well-being (Robinson, Woerner, McMeniman, Mendelowitz & Bilder, 2004). Recent interventions for schizophrenia that follow principles from the traditional clinical psychology usually focus on symptomatology and the deficits patients suffer from and generally try to reduce them. This approach possibly could be improved by an additional focus on what is good in the lives of patients and what actually works well. Hawton, Sutton, Haw, Sinclair and Deeks (2005) suggest that especially the active treatment of affective symptoms of schizophrenia, such as a sense of worthlessness, low self-esteem and hopelessness may lower the suicidal risk of

schizophrenics. Thus, present interventions may be improved by focusing on the enhancement of well-being and by increasing positive feelings such as hope and self-esteem. These processes are addressed within the relatively new field of positive clinical psychology (Gillham & Seligman, 1999).

Positive psychology

Positive psychology concentrates on an individual's strengths, well-being, happiness, satisfaction and optimism rather than deficits (Gillham & Seligman, 1999). The leader of the positive psychology movement, Martin Seligman, states that positive psychology brings back "the idea of a fulfilled individual and a thriving community", he views the building of strength as possibly "the most potent weapon in the arsenal of therapy" (Seligman, 2002, p. 3).

Why a focus on positive emotions and well-being is assumed to be effective in clinical practice can be explained via broaden-and-build theory that is often used within positive psychology: this theory argues that the experience of positive emotions *broadens* attention, cognition and actions of the individual (broaden effect). While the broaden effect occurs on the short-term, it helps *building* skills and physical, intellectual, psychological and social resources on the long-term that again are useful in future problem-solving and coping with difficult situations (build effect) (Fredrickson, 2004).

Thus positive psychology interventions (PPI's) replenish the field of traditional psychology by interventions that improve positive experiences and traits of individuals and stimulate the best qualities, talents and skills of people (Duckworth, Steen & Seligman, 2005). Examples of PPI's are loving-kindness meditation (LKM), mindfulness therapy (MT), acceptance and commitment therapy (ACT), (self-) compassion-focused therapy (CFT), well-being therapy (WBT) and (group) positive psychotherapy (Fredrickson, Cohn, Coffey, Pek & Finkel, 2008; Grossman, Niemann, Schmidt & Walach, 2004; Powers, Zum Vörde Sive Vörding & Emmelkamp, 2009; Lucre & Corten, 2013; Fava, Rafanelli, Cazzaro, Conti & Grandi, 1998; Fava, Ruini, Rafanelli, Finos, Salmaso, Mangelli & Sirigatti, 2005; Seligman, Rashid & Parks, 2006). Considering that schizophrenia often is chronic in nature, it seems profitable to implement this kind of interventions and help affected individuals not to mainly focus on what is bad about a life with schizophrenia diagnosis but focus on what is best and what can be done to live a fulfilled life despite the disorder. There is, for example, mindfulness meditation which can be defined as the ambition to consciously pay attention to a present experience without judging the situation but trying to maintain this attention over time to eventually obtain stable, nonreactive present moment awareness (Miller, Fletcher & Kabat-Zinn, 1995). Mindfulness exercises are possibly effective for schizophrenia patients with regard to the handling of positive symptoms as hallucinations: patients could learn not to judge upcoming hallucinations. Another PPI that may help patients to cope with hallucinations or other occurring symptoms is the practice of the acceptance of symptoms. This is actually connected with mindfulness and nonjudgmental experience. "Acceptance does not imply 'giving in' to symptoms, but instead recognizes that thoughts are products of mental events rather than the self" (Gaudiano & Herbert, 2006, p. 417). Moreover the enhancement of (self-)

compassion may be helpful in preventing and reducing feelings of shame and guilt in schizophrenia patients that potentially result in stigma and thereby in treatment avoidance (Miller & Mason, 2005). This is a PPI that additionally may help schizophrenics to get out of social isolation and improve social functioning. Social skills training could also be effective in reaching these last two goals.

In sum, research has shown that these PPI's have been effective mainly for samples consisting of individuals diagnosed with mood disorders as depression (Bolier, Haverman, Westerhof, Riper, Smit & Bohlmeijer, 2013; Sin & Lyubomirsky, 2009). For other psychiatric disorders there is relatively little known about the effectiveness of such interventions. This is also the case for schizophrenia. Moreover, no literature review exists so far that addresses positive psychology interventions in the treatment of schizophrenia, so that the aim of this present review is to investigate the following questions:

1. Which interventions deriving from the field of positive psychology do exist so far in the treatment of schizophrenia?
2. What is the effect of positive psychological interventions (PPI's) on:
 - a. Positive psychological processes, well-being and quality of life of people with schizophrenia?
 - b. The symptoms of schizophrenia and comorbid conditions?

Method

To conduct this study the guidelines of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) were used.

Search strategy

We searched in three electronic databases: Scopus, PsycInfo and Web of Science. Within each database terms related to 'positive psychology' and 'well-being' in combination with 'schizophrenia' and terms respectively related to 'intervention' and 'effectiveness' or 'outcome' were used. The whole search strategies and used search terms are shown in table 1 (see Appendix A). For recent literature the mentioned databases were searched from 1998 (start of the positive psychology movement) to June 2017.

Inclusion & exclusion criteria

Studies that were found through the used search strategies and that possibly were eligible for this review, were first screened on title and then on abstract. The studies that were not excluded by then, were assessed regarding to their eligibility on basis of the whole paper. To be included in this review studies had to meet the following criteria. Studies had to: (1) investigate the effectiveness, acceptability and/or feasibility of interventions that are based on positive psychological theories, thus

intend to enhance positive emotions, behaviour and/or cognitions and wellbeing; (2) include adult participants (age of 18 or older) diagnosed with schizophrenia; (3) provide an assessment of wellbeing of the participants or related constructs. Studies were excluded from the review if they: (1) investigated interventions that were based on physical activity to improve well-being of participants (i.e. yoga); (2) studied the effect of interventions for depression on participants diagnosed with schizophrenia; (3) researched interventions that were either based on Integrated Psychological Therapy (IPT) or Metacognitive Training (MCT) even if these interventions included positive psychological measures because there already exist reviews that studied the effect of these two forms of therapy on people with schizophrenia (Eichner & Berna, 2016; Müller, Roder & Brenner, 2007; Roder, Müller & Schmidt, 2011); (4) used a sample that consisted for more than ten percent out of people with other diagnoses than schizophrenia or schizoaffective disorder; (5) were not freely available.

Data extraction

The data that were used for this review were extracted by only one researcher. From the included articles, the following data were collected: (1) characteristics of the intervention: used positive psychological component(s) that aimed to improve well-being, reduce symptoms and/or to impart information/knowledge; target population that got addressed through the intervention; goal(s) of the intervention: enhancement of positive psychological processes and well-being, symptom reduction and/or psychoeducation; duration and total number of sessions (intensity); if there was guidance needed and the used format (individual/group); (2) characteristics of the reported study: study design, including randomization process, number of control groups and the treatment these control groups got; sample sizes per group; points of assessment, including measurements during the intervention and at follow-up; outcome measures, concerning effectiveness and acceptability/satisfaction of the interventions with respective used instruments and study results regarding the effectiveness and acceptability of PPI's in comparison with control groups.

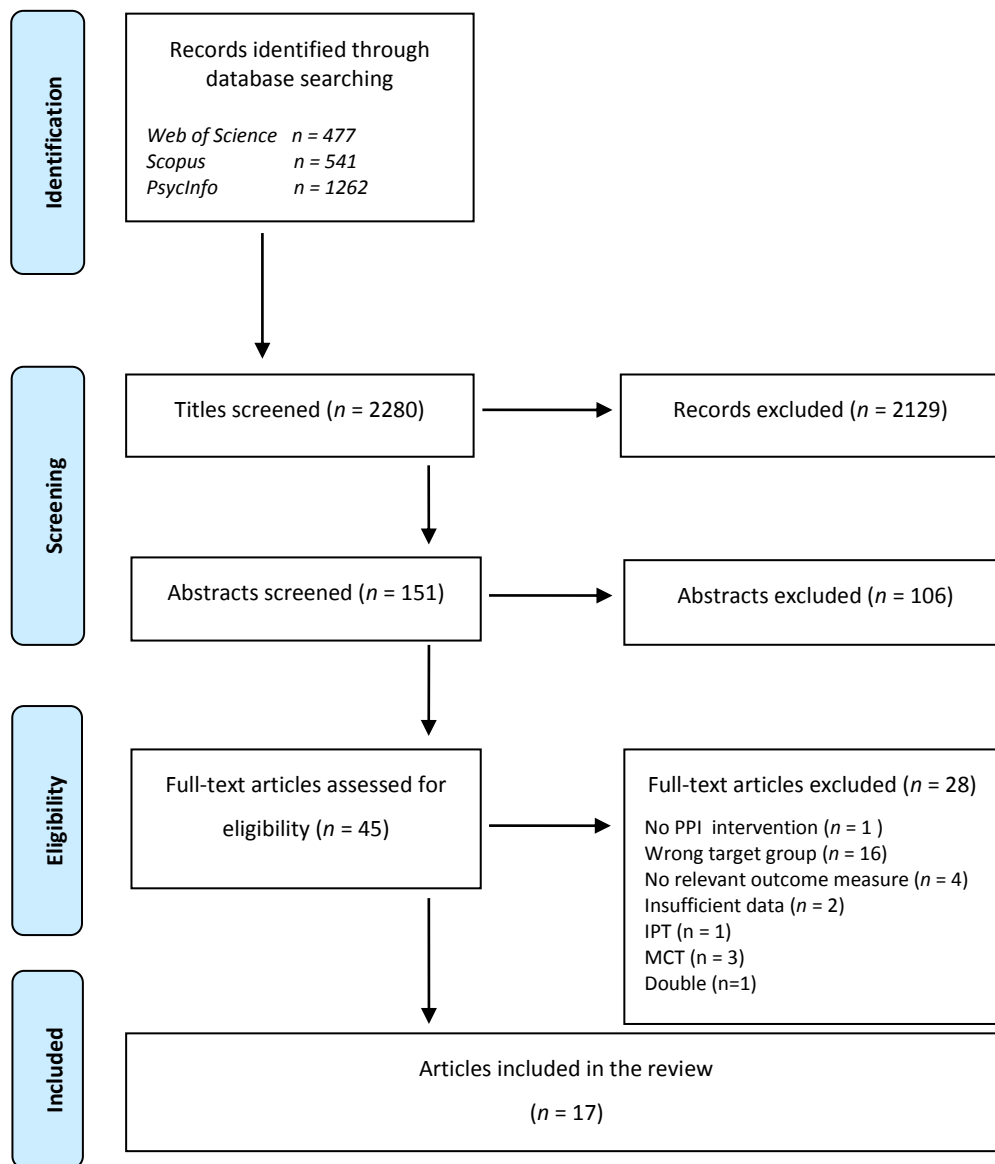
The checklist for quality assessment of interventions from Henselmans, Haes and Smets (2012) was used to estimate the quality of the reviewed studies. Therefore, data regarding randomization, blinding, loss of participants to follow-up, method of analysis, validity of measures, the equivalence of conditions, the consideration of group differences and sample size were collected and are presented in table 2 (see Appendix B).

Results

Selection of studies

In total there were 2280 articles found through electronic databases searches. The flowchart of the selection process is to find in figure 1. After excluding studies at the title screening phase ($n = 2129$), 151 article abstracts were reviewed. Of the 45 articles assessed for eligibility on the full texts,

Figure 1. *Flowchart of the study selection process (PRISMA, 2009).*



17 were included in the review. The other 28 articles were excluded due to various reasons (see flowchart). As well as the data extraction also the study selection is done by only one researcher.

Intervention characteristics

The 17 articles described 17 different interventions with each including (different) positive psychological components. The intervention characteristics of the studies are displayed in table 3. Numbers 1-17 were ascribed and used to refer to the different interventions in the following sections.

Goal and target population. The general target populations of the interventions were adult individuals diagnosed with schizophrenia (1;3;10;11), both individuals with schizophrenia and those with schizoaffective disorder (5;8;9;12;13;17), individuals with schizophrenia or any related disorder according to either the DSM-IV or the ICD-10 (2;4;14;15), or individuals with schizophrenia, with any

Table 3. *Intervention characteristics, ordered by mode of delivery and year.*

	First author (year)	Name of the intervention	PPI component(s)	Target group	Goal	Intensity	Guidance
<i>Individual</i>							
1	Mayhew (2008)	Compassionate Mind Training (CMT)	(1) Fostering (self-) compassion (2) Relaxation exercise	Adult psychotic voice hearers	(1) Increase in participants' positive emotions and self-compassion (2) Decrease participants' hostile voices, levels of anxiety, depression, paranoia and self-criticism	Duration: 12 weeks Sessions: 12	Yes
2	Shawyer (2012)	Treatment of Resistant Command Hallucinations (TORCH)	(1) Fostering acceptance of symptoms (ACT) (2) Mindfulness exercise (3) Enhancing motivation	Adults with command hallucinations in psychotic disorders	(1) Increase in confidence in being able to resist commands and coping with them, functioning and quality of life (2) Decrease in illness severity and reduction of symptoms	Duration: 15 weeks Sessions: 15	Yes
3	Grant (2014)	Recovery-Oriented Cognitive Therapy	(1) Skills training (2) Fostering acceptance of symptoms (ACT) (3) Increase activity	Adults with schizophrenia diagnosis	(1) Increase in well-being and functioning (2) Breaking a 20-year cycle of hospitalizations	Duration: 18 months Sessions: 70	Yes
4	Priebe (2015)	Computer-mediated intervention: DIALOG+	(1) Enhancing efficient communication	Adults with psychosis	(1) Improve clinician-patient meetings, make them more client-centred and increase the patients' quality of life	Duration: 6 months Sessions: 6	Yes
<i>Group</i>							
5	Voruganti (2006)	Adventure- and Recreation-Based Group Intervention	(1) Fostering personal growth (2) Increase activity	Adults with schizophrenia	(1) Get participants to flourish again (2) Decrease participants' physical, psychological and social limitations	Duration: 8 months Sessions: 16	Yes
6	Ferguson (2009)	Well-Being Therapy (WBT)	(1) Skill training	Mentally disorder offenders	(1) Increase in subjective well-being and quality of life of participants (2) Reduction of symptoms	Duration: 6 weeks Sessions: 6	Yes

Table 3. *Intervention characteristics, ordered by mode of delivery and year (continued).*

	First author (year)	Name of the intervention	PPI component(s)	Target group	Goal	Intensity	Guidance
<i>Group</i>							
7	Johnson (2011)	Loving-Kindness Meditation (LKM)	(1) Fostering (self-) compassion (2) Mindfulness exercise	Adults with schizophrenia and significant negative symptoms	(1) Increase in positive affect and help participants to flourish again (2) Reduction of negative symptoms	Duration: 6 weeks Sessions: 6	Yes
8	Meyer (2012)	Positive Living (PL)	(1) Skills training (2) Mindfulness exercise (3) Encouraging strengths (4) Savoring positive moments/emotions	Adults diagnosed with schizophrenia	(1) Building strengths and meaning, increase in positive emotions (2) Reduction of symptoms	Duration: 16 weeks Sessions: 11	Yes
9	Vázquez Pérez (2012)	Coping with stress self-efficacy (CSSE)	(1) Skills training	Adults diagnosed with schizophrenia or schizoaffective disorder	(1) Increase in specific self-efficacy for coping with stress	Duration: 8 weeks Sessions: 15	Yes
10	Cai (2014)	Humor Intervention	(1) Skills training	Adults diagnosed with schizophrenia	(1) Increase in well-being of participants	Duration: 5 weeks Sessions: 10	Yes
11	Chien (2014)	Mindfulness-based psychoeducation programme (MBPP)	(1) Mindfulness exercise	Chinese adults diagnosed with schizophrenia	(1) Increase in participants' acceptance and management of their thoughts and emotional responses (2) Psychoeducation	Duration: 24 weeks Sessions: 12	Yes
12	Davis (2015)	Mindfulness Intervention for Rehabilitation and Recovery in Schizophrenia (MIRRORS)	(1) Mindfulness exercise	Adults diagnosed with schizophrenia who follow a vocational rehabilitation program	(1) Increase in work function (work performance and weekly hours worked) of participants	Duration: 16 weeks Sessions: 32	Yes

Table 3. *Intervention characteristics, ordered by mode of delivery and year (continued).*

	First author (year)	Name of the intervention	PPI component(s)	Target group	Goal	Intensity	Guidance
<i>Group</i>							
13	Favrod (2015)	Positive Emotions Program for Schizophrenia (PEPS)	(1) Savoring positive moments/emotions (2) Skills training (3) Relaxation exercise	Adults diagnosed with schizophrenia	(1) Increase the anticipation and maintenance of positive emotions (2) Reduction of negative symptoms (3) Psychoeducation	Duration: 8 weeks Sessions: 8	Yes
14	Taylor (2015)	Social Cognition and Interaction Training (SCIT)	(1) Skills training (2) Social cognition exercise (e.g. ToM)	Adults diagnosed with schizophrenia	(1) Improvements in participants' social functioning and well-being	Duration: 8 weeks Sessions: 16	Yes
15	Wang (2016)	Mindfulness-based psychoeducation group program (MPGP)	(1) Mindfulness exercise (2) Skills training	Chinese adults diagnosed with schizophrenia	(1) Improvements in participants' functioning, awareness, acceptance and management of their symptoms (2) Reduction of symptoms (3) Psychoeducation	Duration: 24 weeks Sessions: 12	Yes
16	Ascone (2017)	Compassion Focused Imagery Intervention	(1) Fostering (self-) compassion	Adult psychotic patients with paranoid ideation	(1) Increase in positive affect (2) Reduction of paranoid symptoms	Duration: 10 minutes Sessions: 1	Yes
17	Schutt (2017)	Cognitive Enhancement Therapy (CET)	(1) Cognitive skills training (2) Social cognition exercise (3) Encouraging social interaction	Adults diagnosed with schizophrenia	(1) Improvement of perspective-taking, gistful processing of information and social functioning (2) Reduction of neurocognitive and social cognitive deficits	Duration: 8 weeks Sessions: 6	Yes

related disorder or bipolar disorder, including bipolar affective psychosis (6;7;16). Ferguson, Conway, Endersby and McLeod (6) applied a well-being intervention to a very specific population, namely to mentally disorder offenders, from which 92% were diagnosed with (paranoid) schizophrenia. Specific aims of the interventions varied but generally the goals were in line with positive psychology, thus enhancing individuals' (specific) positive emotions, cognitions, behaviour, well-being and/or quality of life but also complementing traditional clinical psychology by concurrently aiming to reduce positive, negative and/or cognitive symptoms of schizophrenia (1;2;3;6;8;9;11;13;15;16;17). Other interventions primarily aimed to enhance positive psychological processes but did not focus on symptom reduction (5;7;10;12;14). Priebe et al. (4) had the special aim to improve clinician-patient meetings, make them more client-centred to be able to focus on positive change and thereby favour the patients' quality of life. A number of interventions additionally included psychoeducation into the treatment aiming to provide sufficient information about schizophrenia (2;3;11;13;15). None of the interventions had the goal to merely reduce symptoms.

PPI-components. Positive psychological components that were mostly used in the interventions were *mindfulness exercises* that got implemented not only within interventions that used mindfulness as a basis but also as additional component in interventions that mainly used other methods (2;7;8;11;12;15). Also *skills training* got implemented in various forms. Skills that were practiced and thereby wanted to enhance self-efficacy include coping, goal setting, social- and planning skills and the behavioural expression of emotions (2;3;6;8;9;10;13;14;15). The experience of hallucinations got addressed through the training of coping skills and by *fostering the acceptance of symptoms* (2;3). Two interventions tried to enhance (social) cognition abilities through *social cognition exercises* and *cognitive skills training* programs, addressing attention, memory, problem solving, perspective-taking, gistful processing of information and social context appraisal (14;17). Another often used PPI component was the *fostering of (self-) compassion*. Thereby both compassion towards others as well as self-compassion were aimed to get improved which was often done through imagery (1;7;16). Imagery as well as a so-called gratitude letter were tools that helped to include the practice of *savouring positive moments/emotions* and capitalizing/anticipating (present and past) pleasant experiences, another important PPI-component (8;13). Within the intervention, evaluated by Meyer, Johnson, Parks, Iwanski and Penn (8) and the one studied by Cai, Yu, Rong and Zhong (10) the *encouraging of strengths*, such as humor, were used to enhance positive emotions and well-being of participants. Other interventions had additional components that *increased activity* of participants (3;5). Voruganti et al. (5) described an adventure- and recreation-based intervention that used activation of participants and new experiences to *foster personal growth* and flourishing of the individuals. Grant, Reisweber, Luther, Brinen and Beck (3) tried to enhance honesty and foster honest disclosure within the treatment of a schizophrenia patient. Mayhew et al. (1) and Favrod et al. (13) additionally made use of *relaxation exercises*. PEPS, the Positive Emotions Program for schizophrenia, evaluated by Favrod et al. (13), also included the modifying of defeatist thinking:

participants developed positive alternative thoughts that could be used when getting confronted with terrifying, negative and incongruous ideations. Furthermore Schutt et al. (17) used the *encouraging of social interaction*, whereas others either tried to *enhance motivation* (2) or *enhance efficient communication* (4).

Intensity and mode of delivery. The interventions varied in duration from one day, including one session (16) to 18 months with 70 sessions (3). Three interventions were implemented over 5 to 6 weeks with respectively between 6 to 20 sessions (6;7;10). Others lasted 8 weeks and included 15 to 16 sessions, thus about two sessions per week (9;14) or a total of 6-8 sessions within these 8 weeks (13;17). Both Mayhew et al. (1) and Shawyer et al. (2) evaluated interventions that lasted 12, respectively 15 weeks with each one weekly session. Two programs included 11 to 32 sessions distributed over a period of 16 weeks (8;12). Furthermore there were three treatments lasting 24 weeks, containing 6 to 12 sessions (4;11;15). Voruganti et al. (5) investigated the effects of an intervention that was implemented over 32 weeks, including in total 16 sessions.

With regard to the mode of delivery of the interventions it is to say that all of the studies reviewed evaluated treatment programs that were guided by a professional. Most of the interventions were group interventions, thus delivered within a group of participants (5-17). Only four interventions were delivered individually, through face-to-face contact with a clinician, psychologists or therapist (1-4).

Study characteristics & quality of the studies

The study characteristics are presented in table 4.

Design. High quality studies that evaluate an intervention or treatment should apply a randomized controlled trial design. Eight of the 17 studies used a randomized controlled trial (RCT): three of them, namely Chien et al. (11), Shawyer et al. (2) and Wang et al. (15) respectively distributed their participants over three different groups: the experimental group, one group where participants received another intervention treatment and a third group where individuals either received treatment as usual (TAU) or were just assigned to a waiting list. Five RCT-studies had two groups included in their design (4;10;12;14;16). Vázquez Pérez et al. (9) and Voruganti et al. (5) conducted studies respectively using a quasi-experimental design with two groups but without distributing the participants to the different groups in a random way. Vázquez Pérez et al. (9) reported that they used a RCT, but in consideration of an unexpected incident during the randomization process and a former pairing of individuals with same demographic variables, it is not considered that this process was unbiased randomized. The remaining seven studies were non-controlled studies, using one intervention group (1;3;6;7;8;13;17). Grant et al. (3) and Mayhew et al. (1) evaluated the interventions through a case series- or respectively a case report study.

Sample size. According to a checklist for quality assessment of interventions that got applied by Henselmans, De Haes and Smets (2012), a study should include at least 35 participants per

Table 4. *Study characteristics, ordered by quality of study design.*

	First author (year)	Study design	N participants per condition (drop-out)	Outcome measures related to effectiveness (corresponding instruments)	Outcome measures related to feasibility & acceptability (corresponding instruments)	Results: effectiveness (effect size)	Results: feasibility and acceptability
<i>High quality</i>							
4	Priebe (2015)	Parallel-group, cluster-randomised trial study; two-group pre/post-test design	DIALOG+: n=94 (14) Control: n=85 (7)	(1) Subjective quality of life [SQOL] (MANSA) (2) Number of unmet needs (CANSAS) (3) Self-efficacy (GSS) (4) Mental well-being (WEMWBS) (5) Psychopathology (PANSS) (6) Social outcomes (SIX) (7) Therapeutic relationship (STAR-P)	(1) Treatment satisfaction (CSQ-8) (2) Costs of care (CSRI)	(1) SQOL: DIALOG+ > control group (d=0.29-0.34) (2) Sign. fewer unmet needs in treatment group (d=0.65) (3) Sign. better objective social outcomes of treatment group (d=0.50) (4) No sign. differences between groups in any of the other secondary outcomes	(1) Mean total costs were lower in the treatment group (2) No sign. differences between groups in treatment satisfaction
15	Wang (2016)	Randomized trial study; three-group pre/post-test design	MPGP: n=46 (2) CPGP: n=46 (2) TAU: n=46 (3)	(1) Level of psychosocial functioning (SLOF) (2) Number of rehospitalizations (3) Psychopathology (PANSS) (4) Level of recovery (QPR) (5) Insight into illness (ITAQ) (6) Performance mindfulness skills (FFMQ)	NM	(1) Functioning: MGP and CPGP both > TAU; MGP > CPGP (P=0.02 and 0.006) (2) Number of rehospitalization: MGP sign. less than CPGP and TAU (3) Psychotic symptoms sign. reduced in MGP with greater reduction than CPGP (4) Level of recovery: MGP and CPGP both > TAU; MGP > CPGP (MD =3.4 and 8.3, P=0.01 and 0.0008, respectively) (5) Insight: MGP > CPGP and TAU (6) Mindfulness skills in MGP sign. Improved (paired t=7.12, P=0.003)	NM

A>B= A significantly better than B; NM= Not measured; U= Unknown

Table 4. *Study characteristics, ordered by quality of study design (continued).*

	First author (year)	Study design	N participants per condition (drop-out)	Outcome measures related to effectiveness (corresponding instruments)	Outcome measures related to feasibility & acceptability (corresponding instruments)	Results: effectiveness (effect size)	Results: feasibility and acceptability
<i>High quality</i>							
11	Chien (2014)	Multicentre randomized trial study; three-group pre/post-test design	MBPP: n=36 (3) CPEP: n=36 (3) TAU: n=35 (1)	(1) Level of psychosocial functioning (SLOF) (2) Number of rehospitalizations (3) Psychopathology (BPRS) (4) Insight into illness (ITAQ)	NM	(1) Functioning: MBPP and CPEP both > TAU; MBPP > CPEP (2) Durations of rehospitalizations sign. reduced in MBPP group (3) Psychopathology: MBPP and CPEP both > TAU; MBPP > CPEP (4) Insight: MBPP > CPEP and TAU	NM
<i>Controlled studies</i>							
16	Ascone (2017)	Randomized experimental pilot study; two-group repeated measures design	CF: n=U (0) Control: n=U (0) Total n=51	(1) Self-criticism, self- reassurance and happiness (FSCRS) (2) Self-compassion (SCS) (3) Negative and positive affect (4) Sympathetic arousal (skin conductance level) (5) Psychopathology: paranoid ideations (PC)	(1) Perceived subjective benefit	(1) Self-reassurance and happiness: CF > Control (2) Negative affect and paranoid ideations sign. decrease in both groups (3) No sign. effect on self- compassion and sympathetic arousal	(1) No sign. differences in perceived benefit (2) Sign. more positive comments on CF than on control group (3) Sign. more negative reactions in Control group relative to CF
5	Voruganti (2006)	Prospective case- control-study: two- group pre/post- test pilot study	GBP: n=23 (0) Waitinglist: n=31 (0)	(1) Global functioning (GAF) (2) Psychopathology (PANSS, SSTICS, SIP) (3) Self-esteem (ASIS) (4) Weight	(1) Qualitative reports	(1) Sign. increase in self- esteem and global functioning in GBP (2) Psychopathology: marginal reduction in perceived cognitive deficits and functioning in GBP group (3) Strikingly sign. weight loss in GBP group	GBP participants report positive experiences: (1) satisfaction derived from group participation (2) feelings of accomplishment (3) development of trusty relationships (4) changed perspective on life

Table 4. *Study characteristics, ordered by quality of study design (continued).*

	First author (year)	Study design	N participants per condition (drop-out)	Outcome measures related to effectiveness (corresponding instruments)	Outcome measures related to feasibility & acceptability (corresponding instruments)	Results: effectiveness (effect size)	Results: feasibility and acceptability
<i>Controlled studies</i>							
2	Shawyer (2012)	Randomized trial study; three-group pre/post-test design	TORCH: n=21 (1) Befriending: n=22 (2) Waitinglist: n=17 (9)	(1) Compliance with harmful command hallucinations (Interview) (2) Psychopathology (PANSS, modified GAF, PSYRATS) (3) Global functioning (modified GAF) (4) Quality of life (QLESQ) (5) Acceptance of symptoms (VAAS, BAVQ-R) (6) Insight into illness (IS)	(1) Treatment satisfaction (CSQ, qualitative feedback)	(1) Confidence in resisting commands in both treatment groups > WL (2) Decrease of psychopathology in both treatment groups > WL (3) Quality of Life: In both treatment groups > WL (4) No sign. differences between the treatment groups found (5) Only improvements in TORCH tended to emerge or remain at follow-up	(1) Mean levels of satisfaction were similarly high across both treatment groups (2) Ratings of problem improvement: TORCH > Befriending (3) The majority of participants reported that their therapy sessions made them feel “better” or “much better” (85%)
12	Davis (2015)	Randomized trial pilot study; two- group pre/post- test design	MIRRORS: n=18 (3) Intensive Support: n=16 (2)	(1) Work performance (WBI) (2) Psychopathology (PANSS)	(1) Treatment satisfaction (CSQ) (2) Engagement (attendance rates, home practice log data) (3) Qualitative program evaluation	(1) Hours worked: MIRRORS > IS (d=0.76) (2) Work performance: MIRRORS > IS (d=0.82) (3) No results presented regarding psychopathology	(1) High levels of satisfaction with the treatment reported by MIRRORS- participants (2) MIRRORS- participants attended an average of 77% of sessions, higher than the set standard (70%) (3) Participants also indicated they found the material interesting, enjoyed group discussions, and wished that the program was longer

Table 4. *Study characteristics, ordered by quality of study design (continued).*

	First author (year)	Study design	N participants per condition (drop-out)	Outcome measures related to effectiveness (corresponding instruments)	Outcome measures related to feasibility & acceptability (corresponding instruments)	Results: effectiveness (effect size)	Results: feasibility and acceptability
<i>Controlled studies</i>							
14	Taylor (2015)	Randomized trial study; two-group pre/post-test design	SCIT: n=21 (5) TAU: n=15 (4)	(1) Emotion perception (FEIT) (2) Theory of Mind (Hinting Task) (3) Attributional style (AIHQ) (4) Cognitive insight (BCIS)	(1) Engagement (attendance and attrition rates) (2) Treatment satisfaction (satisfaction questionnaire) (3) Perceived subjective benefit (5-point Likert scale: goal achievement; use of group skills; confidence	(1) Emotion perception: SCIT better than TAU (d=0.24) (2) No other effect of the intervention was found on any of the other measures used	(1) SCIT participants attended a mean of 14.4 out of 16 sessionsa (90%) (2) SCIT participants enjoyed the group and found it beneficial (3) 83% would like to be involved in a similar group in the future (4) 22% would have preferred individual work (5) 11% indicate there were components they did not like
9	Vázquez Pérez (2012)	Randomized trial pilot study; two- group pre/post- test design	CSSE: n=9 (2) Waitinglist: n=5 (0)	(1) Psychopathology (BPRS- E) (2) Overall well-being (WI) (3) Number of relapses	(1) Treatment satisfaction (SCI)	(1) Reduction of psychotic symptoms in CSSE > WL (d=6.27) (2) Well-being: CSSE > WL (d=0.65) (3) No relapses in both groups	(1) CSSE participants report higher perceived changes in symptoms and satisfaction with these changes (d=5.53)
10	Cai (2014)	Randomized trial pilot study; two- group pre/post- test design	HT: n=15 (U) Control: n=15 (U)	(1) Psychopathology (PANSS) (2) Depression (BDI) (3) Anxiety (STAI) (4) Sense of humor (MSHS)	NM	(1) Psychopathology: Sign. decrease in both groups, but total PANSS score: HT > Control (2) Depression and anxiety: HT > Control (3) Sense of humor: HT > Control	NM

Table 4. *Study characteristics, ordered by quality of study design (continued).*

	First author (year)	Study design	N participants per condition (drop-out)	Outcome measures related to effectiveness (corresponding instruments)	Outcome measures related to feasibility & acceptability (corresponding instruments)	Results: effectiveness (effect size)	Results: feasibility and acceptability
<i>Uncontrolled studies</i>							
13	Favrod (2015)	One-group pre/post-test pilot study	PEPS: n=37 (6)	(1) Psychopathology (SANS) (2) Depression (CDSS) (3) Beliefs over own capacity of savoring things (SBI)	NM	(1) Sign. reduction in avolition-apathy, anhedonia, asociality (d=0.50-0.57). (2) Sign. reduction in depression scores (d=0.91) (3) Affective flattening or blunting, alogia and attention scales of the SANS did not change (4) Total SANS-score and average total SBI-score showed small, non- significant effect sizes	NM
7	Johnson (2011)	One-group pre/post-test pilot study	LKM: n=18 (2)	(1) Positive affect (Modified DES) (2) Psychopathology (CAINS beta) (3) Experience of pleasure (TEPS, SBI) (4) Psychological recovery (SPWB, THS, SWLS)	(1) Engagement (attendance rates and self-report of meditation practice) (2) Treatment satisfaction and perceived benefits/challenges of LKM (treatment satisfaction questionnaire)	(1) Sign. increased frequency and intensity of positive emotions (d=0.78) (2) Sign. decrease in total negative symptoms (d=1.54), anhedonia (d=1.50) and asociality (d=0.50) (3) Different outcomes regarding the experience of pleasure, effect sized varying from d=-0.31 to 0.77 (4) Environmental mastery (=0.50), self-acceptance (d=0.47 and satisfaction with life (d=0.71) improved (5) Small/no changes in hope and purpose in life	(1) Attendance rate was 84% for the intent-to-treat sample and 91% for completers (2) Completers practiced a mean of 3.7 days per week (3) A majority (n=10) reported LKM led to a sense of peace and relaxation (4) Many (n=8) enjoyed social aspects of LKM

Table 4. *Study characteristics, ordered by quality of study design (continued).*

	First author (year)	Study design	N participants per condition (drop-out)	Outcome measures related to effectiveness (corresponding instruments)	Outcome measures related to feasibility & acceptability (corresponding instruments)	Results: effectiveness (effect size)	Results: feasibility and acceptability
<i>Uncontrolled studies</i>							
8	Meyer (2012)	One-group pre/post-test pilot study	PL: n=16 (3)	(1) Psychological well-being (SPWB) (2) Beliefs over own capacity of savoring things (SBI) (3) Hope (DHS) (4) Self-esteem (SERS-SF) (5) Recovery (RAS) (6) Psychopathology (BSI) (7) Social functioning (SFS)	(1) Engagement (attendance rates) (2) Treatment satisfaction (satisfaction and feedback form)	(1) Sign. increase in overall well-being, hope and savoring (2) Self-esteem only improved from baseline to post-intervention, not maintained at follow-up (3) Sign. improvements in symptoms, recovery, social engagement and interpersonal communication (4) No sign. effects on the total score for social functioning	(1) Attendance rate was 77% for intent to treat sample, 87% for completers (2) Majority reported a favorable response on the satisfaction questionnaire (enjoyable, useful, helping to enjoy life) (3) 69% reported that exercises were only somewhat easy to understand
6	Ferguson (2009)	One-group pre/post-test pilot study	GAP: n=14 (0)	(1) Psychopathology (PANAS; PANSS, NSS) (2) Psychological well-being (SWLS) (3) Future directed thinking (FTT) (4) Depression and anxiety (HADS) (5) Hopelessness (BHS)	NM	(1) Sign. positive effects for negative affect, satisfaction with life, positive future thinking, depression, hopelessness and negative symptoms of psychosis (2) Sign. lower level of depression was not maintained at follow-up (3) No other variables showed change over the research period.	NM

Table 4. *Study characteristics, ordered by quality of study design (continued).*

	First author (year)	Study design	N participants per condition (drop-out)	Outcome measures related to effectiveness (corresponding instruments)	Outcome measures related to feasibility & acceptability (corresponding instruments)	Results: effectiveness (effect size)	Results: feasibility and acceptability
<i>Uncontrolled studies</i>							
1	Mayhew (2008)	One-group pre/post-test case series design	CMT: n=7 (4)	(1) Key beliefs about voices (BAVQ) (2) Self-criticism and self- reassurance (FSCRS, FSCS) (3) Psychopathology (SCL- 90) (4) Individuals' rank relative to their dominant auditory hallucination (VRS) (5) Self-compassion (SCS, weekly diary)	NM	(1) Decrease in symptoms, BAVQ-scores, malvolent voices and self-criticism for all participants (2) Hostile voices where often transformed, becoming more reassuring, less persecutory and less malevolent.	NM
17	Schutt (2017)	One-group pre/post-test pilot study	CET: n=6 (1)	(1) Neurocognitive performance (MATRICS battery) (2) Functional abilities (UPSA) (3) Depression, self-efficacy, residential experiences (Interviews)	(1) Treatment satisfaction (Interviews)	(1) No sign. positive effects; only indications of positive changes in some participants	(1) Participants reported enjoying the computer exercises (2) Continuing positive feedback in relation to perspective- taking exercises, encouraging positive feedback to others and psychoeducation
3	Grant (2014)	Case report study; pre/post-test design	CT-R: n=1 (0)	(1) Psychosocial functioning (GAS) (2) Psychopathology (SANS, SAPS) (3) Neurocognitive performance (CNB) (4) Functional abilities (UPSA-B)	NM	(1) Improvement in global functioning, UPSA-B- and CNB scores (2) Reduction of avolition- apathy and positive symptoms (3) Everyday functional skills and scores on the neurocognitive battery increased	NM

condition to be able to generalize the findings to the target population. This criterion is met only by three of the ten controlled studies (4;11;15) and by one uncontrolled study from Favrod et al. (13) who applied the Positive Emotion Program for schizophrenia to more than 35 participants (n=37). Grant et al. (3) applied a recovery-oriented cognitive therapy to only one woman with a 25-years history of schizophrenia. Thus within the most reviewed studies, the sample sizes were relatively small, largely varying from 5 to 31 participants per condition.

Drop-out. Due to the afore mentioned checklist for quality assessment for interventions, a study of high quality should observe maximum 30% loss of participants to follow-up (Henselmans et al., 2012). All controlled studies that did a follow-up assessment lost less than 30% of the participants to the follow-ups (2;4;5;9;11;12;15). This means that drop-out within these studies was no point of quality limitation. Taylor et al. (14) did not use a follow-up assessment but also had a drop-out rate lower than 30%. The study from Ascone et al. (16) lasted only one day, including one session, no follow-up, so that there was no drop-out registered. Cai et al. (10) gave no information over drop-out rates while studying the humor therapy. Also most of the uncontrolled studies did not have capital drop-out rates (3;6;7;8;13;17). Within their case series design, Mayhew et al. (1) lost 4 of the initial 7 participants, so that they eventually described results of three different cases.

Points of assessment. Most of the studies assessed their participants three times: either at pre- and post-treatment and one time during the intervention (16), or, what seemed more common, pre- and post-intervention and during one follow-up (1;2;5;6;7;15). Most of these follow-up assessments took place six months after the intervention was finished (1;2;15). There were five studies that assessed at two points, pre-post-intervention (8;10;13;14;17). Four studies conducted assessment at four points in the process (4;9;11;12): at baseline, at the end of the intervention, and at two follow-ups, respectively three and six months after the intervention (9), or instead of a second follow-up the fourth measure took place during the intervention (4;12). Chien et al. (11) conducted measurement at baseline, during the intervention and at two follow-ups. Grant et al. (3) measured five times: pre-post-intervention, two times during the course of the treatment and at a six months follow-up. A follow-up assessment is important to be able to conclude if effects of an initial intervention may or may not be long-lasting. In total six reviewed studies did not assess at follow-up and thereby lowered their quality (8;10;13;14;16;17).

Measures. To conduct a high quality study it is further important to use questionnaires and measures that are standardized, valid and reliable. Most of the 17 studies used at least partially measures that are well known, often used and are proven to have good psychometric qualities (1;3;4;5;6;8;9;11;12;13;14;15;16). However, sometimes the different instruments and their psychometrics were not described well enough to conclude whether they were standardized and of high quality or not (2;7;10;17). Thereby the quality of these four studies decreased.

Analysis. The analysis used within a study is relevant when looking at its' quality. According to the checklist of quality assessment for interventions it is important that studies use an intention-to-

treat (ITT) analysis so that overoptimistic estimates, resulting from the removal or exclusion of non-compliers, can be avoided: once randomized, always analysed (Gupta, 2011). From the ten controlled studies that were reviewed, two followed an ITT analysis (4;15). Also Johnson et al. (7), who evaluated a loving-kindness meditation intervention through an uncontrolled study, used ITT analysis. Some of the other studies did not apply an ITT analysis but were considered to meet this quality criterion because they either had no drop-outs or excluded only one single participant from analysis (3;5;6;8;11;16;17). Six of the studies did obviously not use an ITT analysis and thereby lowered their quality (1;2;9;12;13;14). As already said, Cai et al. (10) did not give any information about the loss of participants and also did not report using ITT analysis so that it was not possible to say if they applied this approach or not.

Quality of reviewed studies. By taking into account the criteria that Henselmans et al. (2012) used to check for study quality, five of the reviewed articles would be considered as reporting high quality studies, as to see in table 2 (see Appendix B) (4;5;11;15;16). But looking at the used criteria, it can be considered that some criteria are of more importance than others, as only three of the six studies had a sufficient number of participants (4;11;15). Except from the criteria *blinding* and *concealment* these studies satisfied all other criteria listed.

Well, considering the characteristic of the different studies, including study design, number of participants, drop-out, number and points of assessment, instrument qualities and analysis approach, three studies were conceived as high quality studies. These were the studies from Chien et al. (11), Priebe et al. (4) and Wang et al. (15).

Outcome measures & results

The studies differed in whether they evaluated the effectiveness and/or the feasibility and acceptability of the diverse interventions. The results are separately discussed below.

Feasibility and acceptability of the intervention. Priebe et al. (4) reported the only high quality study that looked at both, feasibility and effectiveness of the intervention. Their results addressing the computer-mediated intervention DIALOG+ showed that costs were lower in the treatment group and that this intervention was feasible and cost-saving. Also studies with lower quality indicated overall positive findings of positive psychological interventions with regard to their feasibility and acceptability (2;5;7;9;12;14;16;17). For example, the participants of the study from Voruganti et al. (5) reported positive experiences and great satisfaction with the adventure-, recreation-based group intervention. They mentioned satisfaction derived from group participation, feelings of accomplishment, the development of trusty relationships with other participants and therapists and that the intervention changed their perspective on life. Ascone et al. (16) received significantly more positive comments from their compassion focused imagery intervention group than from participants of the control group who received a control imagery intervention. Yet, perceived subjective benefit differed for the different interventions: varying from higher perceived change in the treatment group to

same perceived benefit of both groups (16;9). The majority (85%) of participants included in the study from Shawyer et al. (2) reported that the therapy made them feel "better" or "much better".

Acceptability levels of the interventions were generally high, with participants enjoying therapy, finding the intervention material interesting and useful, finding the treatment helpful to enjoy life and wishing for a longer duration of the programs (8;12;14). Nevertheless some participants (11%) of the treatment group from Taylor et al. (14) did not like all the components included in the intervention and would have preferred an individual format (22%). In contrast the results found by Johnson et al. (7) showed that many participants specifically enjoyed the social aspects of the implemented intervention. Furthermore, 69% of the participants in the study from Meyer et al. (8) reported that the exercises that were implemented in the Positive Living intervention were only somewhat easy to understand, without giving an indication of particular exercises that were difficult to understand. With regard to the often low adherence to treatment rates of schizophrenia patients, it was one positive finding made by four different studies that the respective attendance and adherence rates were high, varying from 77% to 91% (7;8;12;14).

To summarize, except from a few negative comments that were given on some of the evaluated interventions, overall acceptability of the PPI's was high. Participants were generally more satisfied with the interventions than participants of the control groups, and gave positive feedback on the PPI's.

Effectiveness of the intervention. All of the studies gave at least an indication of effectiveness of the evaluated interventions. With regard to the limited quality of most of the reviewed studies, the findings described in the following have to be considered with caution. To create a clear arrangement, the study results relating to the effects on positive psychological processes, including well-being, quality of life and compassion on the one hand and on psychopathology on the other are separated in the following.

Effects on positive psychological processes and well-being. The three studies considered as high quality studies, respectively conducted by Priebe et al. (4), Wang et al. (15) and Chien et al. (11) reported overall positive results of the evaluated interventions on PPI-processes such as subjective quality of life, level of psychosocial functioning and recovery and on mindfulness skills of participants. Also number and duration of rehospitalizations were significantly lower in treatment groups than in controls (11;15). Similar positive effects were found by the studies with lower quality. However, Ascone et al. (16) who evaluated a compassion focused intervention did not found significant improvements in self-compassion, possibly owing to limited duration (one session) of the intervention. Also Mayhew et al. (1) found positive effects of the compassionate mind training on self-criticism but not on self-compassion. Quality of life (QoL) was an outcome measure in two studies (2;4). Both studies report a significantly increased QoL of participants of the experimental groups, compared to the control groups. For example Priebe et al. (4) report even long-lasting significant effects on QoL through follow-up assessments at 3, 6 and 12 months ($p = 0.035, 0.058$ and 0.014 ,

respectively; Cohen's $d = 0.29-0.34$). Also satisfaction of life got measured by one study (6) and significantly increased, compared with the control group. Also the effects of the Positive Living intervention (Meyer et al., 8) and the Coping with Stress Self-Efficacy training (Vázquez Pérez et al., 9) showed promising effects on well-being. Johnson et al. (7) found increased frequency and intensity of positive emotions as a result of the loving-kindness meditation, whereas Taylor et al. (14) found improved emotion perception through a Social Cognition and Interaction Training. Increased belief in own capacity of savouring things was a further finding by Meyer et al. (8), but could not be recorded in the study that evaluated the Positive Emotion Program for Schizophrenia (Favrod et al., 13). Further results showed that global functioning and self-esteem could be favoured by either an adventure-, recreation-based group intervention or a recovery-oriented cognitive therapy (3;5). Davis et al. (12) evaluated the effectiveness of a mindfulness intervention for vocational rehabilitation and found that this treatment significantly improved work performance and increased the frequency of hours worked. Sense of humor was a variable that was benefitted through the humor intervention evaluated by Cai et al. (10): the intervention group showed significant improvements compared to a control group. No reviewed study reported negative or adverse effects of the PPI's.

In summary, even if there were varying effects on PPI-processes, most of the studies found positive improvements on at least one positive psychological variable. Only two from the 17 studies did not report any significant positive effect of the evaluated positive psychological treatment (13;17).

Effects on psychopathology. Most studies measured psychopathology by assessing severity and/or existence of symptoms. Two of the three high quality studies found significant reduction of psychopathology, including psychotic symptoms, compared to the control groups (11;15). The third high quality study from Priebe et al. (4) found significantly lower general psychopathological symptoms in the experimental group with effect sizes varying between follow-up assessments from $d=0.55-0.65$, but did not note any significant differences in comparison with the control group. Similar positive findings regarding psychopathology were reported by ten other studies (1;2;3;6;7;8;9;10;13;16). Some studies primarily mentioned a significant reduction of negative symptoms of schizophrenia (6;7;13), whereas others reported improvements in both positive and negative symptomatology (3;16), and again one other mainly reported reduced positive symptoms (9). Favrod et al. (13) and Ferguson et al. (6) used depression as an outcome measure and respectively found positive effect of the evaluated interventions (PEPS and WBT) on depressive symptoms. Three studies did not found such effects on psychopathology (5;12;17) and one did not use measurements to assess psychopathological improvements (14).

To sum it up, also the effects of the interventions on psychopathology were generally positive and promising. Positive as well as negative symptoms of schizophrenia got reduced by a lot of the evaluated interventions and some positive effects were found on depressive symptoms.

Discussion

The aim of this systematic review was to provide an overview about what PPI's exist so far in the treatment of schizophrenia and what effects PPI's have on well-being, symptoms of schizophrenia patients and possible comorbid conditions. Despite relatively loose inclusion- and only a few exclusion criteria the number of eligible studies was not high (n=17) but results of this review showed that a wide range of different PPI's already got implemented in the treatment of schizophrenia. These include: mindfulness interventions, compassion-focused interventions, a humor intervention, well-being therapy, loving-kindness meditation and an adventure-, recreation-based intervention, recovery-oriented therapy and different cognitive trainings. Regarding this wide range of PPI's that were evaluated through studies with predominantly lower quality, it is not possible to draw strong conclusions over the effectiveness of specific PPI's but overall results showed promising positive effects of PPI's on participants well-being, symptoms and acceptability of the interventions.

The reviewed interventions differed in type and thereby implemented PPI components in different ways. Some interventions tried to primarily focus on treating one specific skill/strength, such as the humor intervention, evaluated by Cai et al. (10) or the compassion focused imagery intervention (Ascone et al., 16) but most PPI's implemented more than one component, aiming to build more resources. For example Grant et al. (3) conducted a study that evaluated an 18 months recovery-oriented therapy on a woman with schizophrenia that implemented at least three of the following different components.

The most frequently used components were (1) mindfulness exercises: six PPI's implemented mindfulness exercises and for two of them this was the only PPI-component used; (2) skills training: three interventions used skills training as the only PPI component; (3) fostering the acceptance of symptoms; and (4) practice savouring of positive emotions/moments. These results were not surprising regarding that mindfulness interventions as well as acceptance and commitment therapy were already often evaluated and found to be effective in anxiety disorders, depression and mood symptoms (Hofmann, Sawyer, Witt & Oh, 2010; Powers, Zum Vörde Sive Vörding & Emmelkamp, 2009). Additionally, skills training already got implemented in the treatment of schizophrenia patients a long time (Smith et al., 1996). Moreover, researchers suggested the implementation of savouring interventions as being a good measure in improving negative symptoms of schizophrenia (e.g. anhedonia) (Cassar, Applegate, & Bentall, 2013). But also elements such as fostering (self-) compassion and personal growth, relaxation exercises, enhancing motivation, increase activity, enhancing efficient communication, encouraging strengths and social cognition exercises were implemented in the reviewed interventions.

Few studies examined feasibility and acceptability of the PPI's and it was expected that they generally were highly acceptable as a focus on the positive rather than the deficits may be more appealing to participants. Results gave no indications that participants were dissatisfied or unhappy with the positive psychological interventions. Overall acceptability of this kind of treatment was good

and they also did not seem to be more cost-intensive than other common interventions. This was in line with other studies that investigated PPI's and concluded that adherence to treatment and to medication got enhanced through the interventions (Ogedegbe, Boutin-Foster, Wells et al., 2012). Enhancement of medication adherence is a great point of interest in the treatment of schizophrenia as treatment adherence seems to be difficult for many schizophrenia patients resulting in unnecessary relapses (Goff, Hill & Freudenreich, 2010). Ogedegbe et al. (2012) implemented an education program with a positive-affect intervention to a population of hypertensive African Americans and measured its' effect on medication adherence. Participants who received this combined treatment showed significantly higher medication adherence than participants who only received the education program. This interesting and promising results presented by Ogedegbe et al. (2012) should definitely be taken into consideration in future treatment of schizophrenia patients to enhance medication adherence and prevent relapses. Anyhow, the results regarding existing PPI's and their feasibility and acceptability showed that PPI's get increasingly applied in the treatment of people diagnosed with schizophrenia and that they are promising in favouring treatment acceptability in general and (medication) adherence in particular.

Even though there was overall good feedback on the interventions, there remains possibility for improvement: there were some cases of dissatisfaction regarding the mode of delivery. Most studies evaluated group delivered interventions, only a few got implemented individually. Whereas many participants especially liked the group setting and the social aspects of the interventions, some would have preferred to get an individual intervention rather than get treated in groups.

Another interesting point with regard to the mode of delivery is that there was no study found that evaluated a self-help program or an online intervention that people could attend at home but considering that the internet steadily gets more important in the treatment of mental illness these modes of delivery form an interesting option for future research (Ybarra & Eaton, 2005). To conclude, although participants were generally satisfied with the PPI's and with the mode of delivery in particular there are additional modes that have to be taken in consideration in the future. Future research should examine acceptability and feasibility of online delivered interventions and self-help programs. It should investigate if a mode of delivery that gets individually tailored on preferences of participants could further enhance treatment acceptability. Furthermore upcoming studies should examine which exact PPI components are most, respectively least accepted by schizophrenia patients and therefore should implement and evaluate the different components individually.

With regard to the effectiveness of PPI's the findings showed that the interventions led to predominantly positive effects on well-being, quality of life and on symptoms of schizophrenia. The reduction of symptoms was found through most studies and is especially interesting because PPI's are not typically aiming to reduce psychopathology but to enhance positive psychological processes. However, these results match the idea of positive psychology being a complement to traditional psychology rather than representing a substitute for it. Furthermore rehospitalisation- /relapse rates

and depressive symptoms were found to be reduced through some interventions whereas functioning on different areas got improved. Still it is to say that the most reviewed studies were implemented on a small scale and suffered from several limitations: sample sizes of the studies were generally low, all but three studies did not attain 35 participants per condition which should be the minimum when conducting a high quality study. Furthermore the samples mostly were heterogeneous groups in terms of diagnosis. The reviewed interventions were programs targeted at people diagnosed with schizophrenia but also included participants that suffered from other disorders such as schizoaffective, delusional or bipolar disorder (with psychotic symptoms), resulting in findings that could not easily be generalized to a specific population of adult schizophrenia patients. So the quality of most studies was low as well as the number of eligible studies reviewed. This means that the results of this review have to be considered with caution. In conclusion, due to the limited study qualities and the small number of studies reviewed it is impossible to reason if specific PPI's and the different components were more effective and contributing to these positive effects than others but general findings are promising and effects of PPI's on well-being, symptoms of schizophrenia and comorbid conditions seem overall positive. For future research it is important to study the different PPI components individually so that conclusions can be drawn about their individual effectiveness and how they are contributing to positive improvements in participants' well-being and symptoms. Furthermore research should examine which components match the target group of adults with schizophrenia diagnosis best. Therefore it would be practical to use more homogeneous samples in terms of diagnosis. Additionally future studies should be improved by using an appropriate number of participants and follow-up assessments to evaluate long-term effectiveness. This is important to make sure that results can be generalized to the specific target population.

Limitations

The present literature review suffered from some limitations. It was not previously registered and there was no review protocol established in advance. A limitation regarding the study selection process and the data extraction was that both were done by only one researcher, so that there is no inter-rater reliability given resulting in a great chance that potentially relevant literature remained disregarded and that in- and exclusion criteria may got less objective and exclusionary. One possible result of this limitation is that the selected studies for the most part were of lower quality. Lastly there were only freely available articles included in the review also resulting in a small number of eligible studies.

Conclusion

In sum, the findings were generally positive regarding feasibility, acceptability and effectiveness of the PPI's on positive psychological variables as well as psychopathology. Thereby PPI's are promising options in the treatment of people diagnosed with schizophrenia but it is necessary

that future research conducts large-scale studies that are of high quality and get implemented with samples that are of suitable sizes and include representative (homogeneous) groups. In research, the different PPI components should get implemented individually to evaluate their effectiveness and online interventions as well as self-help programs should get examined. In practice it might be good to tailor the mode of delivery individually on the basis of the patients' preferences. Lastly, it would be very interesting for future research to examine whether medication adherence of schizophrenia patients could be improved by PPI's.

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Appendix A

Table 1. *Search strategies per electronic database.*

Search strategy: PsycInfo	
#1	("positive psychology" OR "positive emotions" OR compassion OR gratitude OR kindness OR loving OR mindfulness OR acceptance OR commitment OR happiness OR happy OR satisfaction OR optimism OR "positive feelings" OR humour OR wellbeing OR "well being" OR well-being)
#2	(schizophrenia OR schizophrenic OR "schizophrenic disorder" OR schizophren*)
#3	(intervention OR treatment OR program OR training OR therapy OR psychotherapy)
#4	(outcome OR outcomes OR effect OR impact OR effectiveness)
#5	#1 AND #2 AND #3 AND #4 (filters: Publication Year: 1998-2017, English, German, Dutch, Adults) = 1262 documents
Search strategy: Scopus	
#1	TITLE-ABS-KEY ("positive psychology" OR "positive emotions" OR compassion OR gratitude OR kindness OR loving OR mindfulness OR acceptance OR commitment OR happiness OR happy OR satisfaction OR optimism OR "positive feelings" OR humour OR wellbeing OR "well being" OR well-being)
#2	TITLE-ABS-KEY (schizophrenia OR schizophrenic OR "schizophrenic disorder" OR schizophren*)
#3	TITLE-ABS-KEY (intervention OR treatment OR program OR training OR therapy OR psychotherapy OR exercise)
#4	TITLE ("positive psychology" OR "positive emotions" OR compassion OR gratitude OR kindness OR loving OR mindfulness OR acceptance OR commitment OR happiness OR happy OR satisfaction OR optimism OR "positive feelings" OR humour OR wellbeing OR "well being" OR well-being)
#5	TITLE (schizophrenia OR schizophrenic OR "schizophrenic disorder" OR schizophren*)
#6	#1 AND #2 AND #3 (filter: English, German, Dutch, Article, Publication year: 1998-2017, limit to subject area psychology) = 409 documents
#7	#4 AND #5 AND #3 (filters: English, German, Article, Publication year: 1998-2017) = 132 documents

Table 1. *Search strategies per electronic database (continued).*

Search strategy: Web of Science	
#1	TOPIC: ("positive psychology" OR "positive emotions" OR compassion OR gratitude OR kindness OR loving OR mindfulness OR acceptance OR commitment OR happiness OR happy OR satisfaction OR optimism OR "positive feelings" OR humour OR wellbeing OR "well being" OR well-being)
#2	TOPIC: (schizophrenia OR schizophrenic OR "schizophrenic disorder" OR schizophren*)
#3	TOPIC: (intervention OR treatment OR program OR training OR therapy OR psychotherapy OR exercise)
#4	TITLE: ("positive psychology" OR "positive emotions" OR compassion OR gratitude OR kindness OR loving OR mindfulness OR acceptance OR commitment OR happiness OR happy OR satisfaction OR optimism OR "positive feelings" OR humour OR wellbeing OR "well being" OR well-being)
#5	TITLE: (schizophrenia OR schizophrenic OR "schizophrenic disorder" OR schizophren*)
#6	#1 AND #2 AND #3 (filters: Articles, English, German, Publication year: 1998-2017, limit to subject areas of Psychology [clinical, experimental, biological, educational, social, multidisciplinary, applied, developmental]) = 361 documents
#7	#4 AND #5 AND #3 (filters: Articles, English, German, Publication year: 1998-2017) = 116 documents

Appendix B

Table 2. *Quality assessment of the controlled studies (n=10), ordered by mode of delivery and year.*

	First author (year)	Random	Concealed	Blind professional	Blind participant	Blind analyst	Accounted for group differences	Loss to follow-up ≤ 30%	Intention to treat	Valid measures	Equivalent conditions	Power n > 35	N criteria met	Quality (> 5)
<i>Individual</i>														
2	Shawyer (2012)	Yes	?	No	No	Yes	Yes	Yes	No	?	Yes	No	5	Low
4	Priebe (2015)	Yes	?	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
<i>Group</i>														
5	Voruganti (2006)	No	?	No	No	Yes	Yes	Yes	Yes ^c	Yes	Yes	No	6	High
9	Vázquez Pérez (2012)	No	?	No	No	?	Yes	Yes	No	Yes	No	No	3	Low
10	Cai (2015)	Yes	?	No	?	?	Yes	No ^a	?	?	No	No	2	Low
11	Chien (2015)	Yes	?	?	No	?	Yes	Yes	Yes ^b	Yes	Yes	Yes	7	High
12	Davis (2015)	Yes	?	?	?	No	Yes	Yes	No	Yes	Yes	No	5	Low
14	Taylor (2015)	Yes	?	Yes	No	?	Yes	No ^a	No	Yes	Yes	No	5	Low
15	Wang (2016)	Yes	?	?	?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
16	Ascone (2017)	Yes	?	No	Yes	?	Yes	No ^a	Yes ^c	Yes	Yes	No	6	High

^aNo follow-up conducted

^bConsidered met as only one participant was excluded from analysis

^cConsidered met as no participant dropped out