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Abstract

Empathy is a concept that is plagued by heterogeneous research methodology and definitions. For example, there is evidence for a distinction between affective empathy (AE) and cognitive empathy (CE) or theory of mind (ToM). Some studies further differentiate between affective and cognitive ToM. While most studies report some kind of impairment in AE or CE, research on CE most consistently found impairments in patients with schizophrenia or individuals with schizotypy. There is also evidence in the literature for an association between CE ability and aggressive tendencies in schizophrenia patients. This thesis assessed group differences in CE between individuals with low and high levels of schizotypy and investigated a possible association of type of schizotypy traits and faulty ToM reasoning. Furthermore, evidence for a dissociation between self-report and naturalistic measures was examined. In this sample ($N = 97$), individuals with high levels of schizotypy differed from low schizotypy individuals only in their affective ToM ability and results suggest that MET's CE scale may only measure affective ToM. A dissociation between self-reported empathic abilities and actual ability could also be confirmed. Unfortunately, the association between aggressive tendencies and ToM ability could not be assessed. This thesis highlights the need for a more uniformed methodological approach in empathy research, while maintaining a differentiated view of empathy components and reveals some pitfalls in certain study designs.

Keywords: schizophrenia, schizotypy, empathy, theory of mind, mentalizing, aggression

Zusammenfassung

Empathie ist ein Konzept, das durch heterogene Forschungsmethodologie und Definitionen geplagt ist. Es gibt zum Beispiel Hinweise auf eine Differenzierung zwischen affektiver (AE) und kognitiver Empathie (CE) oder Theory of Mind (ToM). Einige neuere Studien unterscheiden außerdem affektive ToM und kognitive ToM. Während die meisten Studien Beeinträchtigungen in AE oder CE berichten, finden Studien, die CE untersuchen konstant Beeinträchtigungen in schizophrenen Patienten und Personen mit Schizotypie. Außerdem gibt es Hinweise auf einen Zusammenhang zwischen CE und aggressiven Tendenzen in Patienten mit Schizophrenie. Diese Arbeit untersucht Gruppenunterschiede zwischen Individuen mit niedrigen und hohen schizotypen Charakteristika und prüft einen möglichen Zusammenhang zwischen der Art der Schizotypieausprägung und fehlerhaften ToM Schlussfolgerungen. In dieser Stichprobe ($N = 97$) zeigten Individuen mit hoher Schizotypieausprägung nur Unterschiede in ihrer affektiven ToM Fähigkeit und Ergebnisse deuten darauf hin, dass MET's CE Skala möglicherweise nur diese Fähigkeit misst. Eine Dissoziation zwischen Selbstbewertungsfragebögen und naturalistischen Verfahren konnte bestätigt werden. Leider konnten ein Zusammenhang zwischen aggressiven Tendenzen und ToM Fähigkeit nicht untersucht werden. Diese Arbeit hebt die Notwendigkeit für uniformere Studiendesigns und einer Differenzierung des Konzepts Empathie hervor und offenbart einige Schwächen in bestimmten Studiendesigns.

Introduction

1 The schizophrenia spectrum

The diagnostic and statistical manual of mental disorders (5th ed.; DSM-V; American Psychiatric Association, 2013) describes schizophrenia, schizotypal personality disorder and other psychotic disorders as part of the schizophrenia spectrum defined by abnormalities in two or more of the following domains: delusions, hallucinations, disorganized thinking or speech, grossly disorganized or abnormal motor behaviour and negative symptoms. These abnormalities disturb the level of functioning in work, interpersonal relations or the ability to care for oneself. Unsurprisingly, these abnormalities make schizophrenia and related psychotic disorders one of the most impairing psychiatric conditions. In contrast to older viewpoints on these disorders, that regarded them as binary diseases (either present or absent), nowadays, there is an agreement among researchers that multiple intra- and interindividual continua play a major role in the etiology and course of these disorders (Ettinger, Meyhöfer, Steffens, Wagner & Koutsouleris, 2014).

This thesis will take a closer look at what schizophrenia and psychometrical schizotypy are, how they are related to each other and further look into the empathic ability and aggressive tendencies of people with schizophrenia and schizotypy.

1.1 Schizophrenia

According to DSM-V, schizophrenia is marked by two or more of five symptom domains (delusions, hallucinations, disorganized thoughts or speech, grossly disorganized motor behaviour and negative symptoms) that need to be present for a significant period of time during a one month period. These symptoms most often lead to a reduced level of functioning in one or more major areas (work, social or self-care) during a significant portion of time. One of the more prominent disturbances being

reduced social quality of life (Haralanova, Haralanov, Beraldi, Möller & Hennig-Fast, 2012). Furthermore, signs of disturbances need to be present for at least six months, whereas at least one month needs to have two or more symptom domains present. These disturbances may not be the result of substance abuse or another medical condition and schizoaffective, bipolar and depressive disorders with psychotic features need to be ruled out as an explanation.

1.1.1 Symptoms of schizophrenia

Delusions are false beliefs that are not supported by evidence and are not subject to change if conflicting evidence is presented. In DSM-V, delusions are separated into a variety of themes. Persecutory delusions are most common among psychotic disorders. They include beliefs that an individual, organization or other group is trying to harm or harass the patient. Grandiose Delusions centre on the belief that the patient is somehow special, whether he or she has exceptional abilities, wealth or fame. Erotomanic delusions occur when an individual falsely believes that another person is in love with him or her. Nihilistic delusions focus on the belief that a major catastrophe will occur. Lastly, somatic delusions are centred on thoughts about the patients' health and organ function. Furthermore, delusions can also be separated into monothematic and polythematic topics, whereas monothematic delusions are centred on only one specific belief. However, polythematic delusions are much more common in schizophrenia (Coltheart, Langdon & McKay, 2007).

Hallucinations are false sensory perceptions that occur without an external stimulus. They feel vivid and clear just like normal perceptions and occur without volition of the patient. Auditory hallucinations (hearing voices or sounds) are most common in schizophrenia and it is important to note that familiar or unfamiliar voices are perceived as distinct from one's own thoughts. Other sensory systems (visual, olfactory, etc.) may also exhibit hallucinatory perceptions, but not as often as auditory hallucinations. In some cultures or religious beliefs, hallucinations may be part of the normal cultural context.

Disorganized thoughts typically present themselves in the patient's speech patterns. He or she might find it hard to stay on one topic and tend to switch from one topic to the next (derailment or loose associations). The patient might also have problems with directly answering questions and responses may only be loosely or not at all related to the question (tangentiality). Speech may also be so impaired that it becomes completely incomprehensible (incoherence).

Furthermore, *motor behaviour* may also be *grossly disorganized or abnormal*. This may range from silly, childlike to unpredictable behaviours that may limit daily activities. Motor behaviour that is marked by a decrease in reactivity to the environment is called catatonic. Like in previous versions, DSM-V distinguishes a number of catatonic behaviours. They may range from a resistance to instructions (negativism) to rigid and bizarre postures (mutism) or a complete lack of verbal and motor activity (stupor). Catatonic excitement can also occur, where the exact opposite (excessive motor activity without obvious cause) is the case.

Lastly, *negative symptoms* are also associated with schizophrenia. Emotional expression in the face, eyes, speech (alogia) and gestures supporting speech may be diminished. Another prominent symptom is avolition that inhibits self-initiated actions by the patient. This can lead to long periods of inactivity or general lack of interest in participation in work and social life (asociality). Another reason for this may be the experienced anhedonia that manifests itself in reduced perceived pleasure from positive stimuli.

According to Carbon and Correll (2014), symptom domains can also be clustered into three groups. Positive symptoms consist of hallucinations, delusions and disorganized thoughts. Negative symptoms include the aforementioned indicators and cognitive deficits may present themselves in seven domains: working memory, attention/vigilance, speed of processing, social cognition, reasoning, problem solving and visual and verbal learning and memory.

Furthermore, DSM-V also states certain specifiers that may be used after a one

year duration of the illness to further describe the status of the patient. First episode patients have just or are currently experiencing their first manifestation of the illness. Some individuals, however, experience multiple episodes (more than two). These episodes can be acute, meaning that criterion A is currently fulfilled, or in partial remission after an episode, where defining criteria are only partly fulfilled and an improvement of symptoms is maintained by the patient. There is also the possibility of full remission when no disorder specific symptoms are present.

1.1.2 Comparison of ICD-10, DSM-IV-TR and DSM-V

One major change between the revised 4th edition of the diagnostic and statistical manual of mental disorders (DSM-IV-TR; American Psychiatric Association, 2000) and DSM-V is that bizarre delusions are not subject to special treatment anymore. Delusions are considered to be bizarre when they are implausible, not anchored in an individual's culture or not derived from ordinary life experiences. This differentiation was cut, as the reliability of distinguishing bizarre from non-bizarre delusions has been found to be poor (Tandon, Gaebel, Barch, Bustillo, Gur, Heckers, Malaspina, Owen, Schultz, Tsuang, Os & Carpenter, 2013).

Furthermore, DSM-IV-TR (APA, 2000) differentiated schizophrenia into certain subtypes: Paranoid (prominent positive symptoms like delusions and hallucinations), hebephrenic (mostly disorganized symptoms), catatonic (prominent psychomotor disturbances), undifferentiated (conforms to criteria, but not to a certain subtype) and residual schizophrenia (chronic stage of schizophrenia with long-term negative symptoms). The international statistical classification of diseases and related health problems (10th ed.; ICD-10; World Health Organization, 1992) from the world health organization (WHO) also distinguished certain subtypes. Apart from the aforementioned subtypes, ICD-10 also defines simple (a slow progressive development over at least one year with increasing negative symptoms and absence of positive symptoms), other and unspecified schizophrenia. However, in DSM-V, classification into subtypes was removed as they only poorly explained the

heterogeneity of the schizophrenia spectrum. Furthermore, during the course of the illness patients may move from one subtype to another or exhibit multiple subtypes leading to poor diagnostic reliability and stability (Tandon et al., 2013).

1.1.3 Epidemiology and course of schizophrenia

According to DSM-V (APA, 2013) lifetime prevalence of schizophrenia is approximately 0.3%-0.7% and symptoms typically emerge between the late teens and the mid-30s. Although emergence can also rarely happen before adolescence and earlier onset is considered a predictor for worse prognosis. However, some late-onset cases (after the age of 40) also occur and are mostly dominated by female individuals. Male patients, on the other hand, generally have an earlier onset, worse premorbid adjustment, lower educational achievement, more prominent negative and cognitive symptoms and in general a worse outcome than females. DSM-V (APA, 2013) further describes that approximately five years before onset of the illness, also called the prodromal phase, some symptoms may already be present. Unfortunately, it is difficult to relate these attenuated symptoms to schizophrenia, as they are often masked as personality peculiarities or seen as behaviour related to age (e.g. puberty). There are, however, also cases that have an acute onset, where full symptoms usually emerge in a matter of days or weeks. The course of development is considered to be favourable in about 20% of individuals and a small number also report a complete recovery. While psychotic symptoms tend to diminish over the life course, negative symptoms tend to be more persistent and closely related to prognosis. Cognitive symptoms, on the other hand, may not improve much over the course of the illness. Furthermore, there is evidence of both environmental (season of birth, urban environment, childhood trauma and minority ethnic groups) and physiological risk factors (genetic, pregnancy and birth complications, stress, infection, malnutrition and other medical conditions). Due to these many different emergence factors it is unsurprising that the individual course, symptom profile and treatment effectiveness highly varies from patient to patient (APA, 2013).

There is also a tendency for suicidal behaviour among schizophrenia patients. Approximately 5 to 6% of patients suffering from schizophrenia die by suicide and about 20% have attempted suicide on one or more occasions. This suicidal behaviour may be a consequence of delusions or hallucinations, as they have been reported to command to harm oneself or others, but prominent negative symptoms are also a major contributor to suicidal behaviour (APA, 2013).

1.2 Schizotypy

Schizotypy is a construct that describes certain schizophrenia-like personality traits like odd or bizarre behaviour, strange speech, magical thinking, unusual perceptual experiences and social anhedonia (Nelson, Seal & Phillips, 2013).

Literature on schizotypy is somewhat heterogenous and can broadly be grouped into two approaches (Ettinger et al., 2014). The quasi-dimensional approach was refined by Rado (1953) and Meehl (1962) and considers schizotypy as a premorbid expression of schizophrenia symptoms. These symptoms may increase in strength as an individual moves along the continuum towards schizophrenia. In this approach, the continuum only applies to individuals with schizotypy and schizophrenia, who also have schizophrenic genes (Asai, Sugimori, Bando & Tanno, 2011). According to Meehl (1962) approximately 10% of individuals may exhibit schizotypal personality traits and are also at risk of developing schizophrenia, due to having schizophrenia genes. The cause of this vulnerability is believed by Mehl (1962) to stem from a neural defect coined by Mehl as schizotaxia, which stems from a defect in a single gene (the schizo-gene). Schizotaxia combined with certain socially learned regimes, are contributors for schizotypal individuals to also develop schizophrenia (Mehl, 1962). Apart from this continuum of levels of trait expression, this approach is actually categorical, as it considers a genetic vulnerability that is either present or absent (Nelson et al., 2014). Nelson et al. (2014) further argue that there is evidence against the quasi-dimensional approach. For example, they reviewed different studies that used self-report questionnaires consisting of items resembling hallucinations and

delusions and found that a majority of individuals in the general population report some kind of subclinical psychotic symptoms. This, however, should not be the case, according to the quasi-dimensional model, as it postulates that only about 10% of individuals should have such unusual experiences. The fully-dimensional approach by Eysenck and Claridge, on the other hand, describes schizotypy as a continuum that applies to all members of the population (Ettinger et al., 2014), because all people have schizophrenic genes and therefore, might exhibit schizotypal personality traits (Asai et al., 2011). This continual view in the general population is also in line with findings in the review by Nelson et al. (2014), where a majority of individuals in the general population reported some kind of unusual psychotic-like experiences. In this model, some individuals at the high end of the continuum are at risk of developing schizophrenia, but may not necessarily do so, as other risk factors also need to be present (Nelson et al., 2014). However, Nelson et al. (2014) note that individuals with high schizotypal traits are not necessarily dysfunctional and further evidence for this will be discussed in the next chapter. This approach is in line with a majority of recent theories on schizophrenia (Ettinger et al., 2014) and also recent taxometric studies supporting a dimensional structure for schizotypy (Rawlings, Williams, Haslam & Claridge, 2008).

1.2.1 Dimensions of schizotypy

Originally, Claridge, McCreery, Mason, Bentall, Boyle, Slade and Popplewell (1996), found that schizotypal traits can be congregated into four groups: Aberrant perceptions and beliefs, cognitive disorganization, introvertive anhedonia and asocial behaviour. However, a more recent factorial analysis by Vollema and Hoijtink (2000) found that a three-dimensional model, similar to that of schizophrenia, best describes their used data of self-reported schizotypy traits. In this model, traits are also grouped into positive, negative and disorganized clusters or dimensions, similar to schizophrenia. Most studies using self-report questionnaires use this model (Mohr & Claridge, 2014), but some models also define a fourth cluster to account for healthy

individuals with schizotypy (Wang, Neumann, Shum, Liu, Shi, Yan, Lui, Zhang, Li, Cheung & Chan, 2013).

This fourth cluster may be a reason to note that, unlike schizophrenia, schizotypy may sometimes have a positive side for certain individuals. According to Mohr and Claridge (2014), most research focuses on impairment and excludes potential beneficial properties of schizotypy. While individuals with schizotypy often report lower quality of life, their review shows that this may be attributable to certain dimension combinations. For example, individuals with prominent positive and low disorganized features may view their experience differently than those with mainly negative or high disorganized features. Former individuals seem to view their experiences mostly as pleasant and even as enriching mental experiences, while prominent negative and/or disorganized clusters are related to perceived distress. Studies on people in new religious movements (e.g., Hare Krishna) or people who hold esoteric beliefs with prominent positive traits, show that they report fewer distress and are less preoccupied by their experiences. By them, these experiences are even believed to have a positive impact in enhancing their understanding of the world and themselves (Mohr & Claridge, 2014). Mohr and Claridge (2014) further postulate that this may be attributable to a better integration of perceived paranormal experiences into a coherent cognitive framework leading to reduced distress.

Some cognitive models ascribe deficient selective attention that disables the inhibition of irrelevant information to individuals with schizotypy, leading to more remote associations and overgeneralizations (Nelson & Rawlings, 2010). Mohr and Claridge (2014) investigated whether this may have an impact on creative abilities and found that studies using standardized tests mostly show worse performance in psychiatric groups. On the other hand, they found that studies using experimental observation tasks comparing divergent (finding multiple solutions) and convergent (finding the one correct solution) thinking abilities found different results for different symptom profiles. Individuals with prominent positive features showed increased divergent and in some studies also convergent thinking abilities, while negative

features were associated with only intact convergent thinking abilities (Nelson & Rawlings, 2010). Therefore a schizotypy profile with prominent positive features may be associated with increased creative thinking abilities, but a lack of convergent thinking ability may also impair the ability to focus remote associations to a coherent thought or conclusion (Mohr & Claridge, 2014). However, Mohr and Claridge (2014) also found that studies researching the problem solving and reasoning capabilities of individuals with high schizotypy levels, compared to healthy controls or individuals with low levels of schizotypy, demonstrated that they were able to form more correct solutions in insight problems (the problem needs to be restructured until the solution arises leading to a “aha-moment”), but not in incremental problem solving tasks (only one solution possible). Also, individuals with medium and high schizotypy levels were able to find twice as many strategies in group problem tasks than individuals with low schizotypy levels, while also being more efficient in speed (Mohr & Claridge, 2014). Therefore, Mohr and Claridge (2014) conclude that it is important to also look at possible beneficial factors of schizotypy and focus on differentiating healthy and worrisome schizotypy profiles.

1.3 Relation of schizophrenia and psychometrical schizotypy

Looking at the diagnostic criteria for schizophrenia and schizotypy one can easily make the assumption that both must be related as they share certain features. Schizotypy seems to be accompanied by similar experiences as in schizophrenia, but in attenuated form (Ettinger et al., 2014). Both are defined by a subset of positive, negative and disorganized clusters that, depending on the degree of expression, may negatively affect social and work life and disrupt cognitive functioning. But is there evidence for this assumption?

Ettinger et al. (2014) reviewed literature regarding this question and came to the conclusion that there is evidence for this on a genetical, cognitive-perceptual and neural level. According to this review, behavioural genetic studies show that first degree relatives of patients with schizophrenia exhibit increased schizotypal levels. In

these studies, the severity of positive symptoms in schizophrenia patients was also linked to the severity of positive schizotypal traits in relatives. This association is further complemented by studies using molecular genetic data that show an overlap of genetic association profiles of individuals with schizophrenia and schizotypy (Nelson et al, 2014). Secondly, there is evidence on a cognitive, perceptual and motor control level. Like in schizophrenia, individuals with schizotypy report problems in verbal learning, memory, working memory, attention, executive functioning and psychomotor control, but in attenuated form (Ettinger et al., 2014). Lastly, there is evidence on a neurological level. Neuroimaging studies with schizophrenia patients show reduced grey matter volume in temporal, parietal and frontal cortical areas, the hippocampus, amygdala and also the cerebellum (Shepherd, Laurens, Matheson, Carr & Green, 2012). While imaging studies on individuals with schizotypy are much rarer than with schizophrenia patients, some studies found similar volume reductions (Ettinger et al., 2014). They reported a reduction in temporal grey matter volume in people with high schizotypy levels and a link between positive schizotypy traits and a reduction in frontal and cortical areas. However, other studies indicated a thickening of frontal and cortical areas, arguing that this may be a compensatory or protective process in individuals with prominent positive schizotypy traits (Kühn, Schubert & Gallinat, 2012). This may be in line with the reasoning of Mohr and Claridge (2015) that a prominent positive schizotypy profile could be regarded as healthy or at least healthier, compared to negative and disorganized traits.

This thesis agrees with the conclusion by Ettinger et al. (2014) that schizotypy and schizophrenia are related to each other on a continual spectrum. Therefore, it is regarded as acceptable to base the hypotheses of this thesis on findings of schizophrenia research and look into similarities in a schizotypal population.

2 Empathy

Empathy can be described as a very old construct, which can generally be defined as feeling and/or understanding what someone else is feeling and/or thinking (Cuff, Brown, Taylor & Howat, 2014). It may easily be said that empathy can be regarded as a very crucial part in interpersonal interactions, because it enables us to respond to emotional experiences of others and thereby eliciting a continual response from the other person (Fujino, Miyata, Genichi, Manabu, Akahiko, Hironobu, Toshihiko, Hidenao & Toshiya, 2014). This shared experience also helps us to understand how other people feel and what they want (Singer, 2006).

Even though the term empathy has been around for a long time a certain heterogeneity in its definition persists to this day in scientific literature (Melloni, Lopez & Ibanez, 2014; Cuff et al., 2014). This lack of a universal definition makes interpreting scientific findings, on this topic, very difficult and requires an extensive analysis of the definitions and methodology used to compare different results. Especially, because different perspectives on what empathy is may lead to different measurements used to operationalize it. There is also a certain amount of confusion with overlapping or related constructs, such as sympathy or compassion. This unclear definition even seems to have practical implications, as Cuff et al. (2014) further explain that in therapy some understandings of empathy can lead to more effective outcomes than others.

2.1 Distinguishing empathy from other concepts

There are several concepts that might appear similar to empathy and are sometimes even seen equivalent to it by some authors. Cuff et al. (2014) showed that while certain concepts may share similarities with empathy, they are still different enough to be distinguishable from the empathic experience. Sympathy, for example, is a concept that is often used synonymously by the general population. While empathy helps us to connect to someone else, by feeling sadness when perceiving

sadness in others, sympathy only elicits feelings of concern (Cuff et al., 2014). The reason for this may be that sympathy is focused on a current need to relieve situational tension, therefore sympathy may be seen as an intentional emotional reaction, while empathy elicits an involuntary automatic reaction. Compassion, the feeling that arises when witnessing another's suffering, is also often associated with empathy. However, a compassionate reaction is more concerned with one's own feelings towards the plight of others than with sharing of emotional experiences (Cuff et al., 2014). Also in contrast to empathy, compassion always motivates a desire to help those in need, while empathic ability, on the other hand, does not necessarily elicit prosocial behaviour (Cuff et al., 2014). Psychopathic individuals, for example, are quite capable of understanding other's mental states, but might use this information to further their own gain (Bo et al., 2014). Evidence for this will be discussed in chapter 3.3. Some other concepts used in literature are mimpathy (imitating others emotions, without experiencing them), transpathy (a concept similar to emotional contagion) and tenderness (warm feeling generated by the delicate and defenceless) (Cuff et al., 2014). While all being different concepts, they may be summed up in an overarching category: Social Cognition generally describes the mental operations underlying social interactions (Mehta, Thirthalli, Bhagyavathi, Kumar, Subbakrishna, Gangadhar, Eack & Keshavan, 2014). It may also be seen as a multifaceted construct that is involved in understanding, interpreting and responding to social cues, motives and actions (Smith, Horan, Karpouzian, Abram, Cobia & Cernansky, 2012).

2.2 Investigating the components of empathy

As one of the aims of this thesis is to get a clearer picture on how empathy is defined in current research, it is important to identify the different aspects that differentiate the definitions used. Most recent studies tend to agree that at least two concepts can be distinguished. Firstly, an affective component or affective empathy (AE) that is a more automatic process helping us to feel what someone else is feeling. AE allows for a shared emotional experience with someone else (Shamay-Tsoory, 2011) and can be

called the most rudimentary element to detect the emotional state of others (Decety, 2011). This ability develops very early, as infants are already able to detect and react to others emotional signals, such as facial stimuli (Decety, 2011). It is suggested that this simulation is similar or even identical to emotional contagion and that is why AE by itself is sometimes seen equivalently to emotional contagion (Lehmann, Bahcesular, Brockmann, Biederbeck, Dziobek, Gallinat & Montag, 2014). Later in this chapter, similarities of both constructs will be discussed. Neurologically, the mirror neuron system is implicated in this automatic simulation. In primates, for example, it could be shown that the motor mirror neuron system was engaged either by performing an action or observing another primate doing the same motion (Shirtcliff, Vitacco, Graf, Gostisha, Merz & Zahn-Waxler, 2009). The mirror neuron system is also heavily implicated in pain studies with humans, as feeling pain and observing someone else in pain activates similar neural networks (Cuff et al., 2014).

Secondly, a cognitive component or cognitive empathy (CE) is postulated that lets us infer and understand what someone else is thinking and according to some authors also what other persons are feeling (Cuff et al., 2014; Melloni et al., 2014; Shamay-Tsoory, 2011). In contrast to AE, CE is a slower top down controlled process that incorporates context like memories, motivation, intentions, attitudes, etc. into the empathic experience (Melloni et al., 2014). This also enables us to understand what someone else might be feeling or thinking without having a direct emotional stimuli to work with. For example, we can understand how a fictional person in a book might feel, by incorporating what is known about them into the current situation the character is experiencing. CE is often also called perspective taking, mentalizing or theory of mind (ToM). Whether ToM or mentalizing are equivalent to CE (Bragado-Jiminez & Taylor, 2012; Derntl, 2012a) or only overlapping components of it (Lehmann et al., 2014) is still being debated in the literature. More and more authors agree though that ToM can be further split up into an affective and a cognitive component (Bo, Abu-Akel, Kongerslev, Haahr & Bateman, 2014; Harari, Shamay-Tsoory, Ravid & Levkovitz, 2010; Shamay-Tsoory, 2011; Cuff et al., 2014). Affective ToM describes the process

of understanding what someone else is feeling, not through direct explicit stimuli, but by inferring this mental state through contextual stimuli. It can be regarded as the emotional form of perspective taking or mentalizing (Shamay-Tsoory, 2011), may be related to both AE and CE and is suggested to be one of the prerequisites for empathy (Bo et al., 2014). Cognitive ToM is probably what most authors think of, when they discuss ToM, the understanding of beliefs, intentions and thoughts (Bo et al., 2014). This differentiation of an affective and a cognitive ToM component is complemented by neuroimaging research on frontal cortex activity that will be discussed in chapter 2.4. This differentiation of ToM gives a good indication of the interrelatedness of empathy and ToM, because recent studies suggest that affective ToM and CE may refer to identical concepts (Adjeroud, Besnard, Massioui, Verny, Prudean, Scherer, Gohier, Bonneau & Allain, 2015). As mentioned before, the key difference between cognitive empathy and ToM may only lie in the definition of cognitive empathy. One may see both ToM components as equivalent to CE, if CE is defined as “understanding what someone else is feeling and thinking”. However, if CE is defined as “understanding what someone else is feeling”, then only the affective ToM component applies to the concept of CE. This thesis will regard the definition of CE as “understanding what someone else is feeling” and ascribe only affective ToM as a component of cognitive empathy. Additionally, it is argued that another important distinction should be, whether the ToM task used measures first-order ToM or second-order ToM, which in the latter case refers to the ability to infer what someone else is thinking another person is feeling or thinking. Schizophrenia patients with and without comorbid OCD, for example, showed different results between patient groups in first- and second-order ToM tasks (Ntouros, Bozikas, Andreou, Lavrentiadis & Garyfallos, 2014).

There is varying degree of consensus on what components empathy consists of. Some authors ascribe only the emotional part to the empathic experience and see cognitive components like ToM as separate processes (Singer, 2006; Coutinho & Decety, 2014). Other studies on empathy suggest that the cognitive component is a

vital part of the empathic experience (Cuff et al., 2014; Melloni et al., 2014; Zaki & Ochsner, 2012). Most recent studies examining empathy in schizophrenia tend to share this viewpoint (Abramowitz, Ginger, Gollan & Smith, 2014; Achim, Oullet, Roy & Jackson, 2011; Bragado-Jiminez & Taylor, 2012; Fujino et al., 2014; Lehmann et al., 2014; Smith et al., 2012).

2.3 Exploring other properties of empathy

Another important factor that is discussed in the debate about what components comprise empathy is the self/other distinction. The ability to distinguish our own and perceived mental states of others. Cuff et al. (2014) argue that this one of the main aspects that helps to distinguish empathy from other related constructs, like emotional contagion that lacks this self/other distinction. According to Lehmann et al. (2014), this may be an argument for an inclusion of cognitive elements into empathy. They argue that AE by itself is similar to emotional contagion, as it is just an automatic affective resonance without a clear self/other distinction. Similar to emotional contagion, one is “infected” by another’s emotion, by mirror neuron simulation (Cuff et al., 2014). CE might help us to realize that the perceived emotional state is not our own, but that of another person (Bird, Silani, Brindley, White, Frith & Singer, 2010) and to differentiate empathy from mere emotional contagion. An imaging study by Luo, Wang, Jin, Huang, Xie, Deng, Fang, Zheng, Chen, Li, Jiang and Zheng (2015) showed that perspective taking (CE) scores in females were associated with event-related potentials, when identifying another individuals feeling or evaluating the observers own feelings in a facial recognition experiment. When using a passive viewing task, however, only AE scores were related to ERP components. This may indicate that the cognitive component of empathy plays a part in modulating the affective response generated by the automatic simulation of AE processes. Cuff et al. (2014) argue that without this cognitive component we would only be able to feel what someone else is feeling, but not able to distinguish whether it is a feeling of our own or someone else. Evidence for this assumption may be found in other psychopathological disorders like borderline

personality disorder (BPD). Studies investigating the empathic ability in BPD patients found that, while their AE ability may be intact or even increased, the cognitive component seems to be consistently impaired (Dziobek, Preißler, Grozdanovic, Heuser, Heekeren & Roepke, 2011). As BPD patients report a decreased ability to regulate emotions and an increased emotional reactivity (Rosenthal, Gratz, Kosson, Cheavens, Lejuez & Lynch, 2008), it may be argued that the lack of cognitive control hinders patients in recognizing that the perceived emotional state is not their own, leading to the reported high emotional reactivity. Other studies in this field also argue that CE is important in regulating the initial reaction generated by AE processes (Ripoll, Snyder, Steele & Siever, 2013). Further evidence for this may be found in neurological correlates of empathy, which will be discussed in chapter 2.6.

Whether empathy may be seen as an ability (a stable trait) or state that is influenced by contextual, situational information, is another important aspect in the discussion concerning empathy. Especially, because depending on the assumption made, implications arise for treatment of empathic impairments (e.g. training of mentalizing capabilities). Cuff et al. (2014) reviewed literature regarding this topic and came to the conclusion that there is enough evidence to support both state and trait influences. Anatomical differences and developmental factors contribute to the argument that empathy is influenced by traits. Apart from that, gender (Luo et al., 2015), educational and psychopathological influences (Cuff et al., 2014) also argue for a trait influence. On the other hand, there is considerable evidence that suggests that empathy is context specific (state influenced) (Cuff et al., 2014). For example, sex offenders, while generally not being impaired in empathic ability, are able to avoid empathic concern for certain individuals or groups. This can also be seen in studies concerning empathy and violent men in relationships (Cuff et al., 2014). These men only have a decreased empathic accuracy (correctly inferring emotions in others) for their spouses, but not for female strangers. Other context specific, situational factors that have been found to influence empathy are observer-target similarity (similar race,

gender and religion), the observer's value of the target or the cognitive workload needed to make an assessment. According to Melloni et al. (2014) this contextual modulation may represent an adaptive advantage, as social interactions rarely occur in the same manner. Further evidence for a state influence arises with efficacy studies on social cognitive treatment with schizophrenia patients. Kurtz, Gagen, Rocha, Machado and Penn (2015) found in their critical review that training on facial affect recognition and ToM produced moderate to large effect sizes, suggesting that empathy can be exercised.

This thesis will work with the conclusion by Cuff et al. (2014), where empathy includes both an affective and a cognitive component. Both are integral to the empathic process, but are still different processes. Therefore, empathy is both automatically elicited, but also subject to top down controlled processes. This definition is further supported by recent developmental neuroscience research as these two systems seem to be interacting, yet partially separate neural circuits in the brain (Decety, 2011; Bragado-Jimenez & Taylor, 2012). Furthermore, it can be said that the shared emotional experience in the other person and the perceiver is similar, but not entirely identical. This may be seen as a result of a maintained self/other distinction, although a degree of self/other merging is necessary. Also both trait and state influences act on empathic ability. Behavioural outcomes are not part of empathy itself, but can be ascribed to related concepts like compassion.

One aspect most researchers probably will agree on though, is that empathy is fundamental for interpersonal relationships, as an understanding and recognition of other's feelings and intentions is necessary to predict outcomes of interpersonal interactions.

2.4 Neurobiological correlates of empathy

As mentioned before, there is evidence for neurobiological correlates for AE and CE produced by recent neuroimaging studies. Shirtcliff et al. (2009) propose that the ability to feel what someone else is feeling (AE) likely arose ontogenetically early

within the mammalian brain to support social bonds, especially the bond between the mother and the child. Later on in evolutionary development, this system was further adapted to also support other forms of affiliation like pair bonding, friendships, etc., that are required in larger social groups. The limbic system in the brain is heavily implicated when investigating AE processes. One part of the limbic system is the insula, located in the lateral sulcus on both sides of the brain. Its function is to conduit information between limbic and thalamic structures to convey information about arousal, emotions and homeostasis. Interestingly, insula activity seems to be the same when experiencing, viewing or imagining emotions directly or on others. For example, activity in insula regions is almost the same when viewing facial disgust or actually smelling an unpleasant odour.

The insular cortex also shows connections with numerous other structures, like the amygdala, prefrontal cortex (PFC), anterior cingular cortex (ACC) and the superior temporal gyrus (STG) (Mitchell & Rossel, 2014). This may ascribe a crucial role in contextual modulation to the insula, as it allows for integration of internal states and feelings with information about the situation (Melloni et al., 2014). A structure that is often activated together with the insula is the ACC (Shirtcliff et al., 2009). The ACC's function is to signal when something is wrong and to further modulate automatic processes, when they need to become effortful, which may be the case when errors or conflicts are detected. It is also implicated when perceiving pain, but more so in the emotional aspects of pain like distress. The amygdala also has a regulatory function, orienting attention to affectively salient stimuli (Völlm, Taylor, Richardson, Corcoran, Stirling, McKie, Deakin & Elliot, 2005). It mediates arousal and vigilance and responds to emotional or stressful stimuli, especially fear and pain. However, Shirtcliff et al. (2009) found that it does not get triggered so much by experienced fear as by observed or recognized fear in others, revealing its role in (affective) empathic processes. Given the role of the inferior frontal gyrus (IFG) in action observation, imitation, mentalizing and emotion processing, it is not surprising that this region is

often implicated during various empathy studies, especially AE tasks (Derntl et al., 2012b).

There is also evidence for activation in certain structures during CE tasks. Three structures have been reported to be related to CE: the temporal poles, the (posterior) superior temporal sulcus (pSTS)/temporo-parietal Junction (TPJ) and most consistently the medial PFC (Singer, 2006). One aspect of perspective taking is the ability to visualize what someone else is seeing through their perspective. One region heavily implicated in representing the world from different visual perspectives is the the pSTS and the adjacent TPJ (Frith & Frith, 2006). This region coordinates eye-movement observation, is active when viewing facial stimuli and provides information where someone is looking and also where one's own body is positioned in space. Frith and Frith (2006) argue that this enables us to realize that other people may have different knowledge about the world from us and furthermore, helps us to understand that beliefs held by other people may be rooted in false knowledge. Saxe and Kanwisher (2003) compliment this statement, because they found that the TPJ (bilaterally) was active during tasks using stimuli that required ToM reasoning, but not during logically similar non-ToM tasks (mere presence of a person). Their study also showed that the left TPJ responded more to verbal descriptions, while the right side was more active during nonverbal stimuli. Schurz, Aichhorn, Richlan and Perner (2014) also found evidence for lateral differentiation of the TPJ and its role in self-awareness in their meta-analysis. Specifically, stimulation of the right TPJ lead to "out-of-body" experiences, while left TPJ stimulation lead to perception of an illusory shadow figure.

The temporal poles, on the other hand, help us to utilize knowledge from our own and observed experiences by others. Furthermore, this region enables us to modify our understanding of a situation by the perceived context in which it happens and helps us to generate a wider semantic and emotional context from past experiences (Völlm et al., 2005).

Lastly, the medial PFC (mPFC) is not only active during AE tasks, but also during CE tasks. Mitchell and Rossel (2014) found that this region and the adjacent paracingulate cortex (PCP) are activated when participants are asked to think about own and other's mental states. However, Frith and Frith (2006) found that participants with impairment in the frontal cortex, in general, score lower in ToM tasks, while isolated impairment to the mPFC did not lead to a lower score in ToM tasks. They argue that this may indicate that the mPFC is used during perspective taking, but is not necessary for standard ToM tasks. Schurz et al. (2014) came to a similar conclusion in their meta-analysis. They found that the mPFC was equally active during ToM tasks, in the same way as during listening to stories about a person's physical appearance and argue that the role of the mPFC may be only to generate an overall impression of another person, by processing social and emotional relevant stimuli. There is evidence that the mPFC is further divided into substructures that are each responsible for different ToM modalities. Frith and Frith (2006), for example, found that when thinking about mental states about similar (political, gender, ethnicity, ...) others the ventral mPFC was activated, but thinking about dissimilar others lead to activity in a more dorsal region of the mPFC. Furthermore, the differentiation between affective and cognitive ToM seems to be complemented by neuroimaging studies concerning frontal cortex activity. Thinking about people's feelings (affective ToM) was associated with activity in the medial orbital cortex, while thinking about beliefs, intentions and thoughts (cognitive ToM) was associated with activity in more dorsal regions. Völlm et al. (2005) also found evidence for such a division in functionality. PCP activation was not found during tasks that involved inferring the mental state of a single person without other cues (other persons interacting, background, etc.), only when such cues were present.

2.5 Measurement of empathy self-report vs. naturalistic measures

The majority of studies investigating empathic ability use self-rating questionnaires like the Interpersonal Reactivity Index (IRI; Davis, 1983). Sometimes results of such

studies are reported as regarding the empathic ability of subjects. This, however, may likely be a mistake, as self-rating tasks only reveal the subjects perception of his or her own ability. This is crucial, because self-awareness may be diminished in certain psychopathological disorders like schizophrenia (Mitchell & Rossel, 2014). Furthermore, there is evidence that the ability to accurately rate one's own emotions might be dependent on the current mood state (depressed/manic) (Flury, Ickes & Schweinle, 2007), which may change rapidly in certain disorders. There are also some studies that suggest that the self-perceived empathic ability may not be related at all to the actual ability in schizophrenia patients (Abramowitz et al., 2014) and also in patients with borderline personality disorder (Dziobek et al., 2011). According to Dziobek et al. (2011), introspection is required in self-report measures and this introspective ability is reduced in patients with borderline personality disorder. Abramowitz et al., (2014) found that, similar to other studies, IRI scores and performance based tasks from the Derntl paradigm were not related to each other, but the two performance based tasks, on the other hand, did correlate with each other. However, such tasks may still play an important role as they can be applied with little time and effort, but caution is advised when interpreting such results.

On the other hand, more and more recent studies employ naturalistic, ecologically valid measurements like the Movie for the Assessment of Social Cognition (MASC) or the Awareness of Social Inference Task (TASIT; McDonald, Flanagan, Rollins & Kinch, 2003). These measurements try to infer empathic abilities through more realistic experimental conditions. Like real interpersonal interactions, they include dynamic, implicit social cues and inferential tasks. According to Sparks, McDonald, Lino, O'Donnel and Green (2010), most often social interactions are simulated by video clips, after which the subject is asked to choose one of several mental states, they think is most matching. For example, TASIT employs three kinds of video clips (Sparks et al., 2010). Firstly, in the emotion evaluation condition video clips of an actor portraying an emotion (sad, happy, fear, disgust, etc.) are shown. After that, the

subject needs to infer implicit social cues, by watching video clips that show an actor using a sarcastic (simple or complex) or sincere tone in an interaction with another actor. As the dialogue is ambiguous, the subject is required to infer the mental state via demeanour, tone of voice, facial expression and gestures. In the last condition, subjects are provided extra information regarding the true state of affair between two actors and need to infer the mental state of one during an interaction.

Most often, the kind of measure that is employed heavily depends on what empathic component the study focuses on, as most studies focus on either AE or CE (Melloni et al., 2014). Even though naturalistic measurements have an increased validity, regarding actual empathic ability, it is important to note that naturalistic and simplified approaches could and should complement each other. Such a combination could possibly facilitate investigation of potential problems with individuals' insight into their own perceived ability, as it includes both the individuals' evaluation of their own abilities and also assesses the actual ability.

2.6 Empathy in schizophrenia and schizotypy

As noted before, empathy is a crucial part in society, because it helps us to build interpersonal relationships, by understanding emotions and intentions of others. However, if this ability is compromised or impaired, as is the case in the majority of psychopathological disorders, alterations in social behaviour usually follow (Coutinho & Decety, 2014). In order to help patients deal with these impairments, it is important to understand what abilities are actually diminished, preserved or even increased. Research regarding empathy in patients suffering from schizophrenia has produced a number of hypothesis regarding the empathic ability of schizophrenia patients.

Unfortunately, many studies only investigate either AE or CE and use mostly self-evaluation questionnaires to assess empathy (Melloni et al., 2014). Research into AE ability typically focuses on single-target facial expression recognition and rarely utilizes measures of affective arousal (Zaki & Ochsner, 2012) and study results on AE ability of schizophrenia patients are mostly mixed (Abramowitz et al., 2014). For example, a

study by Shamay-Tsoory (2007) found this ability to be diminished, but using only self-evaluation measures (IRI) to make this assumption and therefore, it may be said that only patients' self-perceived ability is lowered, but it remains unknown whether their ability is actually impaired. Abramowitz et al. (2012) also used the IRI and a performance based empathy task known as the Derntl Paradigm. They found that accuracy and response time of the affective response task (AE) was lower than in the control group and patients reported more personal distress. Lehman et al. (2014), on the other hand, used the IRI and MET to assess AE ability in schizophrenia patients and found AE to be intact. A suggested explanation for these differences comes from Achim et al. (2011). The Empathic Concern (EC) and Personal Distress (PD) scale of the IRI form the AE subscale of this test. Achim et al. (2011) and others (Abramowitz et al., 2012; Derntl, Seidel, Schneider & Habel, 2012b; Fujino et al., 2014; Smith et al., 2012) found that PD is actually more affected (higher than controls) than EC. This may indicate a specific deficit in self-perceived emotion regulation rather than a general AE deficit. Perhaps, differences in the material used in these tasks affect the perceived personal distress differently. Sparks et al. (2010) further argue that a failure to take perspectives and a focus on the self might lead to higher PD and lower EC.

CE ability, on the other hand, is shown to be mostly impaired in patients with schizophrenia. In some studies using the IRI, patients suffering from schizophrenia report lower scores in the Perspective Taking (PT) and Fantasy (FS) subscales (Achim et al., 2011; Fujino et al., 2014; Shamay-Tsoory, 2007; Smith et al., 2012), while others only found FS to be lower compared to controls (Derntl, 2012a; Derntl, 2012b; Lehmann et al., 2014). However, naturalistic measures tend to show more consistent results. Lehmann et al. (2014) found that patients' CE ability in the CE subscale of MET was reduced compared to controls. Several other studies using TASIT seem to agree that ToM ability in patients is impaired (Ntouros et al, 2014; Sparks et al., 2010). However, as mentioned before, some studies tried to differentiate ToM further into an affective and a cognitive part and found that ToM may not be impaired as a whole. Bo

et al., (2013) found that in schizophrenia patients cognitive ToM was intact, but only affective ToM was impaired. This is in line with findings by Mier et al. (2010) who also found lower affective ToM ability in schizophrenia patients. Interestingly, this study also showed that, while patients' ToM accuracy was lower than those of controls, there was no difference in reaction time between groups, but, unfortunately, they only measured affective ToM. Affective ToM was also found to be more impaired than cognitive ToM when using the Derntl Paradigm (Derntl, 2012b). A study using the Movie for the Assessment of Social Cognition (MASC) with paranoid schizophrenia patients (mainly positive symptoms), on the other hand, found that both affective and cognitive ToM scales were impaired in the patient group (Montag, Dziobek, Richter, Neuhaus, Lehmann, Sylla, Heekeren, Heinz & Gallinat, 2011). So it seems that most studies tend to agree that CE ability in schizophrenia patients might be impaired, but there are still mixed results regarding specific impairments of ToM components.

Neuroimaging studies revealed some volumetric and metabolic group differences between healthy controls and patients with schizophrenia in empathy tasks. Derntl et al. (2012b) found hypoactivation of the IFG during AE tasks, possibly explaining patients' difficulties to simulate another person's subjective view. This result seems to be most consistent in imaging studies with schizophrenia patients. Mier, Sauer, Lis, Esslinger, Wilhelm, Gallhofer and Kirsch (2010) further found hyperactivation of the left amygdala and right STS during emotional recognition tasks of neutral faces. However, they could not find a group difference in their follow up affective ToM task, even though the control group increased its activation levels in this second task. They argue that this may point to a deficit for schizophrenia patients in early recognition processes rather than with more complex empathy tasks in general. Mier et al. (2010) found that patients with schizophrenia may already achieve their peak arousal level during initial facial recognition and the already highly activated amygdala may further contribute to augmented attribution of salience to (neutral) facial stimuli and interfere with following ToM tasks. Also, they argue that this may explain reported hypoactivation of these regions in other studies that only measure more complex

(ToM) tasks using neutral stimuli. Derntl et al. (2012b), on the other hand, found that amygdala hyperactivation may only be related to neutral facial stimuli. Their study was in line with other studies that found hypoactivation of the amygdala in patients, especially those with predominant negative symptoms. They argue that this difference points to the amygdala's role in salience attribution. As neutral stimuli are more ambiguous than positive or negative stimuli, the amygdala gets more strongly activated, because it fails to mark the salience of the stimulus. They also found hypoactivation of the ACC, further indicating patients' difficulties in emotional top-down modulation and attribution of salience to emotional stimuli. Reduced ACC grey and white matter volume was also found in another study, where patients were reported to have smaller bilateral ACC volumes compared to controls (Fujiwara, Hirao, Namiki, Yamada, Shimizu, Fukuyama, Hayashi & Murai, 2007). In their study, reduced ACC volume was associated with worse empathic accuracy and ToM skills. Studies investigating patients' ToM skills also found neurobiological correlates for certain CE impairments. Hooker, Bruce, Lincoln, Fisher and Vinogradov (2011) reported that grey matter volume of the ventromedial PFC was associated with the ability to recognize and understand social faux pas, self-reported PT measured with IRI and interview-based rating of the capacity to understand cognitive and affective mental states. In each measure, worse performance was related to less ventromedial PFC grey matter. They also suggested that patients' ability to monitor their own internal affective states and the influence they have on them may be impaired, because the relation between grey matter volume and performance in tasks was stronger in the schizophrenia group. Grey matter volume reduction, but increased activation in the left temporal pole and TPJ were also found in schizophrenia patients in several studies (Benedetti, Bernasconi, Bosia, Cavallaro, Dallaspezia, Falini, Poletti, Radaelli, Riccaboni, Scotti & Smeraldi, 2009). As these areas are highly involved in appreciating perspective differences, they argue that this may be a top contributor to CE impairment in schizophrenia. The orbitofrontal cortex, which may play a crucial role in both affective

and cognitive ToM, is also implicated in schizophrenia, as well as individuals with schizotypy (Nishikawa, Takahashi, Takayanagi, Furuichi, Kido, Nakamura, Sasabayashi, Noguchi & Suzuki, 2015). Both schizophrenia patients and individuals with schizotypy showed a greater difference in volume and sulcus depth in the OFC compared to healthy controls. Still, patients with schizophrenia had a much greater difference than individuals with schizotypy. Also, specific folding patterns (Type II and III) in the OFC were related to both schizotypy and schizophrenia. Type II and III represent risk markers for psychotic symptoms, while Type I pattern may be seen as a resilience marker (Cropley, Bartholomeusz, Wu, Wood, Proffitt, Brewer, Desmond, Velakoulis & Pantelis, 2015). Nishikawa et al. (2015) further argue that these folding patterns may implicate certain genetic and or environmental risk factors for psychotic predispositions during pregnancy, because OFC folding patterns usually emerge around the mid-to-late gestation period. In summary, it may be argued that there are several indications of neurobiological correlates for certain impairments in schizophrenia, but studies also tend to vary, according to the methodology used.

There is also evidence for an influence of symptomatology on the type of error that was made in ToM tasks. According to Dziobek, Fleck, Kalbe, Rogers, Hassenstab, Brand, Kessler, Wolke, Wolf and Convit (2006), the Movie for the Assessment of Social Cognition (MASC) differentiates between three kinds of ToM errors. Overmentalizing errors are made when there is an excessive attribution of mainly malevolent intentions or self-referential meaning to others. Undermentalizing errors, on the other hand, show an impaired concept of mental states in general. There is also a “lack of ToM” category. However, all lead to a false or failing attribution of mental states. Patients suffering from schizophrenia with predominantly positive symptoms made more overmentalizing errors and patients with negative symptoms made more undermentalizing errors (Montag et al., 2011; Pedersen, Koelkebeck, Brandt, Wee, Kueppers, Kugel, Kohl, Bauer & Ohrmann, 2012).

Moreover, some confounding variables could be shown in recent studies trying to assess empathic ability. Bo et al. (2013), for example, found that verbal IQ, cognitive

flexibility, severity of personality disorder and some comorbid (mostly Axis-II) disorders were found to confound empathic research.

While there are many studies regarding the relation of schizophrenia and empathic ability, the same cannot be said for studies regarding schizotypy. One study by Thakkar and Park (2015) used the IRI and found that there might be a correlation between dimension groups and reported empathic ability. In their study, individuals with low negative traits were found to report higher AE and CE ability, while lower positive traits correlated with greater CE ability, but only in men. A similar conclusion was made by Henry, Bailey and Rendell (2008). Self-report measurement with the IRI found reduced reported AE ability in individuals with predominantly negative or disorganized traits. They also used behavioural measures and found that positive and negative traits correlated with reduced CE ability. Regarding group comparison between low and high schizotypy individuals, studies using self-report measures found that empathy as a whole (AE and CE) was reported to be lower in high schizotypy individuals (Wang et al., 2013; Melchers, Montag, Markett & Reuter, 2014; Dinn, Harris, Aycicegi, Greene & Andover, 2002). One study by Jashhan and Sergi (2007) used the naturalistic measure TASIT to infer ToM ability in schizotypy individuals and found there to be no impairment, even though other studies came to a different conclusion (Pickup, 2006).

As described, there is still a majority of heterogeneous results regarding empathic ability in individuals with schizotypy. This suggests that studies disregarding the degree of schizotypy traits may find different results, as the distribution of traits may be completely dissimilar in the different samples.

3 Aggression

3.1 Definition of aggressive behaviour

Like in empathy research, the definition of what can be seen as aggressive behaviour varies between different studies and there is a merging between related

concepts like violence. Generally, aggression refers to any behaviour that is hostile, injurious or destructive and has potential to inflict injury or damage to persons or objects (Anderson & Bushmann, 2002). This behaviour may not only be physical, but also verbal (Stanford, Houston & Baldrige (2008). Furthermore, Anderson and Bushmann (2002) argue that the perpetrator must believe that the behaviour will harm the target and that the target is motivated to avoid the behaviour. Therefore, accidental harm is not aggressive, because it was not intended. According to Anderson and Bushmann (2002), the same is true in the case of harm that occurs during helpful actions, because the perpetrator does not believe that the target is motivated to avoid this harm. They also argue that there is a difference to the construct of violence, as in contrast to aggression, violence has some kind of extreme harm (e.g., death) as its goal. They also elaborate that all violent actions are aggressive, but not all aggressive behaviours are violent (e.g., a child pushing another child is aggressive, but not violent). Bo et al. (2014) differentiate between proactive and impulsive aggression. Proactive (also predatory, instrumental, premediated) aggression refers to aggressive behaviour that is goal oriented, follows a planned pattern and is wilfully carried out. Andersen and Bushman (2002) also postulate that the goal of this behaviour does not necessary need to be harming the victim, but the aggression may also be means of obtaining some other goal. These tendencies are more related to future behaviour and more severe forms of aggression. Proactive aggression is also positively associated with physical aggression and psychopathy traits (Rossel & Siever, 2015). Impulsive (also reactive, affective or hostile) aggression, on the other hand, is affect driven, unplanned and precipitated by perceived or real provocation and is less pathological, except when the reaction is exaggerated in relation to the actual provocation (Bo et al., 2014). Individuals with high reactive aggression tendencies often have a history of abuse, negative emotionality and impulsivity. These two forms of aggression are highly intercorrelated and it is not uncommon that violent acts exhibit both features (Rosell & Siever, 2015). The Research Domain Criteria by the National Institute of Mental Health also distinguishes a third aggression category (Veroude, Zhang-James,

Fernandez-Castillo, Bakker, Cormand & Faraone, 2015). Frustrative non-reward aggression happens when a reward is withdrawn or prevented, especially if there are repeated failed attempts to get the reward.

According to Stanford et al. (2008), aggressive behaviour, in general, is correlated with a number of psychiatric disorders, but a unified, clinically relevant definition is missing in the literature. They argue that this may be due to the many biological, cultural, environmental and social variables influencing aggressive behaviour. Furthermore, intentionality of aggressive behaviour is difficult to measure and is often ascertained via self-report questionnaires. But it is important to note that aggressive and violent behaviour are not directly caused only by psychotic symptoms (Hoptman & Antonius, 2011). Some violence may be related to psychosis and reduced with antipsychotic medication, but other behaviour may be driven by personality traits that influence aggression independent of psychosis. Moreover, there are many different theories concerning the learning, emergence and preservation of aggressive behaviour.

Anderson and Bushman (2002) tried to unify the five common theories concerning aggressive behaviour (Cognitive Neoassociation Theory, Social Learning Theory, Script Theory, Excitation Transfer Theory and Social Interaction Theory) into their general aggression model (GAM). They argue that this unified model better describes aggressive behaviour in everyday environment, as each of the five theories do on their own. Especially, because usual aggressive behaviour is rarely focused on one specific type of aggression, but expresses itself through different motives, intentions and situational factors. They also found that treatment attempts often fail, because they only concentrate on one specific type of behaviour. Their model focuses on processes happening in the person or situation during social encounters. First of all, certain personality traits are found in people with high aggression levels. For example, susceptibility towards hostile attribution, perception and expectation biases may lead to a misunderstanding of the situation and aggravate the individual. Also, inflated or

unstable self-esteem may increase the proneness to anger in certain individuals, when they feel that their self-image is threatened. Secondly, males and females differ in their aggressive tendencies and react differently to various kinds of provocation. Thirdly, beliefs, attitudes and values also heavily influence proneness to aggressive behaviour. If an individual believes that they are able to successfully carry out an aggressive behaviour (self-efficacy) and that it will lead to a desired outcome (outcome efficacy), they are much more likely to engage in this behaviour. There is also evidence for an influence of held attitudes towards other people, genders, ethnicities or other groups on aggressiveness. This may also be related to the empathy bias discussed in chapter 2.3, whereas violent men in relationships showed reduced empathic concern only for their own spouses, but not for women in general.

But there are also many situational factors that influence tendencies for aggressive behaviour. Provocation (verbal, physical, interference to attain an important goal) is one of the main sources of situational influence on aggression. Frustration may build through constant provocation that may unload on the frustrating agent or even on an unrelated individual. Certain cues in a situations, like the mere presence of guns, may also aggravate aggressive tendencies.

The GAM also proposes three different routes aggressive tendencies may take to express themselves. These tendencies may manifest themselves in cognitions (hostile thoughts) or scripts (attributionally biases). Pain or certain discomforts (unpleasant temperature) may aggravate certain individuals. Also pre-existing physiological and psychological arousal may also increase the likelihood of aggressive behaviour. Physiological and psychological arousal can also increase the likelihood of aggressive behaviour.

3.2 Neurobiology of aggression

Neuroimaging research into neurobiological correlates of aggressive and violent behaviour has revealed evidence for involvement of some structures in healthy individuals and clinical populations. Rossel and Siever (2015) reviewed literature on

this topic and found that the amygdala, PFC and the striatum were heavily implicated. As mentioned in chapter 2.4, the amygdala plays a regulatory function by orienting emotional stimuli and mediating arousal and vigilance of cortical and subcortical regions. Bilaterally, reduced amygdala volume has consistently been associated with aggressive behaviour in both clinical and nonclinical samples. Furthermore, there seems to be a lateral divide between amygdalae functions. The left amygdala seems to be more involved with explicit, conscious and effortful mechanisms of affect processes, while the right amygdala is more involved with implicit, subconscious and automatic processes. Rossel and Siever (2015) also reported that more recent neuroimaging research that separated the amygdala into three subdivisions (basolateral, centromedial and cortical), found that there was a functional and lateral difference between the subdivisions. For example, left dorsal amygdala volume was negatively correlated with lifetime aggression, while motor impulsivity was positively correlated with both right and left ventral amygdalae, but did not correlate with dorsal subdivisions. Apart from amygdala volume, its metabolic activity is also implicated in aggression research. In a clinical sample consisting of individuals with borderline personality disorder (BPD) it was shown that amygdala activity was lower in the BPD group in an unprovoked state compared to controls, but increased more in response to provocation (New, Hazlett, Newmark, Zhang, Triebwasser, Meyerson, Lazarus, Trisdorfer, Goldstein, Goodman, Koenigsberg, Flory, Siever & Buchsbaum, 2009). Despite the fact that both groups showed similar degree of increase in behavioural aggressive response in the previous experiment condition. Lastly, Rossel and Siever (2015) found evidence for influence of facial stimuli to amygdala response. In a study comparing fearful and neutral faces it was found that the aggressive group had a lower difference of activation between fearful and neutral facial stimuli. However, they continue to argue that this reduced difference is not an indication for amygdala hypoactivity, but rather for continuous hyperactivity during both fearful and neutral stimuli.

Another structure that is also implicated in aggression research is the PFC, especially the orbitofrontal cortex (OFC) and the ACC (Rossel & Siever, 2015). Both structures complement each other, as the OFC's role is to assess motivational value and affective valence of certain stimuli, while the ACC determines the appropriate actions. As with amygdala volume, smaller left OFC volume was found to be associated with higher levels of trait aggression (Rossel & Siever, 2015). New et al. (2015) also investigated OFC activity in their BPD sample and found that it was increased after the provocation for BPD patients, but decreased in the healthy control group. Rossel and Siever (2015) also found evidence in recent studies that the OFC and amygdala are interconnected via the ACC. For example, the OFC receives more signals from the amygdala than it sends, while the ACC sends more projections to the amygdala. They argue that this further solidifies the ACC's role in action and response mediation and the OFC's perceptual role. Also, in patients with schizophrenia a decreased OFC-amygdala interconnectivity compared to healthy controls and a negative correlation between aggression and amygdalo-frontal connectivity was reported. This may be one of the reasons why patients suffering from schizophrenia have problems in regulating their responses (Rossel & Siever, 2015). Blair (2015) further found that impulsive aggressive responses may be modulated by the ventromedial PFC (vmPFC), by allowing representations of expected rewards and associated punishments with the action. They further argue that the vmPFC may interact with the amygdala by providing information on potential rewards and costs of future actions.

Finally, the striatum, which modulates thalamo-cortical activity, is also believed to impact aggressive behaviour (Rossel & Siever, 2015). Due to its modulatory role it is critical to select and inhibit appropriate competing motor, cognitive and emotional responses. However, the striatum plays a more indirect role in its impact on aggressive behaviour. The ventral striatum, for example, is involved in processing anticipated values of outcomes and events and the dorsomedial striatum is concerned with values of actions. This may also play a role in interpersonal interactions, as the dorsomedial

striatum also handles expectations of effects of social actions. It was shown that false expectations are associated with frustration during social interactions and increase the likelihood of impulsive aggressive behaviour (Rossel & Siever, 2015).

3.3 Aggression in schizophrenia

Aggressive and violent behaviour can be found in a number of psychiatric disorders, such as posttraumatic stress disorder, attention-deficit/hyperactivity disorder, bipolar disorder, substance abuse and certain neuropsychiatric conditions (e.g. dementia, encephalitis) (Rossel & Siever, 2015). Individuals suffering from schizophrenia have also been found to have an increased risk of aggressive behaviour compared to healthy individuals, however, the majority of violent crimes is still being committed by non-psychotic individuals (Bo et al., 2013). Four main risk factors have been identified that may explain this relationship between violence and schizophrenia: Psychotic symptoms, substance abuse, psychopathy or antisocial personality disorder and demographic factors. For comorbid substance abuse, it is hypothesized that these patients are more aware of their problems and therefore try to self-medicate. An increased risk of aggressive behaviour in schizophrenia is also associated with involuntary treatment, lack of insight into illness, cognitive distortion and disorganized and negative symptoms (Steinert & Hamann, 2012). Bo et al. (2013) examined the influence of mentalizing (ToM) abilities in schizophrenia patients with aggressive tendencies. They have shown that patients with predominant proactive aggressive tendencies have intact cognitive ToM and self/other distinction, but patients had a deficiency in self and other affective ToM. They further hypothesized that difficulties in recognition and monitoring of patient's own emotional arousal and own intentions may lead to anomalous theories about internal states of others and themselves. In their follow-up study, Bo et al. (2014) were able to replicate their findings in another sample of schizophrenia patients. They also found that in a clinical setting increased affective ToM abilities were correlated with less aggressive behaviour, while increased cognitive ToM lead to increased aggressive behaviour.

Bo et al. (2014) further argue that this certain ToM profile might influence aggressive tendencies in some disorders. The manipulative behaviour of psychopathic individuals, for example, is hypothesized to be the result of a lack of emotional processing abilities. These individuals show a lack of affective ToM, but not in cognitive ToM. They know how to manipulate others to get what they want, but do not necessarily understand the emotional impact this behaviour has on the other person. A similar ToM profile was also found by Abu-Akel & Abushua'leh (2004) in paranoid schizophrenia patients (predominant positive symptoms). They found that violent behaviour was more probable in patients with poor affective ToM and high cognitive mental state understanding (cognitive ToM). Other studies, however, argued that good mentalizing abilities should make violent behaviour less probable (Ward, Keenan & Hudson, 2000), while Abu-Akel & Abushua'leh (2004) found that impaired cognitive ToM was related to reduced violent behaviour. It may be argued that a lack of cognitive ToM possibly also reduces the perceived self-efficacy (belief that certain behaviour can be carried out), as the patient may be unable to foresee how the other person might react and how the behaviour will influence the other person. This uncertainty may further reduce the chance of engagement of aggressive behaviour in the first place.

Neuroimaging studies on aggression in schizophrenia patients are rather rare compared to research on empathy. Hoptman & Antonius (2011) reviewed literature regarding this topic and found some evidence for certain impairments. For example, structural MRI studies found that cortical thickness was reduced in aggressive patients with schizophrenia. Other studies comparing aggressive and non-aggressive patients found reduced cortical thickness in the right ventromedial PFC in the aggressive group. Another consistent finding is that schizophrenia patients with aggression seem to have certain white matter abnormalities in their inferior frontal white matter. Given the aforementioned reported hypoactivation of the amygdalae to certain facial stimuli, it is not surprising that some studies suggest that amygdala-PFC functioning is compromised in patients. In a previous study Hoptman, D'Angelo, Catalano, Mauro,

Shehzad, Kelly, Castellanos, Javitt and Milham (2010) reported that amygdalaofrontal functional disconnectivity is associated with aggression and antisocial behaviour. Furthermore, they demonstrated that patients showed a robust negative relationship between self-reported aggression and amygdala-ventral PFC connectivity. While it was continually shown that patients with schizophrenia have dysfunctional ventral prefrontal regions that are also involved with social cognition, this region also seems to be associated with increased impulsivity and aggression.

4 Goals and Hypotheses

The aim of this thesis is to find out if similarities in aggressive tendencies, empathy and ToM ability exist between individuals with high schizotypy and patients with schizophrenia. Furthermore, the utilization of solely self-report measures in some recent studies is brought into question by comparing this self-reported ability with actual ability measured by naturalistic measures. Also, the relationship of schizotypy dimensions on ToM ability will be investigated. Therefore, based on the preceding introduction, the following hypotheses were derived for this thesis:

1) Schizotypy, empathy and ToM

H1: It is assumed that Individuals with high schizotypy levels have diminished ToM abilities compared to those with low schizotypy levels and that this impairment only affects affective ToM.

H2: It is expected that there is a relationship between schizotypy dimensions and type of ToM error made in MASC. Individuals with positive traits are predicted to show predominantly overmentalizing errors. Individuals with high scores on the negative dimension of schizotypy are believed to show more undermentalizing errors.

2) Comparison of self-report and naturalistic empathy measures

H3: There is a difference between self-rating and naturalistic measurements of empathy and ToM. It is assumed that the PD and FS scale of the Saarbrückner Persönlichkeitsfragebogen (SPF) are not correlated with total score in MASC (CE) or the MET CE subscale.

H4: The same is presumed for SPF's EC and PD scales and MET's AE subscale.

H5: In addition, it is assumed that MET CE and MASC scores should, on the other hand, be correlated to each other, as they both use naturalistic methodology and measure aspects of ToM.

3) Relationship of ToM ability and aggressive behaviour

H6: It is assumed, that there is a relationship between individual aggressive tendencies and ToM ability.

H7: Proactive tendencies are expected to be related to lower affective ToM abilities.

Methods

5.1 Sample and Procedure

This thesis was part of a larger research project investigating several aspects of individuals with high schizotypy. That is one reason for the low number of test subjects, as the whole testing procedure took about four to five hours to complete. Subjects were first screened for demographical data, schizotypy and verbal IQ via online questionnaire hosted on www.socscisurvey.de. Inclusion criteria were a verbal IQ score of at least 21 and a percental separation of the SPQ total score in the sample population. Individuals with a score lower than 6 (lower 25% of the sample) were considered to have low schizotypy levels and individuals with a score higher than 31 (upper 75%) to have high schizotypy levels. Individuals, who did not match the criteria

were still eligible to win 3 x 100€, if they got randomly chosen after completion of the study. After initial screening, individuals matching the criteria were invited for part two and three of testing. Part two also was filled out via online questionnaire including SPF and RPQ among other tests not used by this thesis. Lastly, subjects were invited to an in-person appointment at the Faculty of Psychology at the University of Vienna. Different test instructors administered, apart from other tests not used in this thesis, TMT, MET and MASC. After completion, subjects were rewarded with 30€ compensation and were also eligible to win 3 x 100€ if chosen randomly. Participants that reported suicidal thoughts or plans were provided with a leaflet containing contact information about places to go for advice and help, along with their compensation money.

Out of 770 participants of part one, 97 participants remained after initial screening. After removing outliers, following the outlier labelling rule of Hoaglin & Iglewicz (1987), 93 participants remained. In MASC's subscales two outliers were removed in the affective ToM correct responses scale and one in both cognitive ToM correct responses and total ToM correct responses. One more outlier was removed from both of SPF's empathy (AE and CE) subscales and lastly, two more outliers were removed in MET's CE subscale (positive and negative emotions). As a whole, age ranged from 18 to 35 years ($M = 23.30$, $SD = .47$) and gender was unevenly distributed with 26 male, 66 female participants and one participant identifying as other. The majority of participants were studying ($N = 47$) or working and studying ($N = 24$), while the rest were either working ($N = 10$), in training/apprenticeship ($N = 8$) or unemployed ($N = 4$). 48 participants were grouped into the low schizotypy group ($M = 2.92$, $SD = 1.53$) with 14 males, 33 females and one other. Age ranged from 19 to 35 ($M = 23.81$, $SD = 3.38$) and 33 individuals a Matura (High school) and 15 a university graduation. The high schizotypy group consisted of 45 individuals ($M = 41.56$, $SD = 6.46$) with 12 males and 33 females and age ranging from 18 to 32 ($M = 23.27$, $SD = 3.29$). Most participants ($N = 36$) graduated high school (Matura), seven had a university degree, one graduated secondary school and one participant had finished an apprenticeship.

Groups did not significantly differ in age ($t(91) = .08, p = .94$) and according to Fisher's Exact Test neither did gender ($p = .91$) and education ($p = .10$).

Regarding aggressive behaviour in the whole sample, there was a tendency for impulsive ($M = 8.46, SD = 4.07$), but not so much for proactive behaviour ($M = 2.37, SD = 2.73$).

5.2 Measurements

5.2.1 SPQ

The Schizotypal Personality Questionnaire – German version (SPQ; Klein, Andersen & Jahn, 1997) is the translated version of the original Questionnaire by Raine (1997) originally based on DSM-III-R criteria for schizotypal personality. It is a 74-item self-evaluation questionnaire that has a total scale of schizotypy characteristics, but items also load in a three-factor structure, that was shown to be most fitting compared to other models (Vollema and Hoijtink, 2000). From this model a positive, negative and disorganized subscale can be derived, with each containing certain traits. The german version of the SPQ showed similar internal consistency as the original version with $\alpha = .88$ (Klein et al., 1997).

5.2.2 SCL-90-R

The Symptom-Checklist-90-Revised (SCL-90-R; Franke, 2002) assesses subjective impairments of physical and psychological symptoms within seven days. 90 items in nine scales measure the subjective impairment of fearfulness, depression, paranoid thinking, phobia, psychoticism, somatization, uncertainty in social situations and compulsive behaviour. Internal consistency of the scales is acceptable with values between .51 and .98 (Franke, 2002).

5.2.3 WST

The Wortschatztest (WST; Schmidt & Metzler, 1992) allows for fast estimation of verbal intelligence and language perception. Participants need to choose one word out of six, while only one is real and five are distractors. Then a total score of correct answers is formed, indicating verbal intelligence.

5.2.4 TMT

To assess cognitive flexibility, the Trail Making Test (TMT; War Department, 1944; Armitage, 1946) was used. In test A participants need to draw a line between numbers in ascending order and time is stopped for duration until completion. Test B works similar, but instead of numbers, letters need to be followed in alphabetical order. In the last test participants are asked to alternate between numbers and letters.

5.2.5 SPF

The Saarbrückner Persönlichkeitsfragebogen (SPF; Paulus, 2009) is the German translated version of Davis' (1983) 28-item Interpersonality Reactivity Index (IRI). The IRI is one of the most used questionnaires to assess self-rated empathy. It has one total score and four subscales. Two subscales measure AE: Empathic Concern (EC) assesses the tendency to experience emotional concern for others and Personal Distress (PD) represents self-oriented feelings of anxiety and unease in tense social situations. CE is measured by the remaining two subscales: Perspective Taking (PT) is the tendency to adopt the point of view of another person and Fantasy (FS) is related to PT, but is concerned with the perspectives of fictitious characters. In SPF the number of items is reduced to 16, as some items were found to have unclear factor loadings or were negatively phrased. Some validation studies, however, have found a small intercorrelation between PT and PD, which could indicate that PD is a concept that may not only refer to AE alone (Paulus, 2009). Like the IRI, SPF has shown a

high internal consistency ($\alpha = .78$) and test-retest reliability ($r = .62$ to $.80$) (Paulus, 2009).

5.2.6 MET

The Multifaceted Empathy Test (MET; Dziobek, Rogers, Fleck, Bahnemann, Heekeren, Wolf & Convit., 2008) is a naturalistic emotion recognition task that consists of 23 pairs of pictures of people in emotionally charged situations. It assesses both AE and CE abilities. Different multiple-choice questions are asked of the participants in each situation. CE is measured by requiring participants to deduce mental states of the portrayed person. (“How do you think this person is feeling?”, Figure 1). To assess AE, participants need to state their level of emotional contagion or concern, making this a self-report measure of AE (“How concerned are you for this person?”, Figure 2). This study will use MET’s CORE 2 version where implicit AE questions and contextual questions about the image background are removed, because, according to the author, intercorrelation with the standard explicit questions is too high. MET also shows satisfactory internal consistency ($\alpha = .07$ to $.09$) (Dziobek et al., 2008).



Figure 1: CE item in MET (Dziobek et al., 2008)



Figure 2: AE item in MET (Dziobek et al., 2008)

5.2.7 MASC

The Movie for Assessment of Social Cognition (MASC; Dziobek et al., 2006) is a naturalistic video-based test for evaluation of subtle ToM difficulties. Participants watch a 15 minute movie about four persons (two male and two female) and their everyday dating and friendship issues. After each scene, subjects are asked to attribute mental states by selecting one of four choices that they think is most fitting. The 45 questions concern the character's feelings, thoughts and intentions (e.g., "What is Klaus feeling?", "What is Sandra thinking", "Why is Brigitte doing this?"). MASC allows for a more differentiated analysis of ToM patterns with separate scores for total, affective and cognitive ToM. Furthermore, it also differentiates the type of ToM error that was made (undermentalizing, overmentalizing and lack of ToM). For example, in the short clip portrayed in Figures 1 to 3, Klaus is the first to arrive at the dinner party and he and Sandra enjoy a conversation about his vacation to Sweden. After a short time Michael also arrives, who has an interest in Sandra. He takes over the conversation and talks only to Sandra. She responds to that by looking at Klaus and then asking Michael if he has been to Sweden. This clip is followed up by the question "Why is Sandra asking this?" with four choices: to again involve Klaus into the conversation (correct answer); she wants to know whether Michael also visited Sweden (undermentalizing); to get back to the topic of Sweden (lack of ToM); she wants to compare Klaus and Michael (overmentalizing). MASC has shown a high internal consistency ($\alpha = .82$ to $.85$), high interrater ($ICC = .99$) and retest-reliability ($r = .97$) (Dziobek et al., 2006).



Figure 3: MASC example 1: Klaus is the first to arrive at Sandra's dinner party. Both seem to enjoy the conversation about Klaus' vacation in Sweden (Dziobek, et al., 2006)



Figure 4: MASC example 2: Michael also joins the party, but he tries do dominate the conversation and solely directs his speech to Sandra (Dziobek et al., 2006)



Figure 5: MASC example 3: Sandra seems to be slightly annoyed by Michael's bragging. Sandra looks at Klaus and then asks Michael, if he has been to Sweden (Dziobek et al., 2006)

5.2.8 RPQ

The "Fragebogen zur Erfassung reaktiver und proaktiver Aggression" (RPQ; Vloet, von Polier, Herpertz-Dahlmann & Raine, 2013) is the German translation of the Reactive-Proactive Questionnaire by Raine, Dodge, Loeber, Gatzke-Kopp, Lynam, Reynolds, Stouthamer-Loeber and Liu (2006). It is a short 23-item self-rated questionnaire that distinguishes between proactive and reactive aggression tendencies and also provides a total score. Items account for physical and verbal aggressive behaviour. RPQ shows a good internal consistency ($\alpha = .91$) and an acceptable retest-reliability ($r = .41$ to $.60$) (Vloet et al., 2013).

5.3 Statistical Analysis

Hypothesis 1 will be investigated using a Multivariate Analysis of Covariance (MANCOVA) with grouping variable being schizotypy group, and MET's CE subscale and MASC's ToM subscales (affective and cognitive) as dependent variables. Verbal IQ (WST) and cognitive flexibility (TMT) were controlled for as covariates. Following

the guideline by Field (2013) a significant MANCOVA will be followed up by subsequent ANCOVA's and Discriminant Analysis. To control for further violation of normal distribution, non-parametric Kruskal-Wallis Tests will also be employed.

The second hypothesis will be tested by utilizing non-parametric Spearman-Rho correlations, when examining the relationship between schizotypy dimensions (positive, negative, disorganized) and type of ToM error made in MASC (affective and cognitive: correct, undermentalizing, overmentalizing and lack of ToM).

The same procedure will be used to inspect correlations between self-report questionnaires (SPF AE and CE subscale) and naturalistic measures (MET's AE and CE subscale, MASC total score).

Lastly, following Bo et al. (2014), individuals will be separated into proactive or impulsive aggression groups, when they differ by more than five points in either scale. Then these groups will be compared regarding their ToM abilities using Spearman-Rho correlations.

Results

Schizotypy, empathy and ToM

To test for difference in ToM ability between low and high schizotypy groups a MANCOVA was employed, while controlling for verbal IQ and cognitive flexibility. Box's M Test indicated that the assumption of equality of covariance matrices for the MANCOVA was not violated ($p = .88$) and assumption of sphericity also held up, according to Bartlett's Test ($p < .01$). Using Pillai's Trace, there was a significant effect of schizotypy group on ToM ability, $V = .21$, $F(3, 85) = 7.39$, $p < .01$, but no significant differences between groups when controlling for verbal IQ ($V = .01$, $F(3, 85) = .26$, $p = .86$) or cognitive flexibility ($V = .07$, $F(3, 85) = 2.09$, $p = .11$). Subsequent ANOVA's, shown in Table 1, revealed mixed results. While there was still no significant difference between groups when controlling for verbal IQ, there was a significant influence of

cognitive flexibility on MASC's cognitive and affective ToM subscales, but as the main MANCOVA was not significant, these results should not be taken into account. Interestingly, between schizotypy groups, degree of significance between MET's CE subscale and MASC's affective ToM subscale were much closer than with MASC's cognitive ToM scale, which only closely managed to get significant ($p = 0.048$).

Table 1

Subsequent ANOVA's between groups and empathy and ToM measures

	<i>df</i>	<i>F</i>	η^2	<i>p</i>
<u>Main effects (schizotypy group)</u>				
MET CE	1	10.37	.11	< .01*
MASC affective ToM	1	18.98	.18	< .01*
MASC cognitive ToM	1	4.10	.05	.05*
<u>Covariate (verbal IQ)</u>				
MET CE	1	.06	< .01	.81
MASC affective ToM	1	.30	< .01	.59
MASC cognitive ToM	1	.74	.01	.39
<u>Covariate (cognitive flexibility)</u>				
MET CE	1	.81	.01	.37
MASC affective ToM	1	4.04	.04	.05
MASC cognitive ToM	1	4.99	.05	.03

Notes: * Previous MANCOVA was significant

These results are also confirmed by non-parametric Kruskal Wallis Tests. Group differences were found only in MET's CE subscale ($H(1) = 10.82, p < .01$) and MASC's affective ToM scale ($H(1) = 15.88, p < .01$), but not in MASC's cognitive ToM scale ($H(1) = 2.88, p = .09$).

Follow-up Discriminant Analysis revealed one discriminant function with canonical $R^2 = .45$. The correlation between dependent variables and the discriminant function showed that MASC's affective ToM scale ($r = .92$) and MET's CE subscale ($r = .75$) loaded more highly in this function than did MASC's cognitive ToM scale ($r = .43$), possibly revealing a difference in contribution to group separation, according to Bargmann (1970). These results confirm the assumption of hypothesis 1.

To test the second hypothesis, Spearman-Rho correlations were deployed and results are depicted in Table 2. There was a significant correlation between all trait groups and affective ToM ability (correct responses), all having moderate negative correlation coefficients. This result, however, was not found for cognitive ToM ability. Overmentalizing errors did not correlate with either trait group. Affective undermentalizing errors, on the other hand, did correlate with all trait groups, while only positive and negative traits correlated with cognitive undermentalizing errors. Lastly, errors displaying a lack of ToM correlated only on the affective ToM level with all trait groups, but not in cognitive ToM. Thus, while significant differences between trait groups could be found, they did not show the assumed direction of the second hypothesis.

Table 2

Spearman-Rho correlations between traits and ToM error made

	<u>Positive</u>		<u>Negative</u>		<u>Disorganized</u>	
	<u>Traits</u>		<u>Traits</u>		<u>Traits</u>	
	r_s	p	r_s	p	r_s	p
<u>Affective ToM</u>						
Correct	-.44	< .01	-.36	< .01	-.35	< .01
Overmentalizing	.07	.54	.04	.71	.01	.95
Undermentalizing	.35	< .01	.27	< .01	.21	.04
Lack of ToM	.34	< .01	.33	< .01	.33	< .01
<u>Cognitive ToM</u>						
Correct	-.18	.09	< .01	.97	-.14	.18
Overmentalizing	.04	.74	-.05	.62	.11	.29
Undermentalizing	.31	< .01	.18	.08	.10	.37
Lack of ToM	.12	.24	.08	.48	.14	.18

Comparison of self-report and naturalistic empathy measures

First, cognitive scales of SPF, MET and MASC were examined using Spearman-Rho correlations. SPF's cognitive subscale did not show a significant correlation with either MET's CE subscale ($r_s = .09$, $p = .38$) or MASC's total score ($r_s = -.01$, $p = .96$), thus confirming the third hypothesis. Also, separating MET's CE scale into positive and negative stimuli, the correlation to SPF's CE scale remained non-significant (positive: $r_s = .17$, $p = .11$; negative: $r_s = .02$, $p = .87$). Secondly, correlations between SPF's AE subscale and MET's two AE subscales (positive and negative emotions) were assessed. SPF's AE subscale only correlated with MET's negative AE subscale

($r_s = .35, p < .01$), but not with the positive emotion AE scale of MET ($r_s = -.01, p = .94$). The naturalistic measures (MASC and MET CE) on the other hand, showed significant correlation ($r_s = .37, p < .01$), confirming the fifth hypothesis.

Relationship of ToM ability and aggressive behaviour

Unfortunately, these hypotheses, regarding the aggressive behaviour in individuals with schizotypy, could not be assessed. In the original paper by Bo et al. (2014), individuals were sorted into either aggression group, if they differed by more than five points between either proactive or impulsive behaviour. As most individuals, in this study, report higher impulsive tendencies ($N = 91$) and the remaining two subjects do not differ by more than two points, these hypotheses could not be tested.

However, individuals with high schizotypy reported more proactive ($M = 3.35, SD = 2.96$) and impulsive ($M = 10.64, SD = 3.84$) aggressive tendencies than the low schizotypy group (proactive: $M = 1.31, SD = 2.00$; impulsive: $M = 6.42, SD = 3.13$). A non-parametric Mann-Whitney U-test revealed that this difference was significant for the proactive ($U = 528.5, p < .01$) and impulsive ($U = 425.5, p < .01$) aggressive scales. Also, Fisher's Exact Test revealed that reported PD was also significantly ($U = 403, p < .01$) higher in the high schizotypy group ($M = 9.50, SD = 2.58$), but not for EC (low: $M = 14.42, SD = 2.06$; high: $M = 14.44, SD = 3.14$) ($U = p = .63$). Furthermore, when combining the groups there was a correlation between the PD subscale of SPF and the reactive aggression subscale of RPQ ($r_s = .27, p = .01$), but not for the proactive subscale ($r_s = .12, p = .26$).

Discussion

Current research on empathic ability in patients with schizophrenia consistently shows that their ability for ToM may be impaired in relation to healthy controls. The first aim of this study was to find out, whether individuals with high levels of schizotypy show a similar ToM impairment. Results are in line with several studies on patient

samples, showing that while cognitive ToM seems to be intact, there are group differences for affective ToM (Lehmann et al., 2014; Bo et al., 2014). Interestingly, also MET's CE scale showed a significant difference between groups, possibly suggesting that this task is more similar to affective ToM than cognitive ToM. This makes sense considering that in MET participants are asked to infer what another person is feeling rather than what they are thinking. Discriminant analysis further complemented this assumption, as it showed that MASC's affective ToM and MET's CE scale explained the group difference better than MASC's cognitive ToM subscale. This result was also confirmed by non-parametric Kruskal-Wallis tests that showed no group difference only for cognitive ToM. Studies using MET only or in conjunction with self-report measures may need to be careful in making assumption regarding individuals' whole ToM ability, as MET's CE scale may only represent affective ToM, while cognitive ToM is not ascertained. The non-significant influences of covariates on group differences may be a result of the non-clinical sample. As schizotypy traits are not as severe in comparison to symptoms in schizophrenia, their impact on cognitive flexibility and verbal ability may also be less pronounced in schizotypal individuals. Nonetheless, this thesis found a difference between low and high schizotypal individuals and interestingly, a similar ToM profile also seen in individuals with psychopathy or schizophrenia (Bo et al., 2014). Investigating impairments in ToM subcomponents may be crucial to further increase efficacy of social cognition treatments for individuals with reduced empathic ability. As demonstrated in this thesis and other studies (Bo et al., 2014; Mier et al., 2010), ToM ability is not always impaired as a whole, but can also be stronger and weaker in certain components. In their critical review, Kurtz et al. (2015) found that empathic accuracy (facial affect recognition) and attribution of mental states can indeed be increased with social cognitive training programs. It can, however, be argued that individuals may profit more from these training programs if they were adapted to their respective impairments. Kurtz et al. (2015) report that the two most represented training approaches in research (Integrated Psychological Therapy and Cognitive Enhancement therapy) often include

multiple training modules, each with varying degree of complexity and different targeted impairments. But training modules that targeted basic, elementary social cognitive skills were found to be much more effective. Perhaps, treatment duration could be shortened, if treatment plans were designed to only target the individuals' specific empathic impairment profile. The finding of different impairments in ToM abilities also provides a possible pointer for future neuroimaging studies concerning ToM ability. As mentioned in chapter 2.4, affective ToM was associated with activity in medial orbitofrontal cortical regions, while cognitive ToM showed more activity in more dorsal regions of the OFC (Frith & Frith, 2006), arguing for a structural separation of both components. Future studies could investigate, whether impairments are associated with neurobiological correlates in volume or activity. Unfortunately, no study could be found that investigated the specific OFC regions and empathy in schizophrenia, schizotypy or borderline personality disorder. For example, Buchy, Ad-Dab'bagh, Lepage, Malla, Joober, Evans & Lepage (2012) implicated the thickness of the OFC (Brodmann's areas 11 and 47) in delusion misattribution. It would be interesting to know, whether this may also be related to (cognitive) ToM impairments and correlates in the medial or dorsal orbitofrontal regions.

Another aim of this study was to investigate whether self-report questionnaires and naturalistic measures were related to each other. A large number of studies rely solely on self-report measures and some also include naturalistic measures, but research suggests that the self-perceived empathic ability of schizophrenia patients might not be related to actual ability (Abramowitz et al., 2014). First of all, this study did not find a correlation between these measures for CE ability. Only the naturalistic measures correlated with each other, suggesting that CE self-report measures (at least SPF) may not reflect the actual CE ability in individuals with schizotypy. Assessment of AE, on the other hand, showed different results. There was a correlation for negative stimuli between MET's and SPF's AE subscale, but not for the positive dimension. One possible explanation for this may be that when individuals report high PD on the SPF AE subscale, they may also be more distressed when viewing negative emotions

in contrast to positive emotions. This was also suggested by Lehman et al. (2014). They found that, when patients viewed negative emotions (fear, anger, sadness), they had a higher susceptibility for emotional contagion. Furthermore, MET's AE scale functions more like a self-report questionnaire, as participants are asked to report their level of emotional contagion/arousal, instead of measuring it directly. As shown in the study by Sparks et al. (2010), patients suffering from schizophrenia have difficulties recognizing negative emotions and multiple studies report that there also is an association between emotional arousal and neutral stimuli without valence. (Haralanova et al., 2012). Perhaps, those individuals who have difficulties recognizing negative emotions are more aroused by them, because they are unable to attribute a specific salience to the stimuli. Therefore, high PD scores in SPF and high reported emotional arousal to negative emotions in MET may contribute to the found correlation for negative emotions. However, a similar difference between positive and negative stimuli was not found for CE, suggesting that CE's top-down functioning may not be impacted as much by type of emotional stimuli. The results of this study, on a sample with individuals with schizotypy, further solidify the assumption by Abramowitz et al., (2014) that self-perceived ability in schizophrenia patients may not be related to the actual ability. Furthermore, there is also evidence that this may be true for other disorders as well. Dziobek et al. (2011) found similar results for patients suffering from borderline personality disorder. This highlights the need for a mixed methodology when researching empathic ability. While self-report measures are important to gain insight into the self-perceived ability of individuals and are easy to employ, it is also necessary to measure the actual ability. This allows to investigate participants' insight into their own strengths and weaknesses. Christopher Frith's neurocognitive approach to see schizophrenia as a "meta-representational" disorder, based on the assumption that cognitive abnormalities better explain clinical symptoms (Pousa et al., 2006), may further highlight the need to examine more than just the self-perceived empathic ability. According to this model, these three abnormalities lead to a false

representation of others and patients' own mental states. Negative and disorganized symptoms lead to avolition that accounts for a disorder of willed action and more importantly, these symptoms also lead to a reduced self-monitoring ability (e.g., own mental states). Positive symptoms, on the other hand, drive defective mentalizing of others mental states and account for the emergence of paranoid symptoms. This also emphasizes the need to differentiate between symptom groups in future research, as different symptom combinations may contribute to different impairments in empathic ability. Furthermore, it was suggested by Ohtani, Bouix, Lyall, Hosokawa, Saito, Melonakos, Westin, Seidman, Goldstein, Mesholam-Gately, Petryshen, Wojcik and Kubicki (2015) that connections between certain medial frontal regions may predict symptoms in first episode patients with schizophrenia. In their study, white matter reduction between right posterior medial orbitofrontal cortex and the right rostral ACC were found to be related to severity of delusions and overall positive symptom severity. Negative symptoms, on the other hand, were associated with reduced white matter between the left posterior medial orbitofrontal cortex and rostral ACC. This could perhaps be an indication for association between neurobiological impairments and following symptomatology, which already was shown to be associated with certain empathic impairment profiles (Montag et al., 2011).

Following this reported association, it was also hypothesized that schizotypy traits may be related to the type of ToM error made in MASC. Several studies on schizophrenia patients suggested that patients with predominantly positive symptoms made more overmentalizing errors, while patients with negative symptoms made more undermentalizing errors (Montag et al., 2011; Pedersen et al., 2012). This study, however, could not find such a clear separation between analogous schizotypy dimensions. Furthermore, in contrast to other studies, this thesis examined both affective and cognitive ToM. For affective ToM, undermentalizing errors positively correlated with all three schizotypy dimensions. This was expected to be found, as more severe symptoms in schizophrenia also interfere more with affective ToM ability. A correlation between lack of ToM and schizotypy dimensions, however, was only

found on the affective ToM subscale, further contributing to evidence for a difference between both ToM modalities. As expected, correct answers were negatively correlated with all trait groups, because attenuated traits may also interfere less with ToM ability. The cognitive ToM subscale, on the other hand, only showed a correlation of undermentalizing errors and positive schizotypy traits. Most surprising, however, was that overmentalizing errors did not correlate with either schizotypy dimension on either ToM scale. One explanation for this may be that schizotypal traits are much more attenuated than in symptoms of schizophrenia, also leading to a less severe influence on ToM ability. Montag et al. (2011) came to a similar conclusion in their study about schizophrenia patients' ToM ability. They found that excessive overmentalizing only occurred in schizophrenia patients that were in acute paranoid states (current active positive symptoms), but not in those with remitted or absent paranoid states.

Sadly, the hypothesis that individuals with proactive aggressive tendencies show lower affective ToM than those with mainly impulsive tendencies could not be tested. As mentioned before, only two individuals reported to have more proactive tendencies, but did only differ by a handful of score points. Naturally, aggressive behaviour is more present in a clinical setting, where more severe symptoms may intensify aggressive behaviour. But there was an indication for a significant group difference on both scales as individuals with high schizotypy reported higher proactive and impulsive aggressive tendencies than those with low schizotypy. Further exploratory analysis found that there was a positive relation between reported impulsive aggression tendencies and perceived personal distress, but not for the proactive subscale. This makes sense, because proactive aggression is more controlled, related to future behaviour and planned in advance than impulsive tendencies. The aggressive reaction to real or perceived provocation in impulsive aggression may be initiated by building pressure felt by perceived personal distress in the situation. This could be taken as an argument for the utilization of self-report or physiological measures in further studies, as there is

much evidence for an influence of personal distress on certain constructs like empathy and aggression.

There were some limitations in this thesis. First of all, this thesis was part of a bigger research group examining different hypotheses. This meant that measurement selection could not be as specific to the actual hypotheses, as in a single study. Ideally, more diverse measures could have been employed and compared to each other. Additionally, due to the huge test battery less participants could be tested, as administration took approximately 4-5 hours to complete in three parts for each individual. A sample of 93 participants surely would be fair enough in a clinical sample, but of course is rather small in a sample taken from the general population. Thirdly, schizotypy grouping through percental distribution of schizotypy levels in individuals was done a-posteriori. This, of course, is problematic as it makes replication of these findings harder, as this percental grouping will be strongly different in other samples. Lastly, demographic properties of the sample are not well proportioned. There is an uneven distribution of gender and also in education. Out of the 93 participants there was a majority of studying participants ($N = 71$), but luckily, only 16 studied psychology, while the rest studied different subjects, therefore reducing the bias of psychology students in the sample.

Conclusion

The results of this thesis highlight certain suggestions made by other authors. First of all, the need for a differentiated perspective on empathy was already demonstrated in many studies. Great care needs to be employed in designing study methodology, measurements and interpretation of results. Especially, regarding ToM the separation into affective and cognitive components consistently shows a difference between both abilities. Following this argument, the importance of a more unified approach in empathy research among studies is highlighted. This regards both semantics and methodology used in research. Secondly, a mixed approach of self-report and

naturalistic measures is suggested by thesis results. It is quite important and more economical to employ self-rating questionnaires, but without assessing the actual ability, researchers are not really able to interpret these findings. As mentioned before, self-reported results may change by confounding psychopathology (mania/depression), and therefore lose their validity, if they are not also related to actual ability. Lastly, the many influences of certain trait profiles emerge in the literature. Future research regarding this topic could try to take a more wholesome approach, by accounting for these influences on empathic ability, aggressive tendencies, creativity, thinking abilities and so on. Research should also take into account that some trait profiles may be healthier for individuals than others.

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Gutachtenerstellung, wissenschaftliche Mitarbeit,
Teilnahme am Creativity Programm

ZERTIFIKATE

2011

Microsoft Office Specialist